PREFACE AND GUIDE TO DICTIONARY USAGE

The first edition of the *Dictionary of Food Science and Technology* was published in 2005 to complement the 2004 edition of the companion *Thesaurus* to the bibliographic database *FSTA – Food Science and Technology Abstracts*. Since that time, not only has the *Thesaurus* been updated several times online and in print, but the passing of time has also meant that many of the terms appearing in the first edition of the *Dictionary* have become outdated; new terms have also become apparent. In this second edition of the *Dictionary*, 763 completely new terms have been defined for the first time, and all 7,849 existing terms from the first edition have been checked for accuracy, resulting in over 1,500 term definitions being rewritten. This second edition of the *Dictionary* contains 8,612 terms in total.

In keeping with the first edition, the second edition contains a large number of definitions covering food commodities of every description and also many definitions of terms which are specific to food science and technology (for example, covering sensory analysis, consumer research, food composition, catering and food safety). It is further augmented with definitions of terms from cognate disciplines (including biochemistry, biotechnology, chemistry, economics, engineering, microbiology, packaging, physics and public health). Whenever appropriate, local names, synonyms and Latin names also appear. New additions to this edition include over 140 nutrition and health-related terms, reflecting recent increases in the importance and emphasis placed on nutrition and health by the food industry, academia and the general public. Coverage of these topics in *FSTA* has also increased in recent years. Similarly, terms relevant to pet foods and pet nutrition appear for the first time, since their appearance in the *FSTA* database from 2006 onwards.

The *Dictionary* has been designed to be comprehensive, clear and easy to use. Alphabetical order in the *Dictionary* is determined on a letter by letter basis (not word by word) as follows:

Acetates
Acetic acid
Acetic acid bacteria
Acetic fermentation
*Acetobacter.*

Characters such as numbers, hyphens, primes, subscripts and superscripts are ignored when ordering terms, as are small capitals, hyphenated modifiers and alphabetic Greek characters. For example, *N*-Acetylglucosamine, *d*-Amino acids, and 2-Aminobutane all appear under the letter A. Similarly, *α*-Carotene and *β*-Carotene both appear under the letter C. The Greek alphabet is given at Appendix A.
Terms in the Dictionary are shown in bold typeface. Cross-references within definitions to other terms appearing in the Dictionary are also shown in bold. For example,

**Ale** Historically, a **beer** type made without **hops**; in modern usage, a range of British-style beers, commonly brewed with top-fermenting **brewers yeasts**

Thus, the entry for ale given above shows that the Dictionary also contains definitions for the terms beer, hops and brewers yeasts. Similarly, the entry for bacteriocins

**Bacteriocins Peptides** produced by specific **bacteria** that possess **antibacterial activity**. Both purified bacteriocins and bacteriocin-producing bacteria are used in the food industry, applications including inhibition of the growth of **pathogens** and **spoilage** organisms

indicates that the Dictionary also has definitions for the terms peptides, bacteria, antibacterial activity, pathogens and spoilage.

The definitions in the Dictionary have been compiled and edited by specialist scientific staff at IFIS Publishing who also produce FSTA and the companion Thesaurus. IFIS is an acronym for the International Food Information Service which was founded in 1968. The IFIS mission is to provide information products and services, commission research and provide education in information science for the international food science, food technology and nutrition community. IFIS Publishing is a not-for-profit organization (Charity No. 1068176) and a company limited by guarantee (Company No. 3507902).

The Dictionary has been compiled to appeal to a wide range of readers. It is hoped that this resource will be a valuable tool for people of all levels working in the fields of food science, food technology and nutrition, as well as students of these subjects and their teachers, and anyone who has a general interest in the issues facing the international food sector.

We would be pleased to hear from readers of the Dictionary who may wish to comment on this edition or suggest candidate terms for future editions. Correspondence concerning the Dictionary should be addressed to the Head of Publishing, IFIS Publishing, Lane End House, Shinfield Road, Shinfield, Reading RG2 9BB, UK; e-mail: ifis@ifis.org.
CONTENTS

Foreword ix

Preface and Guide to Dictionary Usage xi

The Dictionary 1

Appendix A  Greek Alphabet 465

Appendix B  Scientific Societies and Organisations in the Food Sciences 467

Appendix C  Web Resources in the Food Sciences 471
AAS  Abbreviation for atomic absorption spectroscopy.

Absinthe  Spirits flavoured with wormwood. Widely believed to exhibit neurotoxicity as a result of thujone derived from wormwood. The spirit was prohibited in many countries early in the 20th century. However, legal manufacture and sale of the beverage have become more widespread since the 1990s.

Abalones  Marine gastropod molluscs belonging to the family Haliotidae, which contains around 70 species; widely distributed, but found mainly in the Western Pacific (Japan and Australia), and also off California and Southern Africa. Only the adductor muscle is edible, having a mild sweet flavour; this muscle is normally tenderized to soften the naturally tough, rubbery texture. Marketed in a variety of forms, including powdered, brined and canned products.

Abattoirs  Types of slaughterhouses where animals are slaughtered for meat and offal. Abattoirs usually include lairage (a holding area for live animals), a slaughtering line and cold stores. Facilities for processing of by-products (blood, intestines, skins, fat, bristle, unusable waste products), and treatment of waste water and air are often included.

Abondance cheese  French semi-hard mountain cheese made from milk of cows of the breeds Abondance, Montbeliard and Tarine. Characterized by a strong aroma and a complex flavour. The crust and a grey layer beneath are removed before consumption.

Abre  Alternative term for abrey.

Abrey  Sudanese, non-alcoholic, fermented beverages made from sorghum.

Abscisic acid  Plant growth regulator, important in ripening of fruits and cereals.

Absidia  Genus of fungi of the class Zygomycetes. Occur as saprotrophs on decaying vegetable matter, grains, soil or dung, and meat, or as parasites or pathogens of plants or animals. Some species may be used in the production of chitosan (e.g. Absidia coerulea, A. glauca and A. atrospora). Other applications include the production of enzymes for use in the food industry (e.g. α-galactosidases).

Absinthe  Spirits flavoured with aniseed and wormwood. Widely believed to exhibit neurotoxicity as a result of thujone derived from wormwood. The spirit was prohibited in many countries early in the 20th century. However, legal manufacture and sale of the beverage have become more widespread since the 1990s.

Absorbents  Materials or substances that are capable of absorption. Uses of absorbents include incorporation within food packaging (to absorb oxygen as a preservation technique, to control humidity, and to manage aroma and flavour problems in packaged foods) and for purification of foods and beverages, such as drinking water and liquid foods.

Absorption  Process involving molecules of one substance being taken directly into another substance. Absorption may be either a physical or a chemical process, physical absorption involving such factors as solubility and vapour-pressure relationships, and chemical absorption involving chemical reactions between the absorbed substance and the absorbing medium. Absorption includes such processes as the passage of nutrients and other substances from the gastrointestinal tract into the blood and lymph, and also the uptake of water, fats and other substances into foods.

Acacia  Plants of the genus Acacia (family Fabaceae), mostly tropical shrubs and trees. Acacia seeds are used as foods, and shoots may be used in soups, curries, omelettes and stir fries. Acacia honey has a mild flowery flavour. Several species of Acacia yield gums, such as gum acacia which is also known as gum arabic.

Acai  Small, dark purple fruits from the palms Euterpe oleracea. The pulps and juices may be used in beverages, as well as in functional foods. Rich in dietary fibre and fatty acids, and have strong antioxidative activity.

Acanthamoeba  Genus of free-living amoebae which occur in soil and fresh water. Some species may be opportunistic pathogens.

Acaricides  Pesticides used to control mites and ticks (family Acaridae), many of which are responsible for animal diseases and spoilage of stored crops. Examples include amitraz, bromopropylate, coumaphos and fluvalinate. Residues in foods may represent a health hazard to consumers.

ACC  Abbreviation for the plant growth regulator, 1-amincyclopropane-1-carboxylic acid.

Acceptability  The degree to which the quality of a food is regarded as satisfactory.

Acceptable daily intake  A safety level for substances used as food additives. Usually calculated as
Acetate

Acetic acid

Acetates

Acesulfame K

Acerola

Acceptance

ACE inhibitors

Aldehyde

Acetals

Acetan

Acetate

Acetoin

Acetol

Acetone

Acetophenone
Acetylacetone Ketone which occurs in the flavour compounds of foods and beverages, including beer, coffee and fermented dairy products. Also widely used as an analytical reagent, e.g. in the determination of formaldehyde. Synonym is penta-nedione.

Acetylation Introduction of acetyl groups into a compound or substance. Usually achieved by reaction with acetic anhydride, acetic acid or an acetate such as vinyl acetate. Sometimes used to protect hydroxyl groups during organic syntheses. Such modification is also used to alter the physicochemical properties, functional properties or nutritional quality of substances such as starch, proteins and carbohydrates.

Acetylcholinesterases EC 3.1.1.7. Esterases which convert the neurotransmitter acetylcholine to choline and acetates. Act on a variety of other acetic esters and also possess transacetylase activity. Inhibition of these enzymes can be a marker for neurotoxicity. Some acetylcholinesterase inhibitors are used medically, e.g. to treat Alzheimer's disease, and some are used as pesticides. These enzymes can be used analytically to detect pesticide residues in foods and beverages. Acetylcholinesterase inhibitory activity has been found in essential oils and plant foods. Also known as cholinesterases.

N-Acetyl-L-cysteine One of the antioxidant compounds used as food additives, e.g. to minimise browning and off flavour formation in fruit juices, other fruit products and vegetable products, and to inhibit haemagglutinins in legume meal. Also used to inhibit formation of biofilms on food contact surfaces. Commercially available as a food supplement claiming to provide detoxification effects and benefits to the immune system.

Acetylene Hydrocarbon which acts as a plant growth regulator and can be used to control ripening of fruits.

N-Acetylglucosamine Derivative of the amino sugar glucosamine in which the amino group is acetylated. Component of cell walls and chitin.

Acetylglucosaminidases Comprise α-N-acetylglucosaminidases (EC 3.2.1.50), which hydrolyse terminal non-reducing N-acetyl-D-glucosamine residues in N-acetyl-D-glucosaminidases and mannosylglycoprotein endo-β-N-acetylglucosaminidases (EC 3.2.1.96), which catalyse endo-hydrolysis of the N,N′-diacylcylchitobiosyl unit in high-mannose glycoproteins and glycoproteins containing the [Man(GlcNAc)2]Asn structure; one N-acetyl-D-glucosamine residue remains attached to the protein, while the rest of the oligosaccharide is released intact. These glycosidases are involved in chitin degradation applications, and contribute to antibacterial activity in egg shell membranes and to autolysis due to autolysins in some bacteria.

β-N-acetyhexosaminidases EC 3.2.1.52. Glycosidases which catalyse the hydrolysis of terminal non-reducing N-acetyl-D-hexosamine residues in N-acetyl-β-D-hexosaminides. Substrates include N-acetylgalactosides and N-acetylgalactosaminides. Involved in degradation of polysaccharides including chitin.

N-Acetyllactosamine synthases Alternative term for lactosynthases.

Acetylmethylcarbinol Flavour compound found commonly in dairy products and wines. Synonym of acetoin.

N-Acetin neuraminic acid One of the organic acids, synonym sialic acid. A nitrogen-containing sugar derivative with a carbonyl functional group found ubiquitously in complex carbohydrates.

Acetyltransferases A cyttransferases which are members of the class EC 2.3.1 and catalyse transfer of acetyl groups, usually from acetyl-coenzyme A.

Acha Species of cereal crop, Digitaria exilis, indigenous to West and North Africa and grown for its grain.

Achromobacter Genus of strictly aerobic, rod-shaped, non spore forming Gram negative bacteria of the family Alcaligenaceae. Occur in soil and water. Some species produce pigments and enzymes of industrial importance.

Acid casein Casein produced by acid precipitation from milk at its isoelectric point, pH 4.7. Acidification can be achieved by direct addition of an acid or through the action of lactic acid bacteria.

Acid curd cheese A cheese produced by microbial ripening of quarg, ripening proceeding from the outside of the cheese. Cultures used include bacteria, fungi and yeasts, the selection depending on the type of cheese being made.

Acidification Process by which the pH of a substance is decreased to below 7 making it acidic.

Acidity The degree to which a substance or solution is acidic, being dependent upon the concentration of hydrogen ions. Level of acidity is expressed using pH.

Acidolysis Esterification reactions of acids with esters. Used to produce structured lipids (e.g. acidolysis of tristearin with long chain fatty acids) or to modify the lipid composition of fats and oils (e.g. acidolysis of seal blubber oils with lauric acid and interesterification of butterfat with CLA). Catalysed by lipases or chemical catalysts.

Acidophilin Fermented milk prepared by fermentation of milk with a mixture of lactic acid bacteria.
Acidophilus milk

including *Lactobacillus acidophilus*, and kefir grains.

**Acidophilus milk** Fermented milk produced by fermentation of milk with *Lactobacillus acidophilus*. Consumption of acidophilus milk has beneficial effects on the intestine.

**Acidophilus pastes** Cultured milk products made using curd resulting from milk acidification with *Lactobacillus acidophilus*.

**Acid phosphatases** EC 3.1.3.2. Hydrolases with wide specificity which catalyse *hydrolysis* of orthophosphoric monoesters into an alcohol and orthophosphate. Also catalyse transphosphorylation. Widely distributed in nature, and therefore found in a range of foods. Involved in *acidity* regulation in fruits, and in *flavour* development, e.g. in *cheese*. Also used as a marker of *thermal processing* in *meat*. Produced by microbial *fermentation* for commercial applications.

**Acid rain** Rain which has low pH caused by formation of *acids* due to interaction of industrial gas emissions with water. Studies with simulated acid rain have shown adverse effects on yield and quality of exposed crops, especially *fruits* such as *apples*, *pears* and *peaches*. Fruit marketability and composition were affected.

**Acids** Chemical compounds which release hydrogen ions when dissolved in water, or whose H can be replaced by metal atoms or basic radicals, or which react with bases to form salts and water. Include both *organic acids* and *inorganic acids*. Inorganic acids may be used in food processing or cleaning of equipment. Organic acids of many types are constituents of a wide range of foods, both as natural constituents and as processing aids. Important types of organic acids in foods include *fatty acids*, *amino acids* and *carboxylic acids*.

**α-Acids** The main bitter compounds of *hops* resins, used to impart a bitter taste to *beer*. Converted to the more soluble and more bitter *iso-α-acids* during boiling of *worts*. Also known as *humulones*.

**β-Acids** Low-solubility resin constituents in *hops* which have little bittering capacity in *beer*. Also known as *lupulones*.

**Acids resistance** Ability of organisms to withstand acidic conditions. Important for survival of *microorganisms* in acid environments such as the gastrointestinal tract and during *fermentation* of foods.

**Acidulants** Organic *acids* used in foods to control pH and fulfil a variety of functions. Applications include *preservation* of *meat* products, *flavour enhancement*, prevention of discoloration in sliced *fruits*, and prevention of development of *rancidity* in *oils* and *fats*. Commonly used acidulants in the food industry include *citric acid*, *acetic acid*, *propionic acid* and *lactic acid*.

**Acid values** The level of free *fatty acids* present in *lipids*. The acid value, also known as the acid number, is determined by measuring the amount of KOH in milligrams that neutralizes 1 g of the lipid. Acid values of fresh edible *fats* tend to be low and increase with storage as the *glycerides* present in the lipids break down to generate free fatty acids.

**Acid whey** *Whey* produced by acid coagulation of *milk* during *cheesemaking*.

**Acinetobacter** Genus of aerobic, rod-shaped, *psychrotrophic* Gram negative *bacteria* of the family Moraxellaceae. Occur in soil, water and *raw milk*, and on the surfaces of chilled *meat* and *fish*. Some species may be used in production of *lipases* (e.g. *Acinetobacter radioresistens* and *A. calcoaceticus*).

**Ackee** Common name for *Blighia sapida*, also known as akee. This fruit was introduced to the West Indies from West Africa and is particularly popular in Jamaica. Fruits are pear shaped and can be consumed raw, cooked, or in canned or frozen forms. Unripe ackee contains hypoglycine A, a toxic amino acid, which can cause the potentially fatal Jamaican vomiting sickness. Levels of hypoglycine A rapidly diminish at maturity, but damaged or fallen fruit should not be consumed.

**Aconitc acid** One of the *organic acids* found in *sugar cane*. Used in *flavourings* and *acidulants* for the food industry and also in the manufacture of *emulsifying agents*, plastics and detergents.

**Acorns** Nuts obtained from the oak tree (*Quercus* spp.). Widely available, and used as a source of food by some populations, particularly in times of need. Can be pounded into *meal* for use in baked goods or used as *coffee substitutes*. Acorns are high in *starch* and are used in Korea to produce an edible starch gel known as *mook*. They also represent a source of edible *oils*.

**Acoustics** Study of the physical properties of sound; also refers to techniques based on transmission, generation or reception of sound. Acoustic devices have been used to detect *insects* infestation of *grain*. Acoustics has also been employed in examining the structure of materials, e.g. *pasta*, and as the basis of non-destructive methods to determine the *texture* of foods, such as *fruits*, *cheese* and *bakery products*.

**Acquired immunodeficiency syndrome** Epidemic disease commonly abbreviated to *AIDS*.

**Acremonium** Genus of *fungi* of the phylum Ascomycota. May be used in *biotechnology* for the pro-
duction of cellulases (e.g. Acremonium cellulolyticus and A. alcalophilum).

**Acrocomia** Genus of palms, including Acrocomia mexicana, which has edible fruits, and is used as a source of palm oils (oil of coyal) and in manufacture of palm wines. Also includes A. sclerocarpa, which has edible fruits that are used as a source of coconut-like oils.

**Acrolein** Aldehyde, synonym propenal. Formed by microbial fermentation from the precursor 3-hydroxypropionaldehyde. Causes bitter, acrid off odour or off flavour problems in spirits and cider. Also occurs in overheated fats. Precursor for acrylamide.

**Acrylamide** Synonym 2-propenamide (C\textsubscript{3}H\textsubscript{5}NO). Member of the amides which is a neurotoxin and exhibits carcinogenicity in animal models. Formed in foods during thermal processing as a product of the Maillard reaction between asparagine and reactive carbonyl compounds, e.g. in reducing sugars. Forms gels of polyacrylamides on polymerization under specified conditions which are used for PAGE.

**Acrylonitrile** Monomer used in manufacture of a range of plastics used in packaging materials or other food contact applications. Acrylonitrile residues may migrate out of plastics items and cause contamination of foods.

**F-actin** Filamentous actins, formed by longitudinal polymerization of G-actin (globular actin) monomers. Two strands of F-actin coil spirally around one another to form the superhelix, which is characteristic of actin myofilaments within myofibrils.

**Actinidains** EC 3.4.22.14. Cysteine endopeptidases (proteinases) found in kiwifruit (Chinese gooseberries) with specificity similar to that of papain. One of the major allergens in these fruits. Produced in microbial fermentations as recombinant enzymes for commercial uses, which include tenderization of meat. Also known as actinidins.

**Actinidins** Alternative term for actinidains.

**Actinomucor** Genus of fungi of the family Mucoraceae. Occur as saprotrophs on decaying vegetable matter, soil or dung, or as parasites or pathogens of plants or animals. Actinomucor elegans and A. taiwanensis are used in production of East Asian speciality foods, such as sufu and meitauza.

**Actinomycetes** Order of aerobic Gram positive bacteria. Occur in soil, composts and aquatic habitats. Most species are free-living and saprophytic, but some form symbiotic associations and others are pathogenic to man, other animals, and plants.

**Actinomycetales** Obsolete name for Actinobacteria, a class of aerobic Gram positive bacteria which occur in soil and water. Some species are used in the production of enzymes (e.g. lipases and cellulolytic enzymes). This class also includes some plant and animal pathogens.

**Actinoplanes** Genus of Gram positive, aerobic bacteria of the family Actinoplanaceae. Occur in soil, plant litter and aquatic habitats. Actinoplanes missouriensis may be used in production of enzymes (e.g. glucose isomerases and xylose isomerases).

**Actinospectacin** Alternative term for the antibiotic spectinomycin.

**Actins** A family of multifunctional intracellular proteins, best known as a myofibrillar component of striated muscle fibres. They constitute about 13% of muscle proteins and are the major components of the I-band or thin filament of the sarcomere. Actins contain high levels of the amino acid proline. Imino-groups within proline contribute to the folding of actin molecules and result in formation of G-actin (globular actin). G-actin, a spherical molecule approximately 5.5 nm in diameter, constitutes the monomeric form of actin. In the presence of potassium chloride and ATP, G-actin polymerizes into long fibres of F-actin. Most vertebrate genomes contain numerous actin genes with high sequence homology in protein coding regions, but considerable variability in intron size and number. This genetic diversity can be utilized for livestock speciation and meat authenticity tests. Determination of actin content has been proposed as a means of calculating the meat content of meat products.

**Activated C** Alternative term for activated carbon.

**Activated carbon** Amorphous forms of elemental carbon, particularly charcoal, which have been treated, e.g. by acid or heat, to improve their powers of absorption. Used for a variety of food and industrial applications, including drinking water purification, decoloration of sugar solutions and sorption of residues of pesticides from wines.

**Activation energy** Minimum energy required for a chemical reaction to proceed; the difference in energy between that of the reactants and that at the transition state of the reaction. Activation energy determines the way in which the rate of a reaction varies with temperature.
Active packaging

Packaging materials which have functions additional to their basic barrier action. Used for packaging a wide range of foods and beverages. Types of active packaging include: packs which adsorb ethylene to control ripening of fruits; packs which regulate moisture levels; packs which contain oxygen scavengers; packs which contain CO₂ scavengers or generators; packs which release or absorb flavours or aromas; antimicrobial packaging (e.g. packs which release ethanol to control the growth of fungi); packs with special microwave heating properties; and packaging with monitoring systems (time/temp. exposure indicators or temp. control).

Active sites Locations on the surface of catalysts at which reactions occur. On enzymes, substrates are bound at the active sites, the shape of the site being important for strong and specific binding to occur.

Actomyosin A complex of the two major muscle proteins, actins and myosin. Actomyosin is formed during muscle contraction with simultaneous hydrolysis of ATP to ADP. Within myofibrils during contraction, each myosin head region on a thick myofilament attaches to a G-actin molecule within a thin myofilament. This interaction leads to formation of crossbridges between actin and myosin, and to formation of the actomyosin complex. Formation of actomyosin results in rigidity and lack of extensibility in muscles. In the presence of ATP, as in living animals, the actomyosin complex dissociates rapidly; however, post mortem, actomyosin is the dominant form of myofilament protein and it plays a major role in the development of rigor mortis. During post mortem storage, tenderness of meat is affected by modification of the actin-myosin interaction. Thermal denaturation of actomyosin occurs at temp. between 30 and 50°C.

Acylamidases Alternative term for amidases.

Acylases Alternative term for amidases and amidylases.

Acylation Introduction of acyl groups into a compound or substance. Usually achieved by reaction with an acyl halide or carboxylic acid anhydride. Such modification is used to alter the physicochemical properties, functional properties or nutritional quality of substances such as starch, proteins and sugars.

Acylglycerols Systematic name for fatty acid esters of glycerol, such as monoacylglycerols, diacylglycerols and triacylglycerols. Major components of natural fats and oils (particularly as triacylglycerols); also used as emulsifiers. Synonym for glycerides.

Acyltransferases EC 2.3. Enzymes which catalyse transfer of acyl groups from a donor molecule to an acceptor molecule. Includes transferases involved in transfer of amino-acyl groups (EC 2.3.2.-), acyl groups other than amino-acyl groups (EC 2.3.1.-), and acyl groups that are converted to alkyl groups on transfer (EC 2.3.3.-). Involved in a variety of metabolic pathways, including lipids and sterols.

Additives Ingredients added in low quantities to foods during processing for one or more specific purposes. These include prevention of chemical and microbial spoilage, enhancement of flavour or colour, improvement of nutritional values or as an aid to processing. The most common types of additives include preservatives, colorants, sweeteners, flavourings, emulsifiers, thickeners and stabilizers.

Adenine Purine, synonym 6-aminopurine. Component base of nucleic acids, nucleosides and nucleotides.

Adenosine Nucleoside of adenine and ribose, synonym adenine riboside. Constituent of nucleotides and nucleic acids.

Adenosine diphosphate Phosphorylated adenosine derivative, and breakdown product of the nucleotide adenosine triphosphate (ATP). Level may be used as an indicator of freshness in foods such as meat and fish. Usually abbreviated to ADP.

Adenosine monophosphate Nucleotide formed by breakdown of nucleic acids, adenosine triphosphate (ATP) or adenosine diphosphate (ADP). Level may be used as an indicator of freshness in foods such as meat and fish. Commonly abbreviated to AMP.

Adenosinetriphosphatases Alternative term for ATPases.

Adenosine triphosphate Nucleotide which is important in energy metabolism. Ratios of adenosine triphosphate to its decomposition products may be used as indicators of freshness in foods such as meat and fish. Levels may also be used as an indicator of microbial counts in foods. Commonly abbreviated to ATP.

S-Adenosyl-L-methionine One of the coenzymes involved in methyl group transfer. Plays an important role in several human metabolic pathways. Even though it is synthesized in the liver, relatively low levels are found in individuals suffering from coronary heart disease, Alzheimer’s disease, liver cirrhosis and depression. This has lead to its use as a food supplement and its potential application as an ingredient of functional foods. Not widely available in the diet. Produced during fermentation of various microorganisms, including Bifidobacterium bifidum and Kluyveromyces lactis.


**Adenoviruses**

Double stranded DNA-containing viruses of the genus *Mastadenovirus* and family Adenoviridae which can infect mammals and birds. Infection of humans, which can occur via ingestion of faecally contaminated water or shellfish, can cause gastroenteritis.

**Adherence**

Binding of microorganisms specifically or non-specifically to a substratum or to other cells. May be mediated by specialized microbial components or structures (e.g. adhesins and prostheca). Adherence to a particular host tissue is a preliminary stage in pathogenesis for many pathogens.

**Adhesins**

Bacterial cell surface appendages or extracellular macromolecular components that facilitate adherence of a cell to a surface or to other cells. Important in the colonization of mucous membranes, e.g. the intestinal mucous membranes by enteropathogenic *Escherichia coli*. Also facilitate adherence of bacteria to surfaces such as glass, ceramics and synthetics.

**Adhesion**

Attachment and sticking together of one or more substances. Adhesives may be used to promote adhesion, e.g. in packaging materials. Sometimes used to refer to adherence of microorganisms to a substratum or other cells. This may be mediated by specialized microbial components or structures such as adhesins or prostheca. This type of adhesion is important for the action of the microorganism, e.g. a preliminary step in pathogenesis of pathogens.

**Adhesives**

Substances used to stick items together. Most adhesives form a bond by filling in the minute pits and fissures normally present even in very smooth surfaces. Effectiveness of an adhesive depends on several factors, including resistance to slippage and shrinkage, malleability, cohesive strength, and surface tension, which determines how far the adhesive penetrates the tiny depressions in the bonding surfaces.

**Adhumulone**

α-Acids fraction of the bitter compounds of hops.

**ADI**

Abbreviation for acceptable daily intake.

**Adipic acid**

Synonym for hexanedioic acid. Used in acidulants, antimicrobial preservatives or starch-modifying agents. Adipic acid esters are used as plasticizers in plastics.

**Adipocytes**

Cells found in adipose tissues. These cells are specialized for the synthesis and storage of fat (lipid) globules. The fats are usually stored in the form of triglycerides and serve as a source of energy. Also known as fat cells.

**Adipogenesis**

The formation of adipose tissues. Also called lipogenesis.

**Adiponectin**

One of the hormones produced and secreted by adipocytes. Regulates metabolism of lipids and glucose.

**Adipose tissues**

Connective tissues which function as an energy reserve and insulation layer composed of cells (adipocytes) which synthesize and store large lipid globules.

**Adjunct cultures**

Non-starter cultures used in addition to starters, mainly in cheesemaking, to produce a specific benefit, e.g. smoother texture, improved flavour or accelerated ripening of cheese. In production of yoghurt, adjunct cultures have been used to manufacture products with increased levels of nutrients such as folates.

**Adjuvants**

Ingredients added to a mixture to improve the effectiveness of the primary ingredient. For example colour adjuvants are used to enhance food colour.

**Adlay**

Alternative term for Jobs tears.

**ADP**

Abbreviation for adenosine diphosphate.

**ADP-glucose pyrophosphorylases**

Alternative term for glucose-1-phosphate adenyltransferases.

**β-Adrenergic agonists**

Group of non-hormonal growth promoters. Used to enhance growth rates and improve feed efficiency and lean meat content of animals; also used in veterinary medicine as bronchodilatory and tocolytic agents. In general, rapidly excreted from the body; non-authorized use during withdrawal period has resulted in cases of human food poisoning. Banned for use as growth-promoting agents in farm animals in many countries, including European Union member states and the USA. Commonly used examples are clenbuterol and ractopamine.

**Adsorbents**

Substances that are capable of adsorption. Used widely in the food and biotechnology industries. Uses include removal of unwanted materials in foods and beverages that affect either food safety or food quality. Examples include removal of proteins from white wines, pathogens from drinking water sources, radioelements from foods, oxidation products from frying oils allowing oil recovery and reuse, and bitter compounds from fruit juices. Other applications include: for isolation of compounds with potential use in foods; in the immobilization of enzymes; as agents in analytical techniques such as gas analysis and chromatography; and for removal of unwanted aroma and flavour in packaged foods.

**Adsorption**

Adhesion of the molecules of liquids, gases and dissolved substances to the surfaces of solids, in contrast to absorption, in which the molecules actually enter the medium. Adsorption is employed in hydrogenation of oils, in gas analysis, and in chromatography.
**Adulteration** Addition of substances to foods, or substitution of food ingredients with inferior substances, with the intent of lowering the quality and costs of producing the food and defrauding the purchaser, e.g. addition of *starch* to *spices*, and of *water* to *milk* or *beer*.

**Adzuki beans** Common name for seeds produced by *Vigna angularis*, also known as azuki beans. Small red beans with a mild, sweet *flavour*, which are widely cultivated in Japan and China. Traditionally consumed boiled, ground into meal or used to make sweet bean pastes known as *ann* or *an*. Seeds may also be germinated to produce *bean sprouts*.

**Aerated confectionery** *Confectionery* produced with incorporation of air as an ingredient. Use of air adds bulk to the product without increasing its weight, improving product *texture* and *flavour*. Aeration of confectionery results in a range of products with densities ranging from 0.2 to 1.0 g/cm³. Such products include chews, mallows, honeycomb and *meringues*.

**Aeration** Introduction of air into a product to enhance *texture*, *mouthfeel*, *rheology* and visual appeal. The following methods are used to aerate foods: *fermentation*; *whipping* or shaking of low-medium viscosity liquids; *mixing* of doughs or high viscosity pastes, in which air bubbles are entrapped as surfaces come together; steam generation during slow to moderate *cooking*, *baking* or *frying*; entrapment of air between sheeted layers, as in *pastry*es and *crosiers*, or between pulled strands, as in pulled taffy and *candy*; frying in very hot oils, such that internal steam rapidly forms, causing the product to puff; use of chemical *raising agents* such as *baking powders* or *sodium bicarbonate*; rapid dry heating of small or thin products to induce blistering or slight puffing; gas injection (e.g. air, *carbon dioxide*, *nitrogen* and *nitrous oxide*); expansion *extrusion*; pressure heating (dissolution of air or gas under pressure in a syrup, fat mixture or chocolate); *puffing*, in which products such as *breakfast cereals* containing superheated moisture are subjected to a sudden release of pressure; and vacuum expansion, followed by rapid cooling to set the expanded products.

**Aerobacter** Obsolete genus of Gram negative, rod-shaped *bacteria* of the family *Enterobacteriaceae*, the species of which have now been reclassified into the genera *Enterobacter* and *Klebsiella*.

**Aerobes** Organisms that require atmospheric oxygen to live. Often refers to aerobic *bacteria* or other *microorganisms*. Facultative anaerobes are aerobes that can also grow under anaerobic conditions.

**Aerococcus** Genus of Gram positive, coccoid *lactic acid bacteria* of the family Aerococcaceae. *Aerococcus viridans* has been isolated from a variety of foods, particularly *fish* and *fermented foods*, and may also be used in the production of *lactate 2-monooxygenases*.

**Aerolysins** Cytolytic *toxins* secreted by *Aeromonas hydrophila*. Form channels in cell lipid bilayers, leading to destruction of the membrane permeability barrier and osmotic lysis.

**Aeromonas** Genus of facultatively anaerobic, rod-shaped *Gram negative bacteria* of the Aeromonadaceae family. Occur in salt and fresh water, sewage and soil. *Aeromonas hydrophila*, frequently found in *fish* and *shellfish* and occasionally in *red meat* and *poultry meat*, may cause septicaemia, meningitis and *gastroenteritis* in humans.

**Aerosol packs** Containers for pressurized liquids, which are released in the form of a spray or foam when a valve is pressed. Aerosol propellants, usually liquefied gases, are used in the packs. Used as *dispensers* for a variety of foods.

**Aerosols** Substances, including foods, stored under pressure in a container (for example in aerosol cans) containing a propellant and released as a fine spray or froth. Also, in a chemical sense, suspensions of microscopic particles dispersed in air or gas.

**Afalon** Alternative term for the herbicide *linuron*.

**Affination** The first stage in processing of raw *sugar*, in which the layer of mother liquor surrounding the crystals is softened and removed. Raw sugar is mixed with a warm, concentrated syrup of slightly higher purity than the syrup layer so that it will not dissolve the crystals. The resulting magma is centrifuged to separate the crystals from the syrup, thus removing the greater part of the impurities from the input sugar and leaving the crystals ready for dissolving before further treatment. The liquor which results from dissolving the washed crystals still contains some colour, fine particles, gums and resins, and other non-sugars.

**Affinity chromatography** Chromatography technique in which an immobilized ligand is used to retain an analyte that is later eluted under conditions where the binding affinity is reduced. The ligand, which may be a substance such as an enzyme, hormone or antigen, is bound to a matrix such as silica.

**Aflatoxicosis** *Mycotoxicosis* caused by ingestion of *aflatoxins* in contaminated foods or feeds.

**Aflatoxin B₁** Potent hepatotoxic, hepatocarcinogenic, mutagenic and teratogenic *mycotoxins* produced by *Aspergillus flavus* and *A. parasiticus*. Formed during growth on a wide range of *crops*, including *peanuts*, *corn* and other *cereals*, and *oilseeds*. Metabolized to aflatoxin *M₁* and aflatoxin *Q₁*.

**Aflatoxin B₂** Moderately potent hepatotoxic, hepatocarcinogenic, mutagenic and teratogenic *mycotoxins*
Aflatoxin B3

produced by *Aspergillus flavus* and *A. parasiticus*. Dihydroxy derivatives of aflatoxin B$_1$. Formed during growth on the same commodities as aflatoxin B$_1$ (including peanuts, corn and other cereals, and oilseeds), but in smaller amounts. Metabolized to aflatoxin M$_2$, and excreted in milk in this form.

Aflatoxin B$_3$ Toxic mycotoxins produced by older cultures of *Aspergillus parasiticus* and *A. flavus*. Alternative name for parasiticol.

Aflatoxin D$_1$ Carboxylated product of aflatoxin B$_1$, produced by the reaction between aflatoxin B$_1$ and heated ammonium hydroxide. Possesses lower toxicity than aflatoxin B$_1$.

Aflatoxin G$_1$ Potent carcinogenic and genotoxic mycotoxins produced by *Aspergillus parasiticus*. Formed during growth on a wide range of crops, including peanuts, corn and other cereals, and oilseeds. Possess toxicity and structure similar to those of aflatoxin B$_1$.

Aflatoxin G$_2$ Mildly carcinogenic and genotoxic mycotoxins produced by *Aspergillus parasiticus*. Occur in a wide range of foods, including nuts, seeds, beans, spices and fruits. Dihydroxy derivative of aflatoxin G$_1$ with lower toxicity.

Aflatoxin M$_1$ The toxic, 4-hydroxy derivative of aflatoxin B$_1$, found in the livers, kidneys, blood, faeces, urine and milk of mammals that have consumed aflatoxin B$_1$ contaminated feeds or foods. Subsequently occurs in dairy products, particularly cheese, and human milk. Produced in small quantities by *Aspergillus flavus* and *A. parasiticus*, and can occur in corn, nuts and soybeans. Associated with liver damage and cancer. Possesses lower toxicity than aflatoxin B$_1$. Aflatoxin M$_1$ can be degraded by UV radiation.

Aflatoxin M$_2$ The toxic, 4-dihydroxy derivative of aflatoxin B$_2$, found in the livers, kidneys, blood, faeces, urine and milk of mammals that have consumed aflatoxin B$_2$ contaminated feeds or foods. Also occurs in human milk. Aflatoxin M$_2$ is considerably less toxic than aflatoxin M$_1$. Produced in small quantities by *Aspergillus flavus* and *A. parasiticus*.

Aflatoxin P$_1$ Demethylated and hydroxylated product of aflatoxin B$_1$, and the principal urinary metabolic product found in animals. Considerably less toxic than aflatoxin B$_1$.

Aflatoxin Q$_1$ The 3-hydroxy derivative and major metabolite of aflatoxin B$_1$ in humans, rats and primates. Considerably less toxic than aflatoxin B$_1$.

Aflatoxins Mycotoxins produced by certain strains of *Aspergillus*, most notably *A. flavus* and *A. parasiticus*. Formed during growth of these fungi on commodities such as cereals (e.g. corn), nuts (e.g. peanuts) and oilseeds (e.g. soybeans). Contamination can take place both pre- and postharvest. Host crops are particularly susceptible to infection following prolonged exposure to high humidities or damage during drought conditions. Once ingested, aflatoxins are metabolized by the liver to a reactive intermediate, aflatoxin M$_1$. Hepatotoxic and hepatocarcinogenic in humans and animals, and can result in aflatoxicosis.

African breadfruit seeds Kernels of fruits produced by the tree *Treculia africana*. Eaten roasted as nuts or ground into meal which is used to fortify foods or to prepare porridges.

African locust beans Seeds produced by *Parkia filicoidea* or *P. biglobosa*. Not eaten raw, but fermented to produce food flavourings or protein-rich iru or dawadawa. The yellowish pulp surrounding the seeds can also be eaten, either raw or as an ingredient in soups, stews and beverages.

African mangoes Common name for the African tree species, *Irvingia gabonensis*. Also known as bush mango or wild mango. Fruits resemble cultivated mangoes, but they are botanically unrelated. Pulp of the fruit is eaten fresh or used for the preparation of products such as juices and jams. African mango seeds, also known as dika nuts, have a variety of food uses.

African mango seeds Seeds from the tropical African tree *Irvingia gabonensis* which are rich in fats and are used in Africa to make dika bread as well as a type of butter. Alternative term for dika nuts.


African oil beans Edible oilseeds of the leguminous tree *Pentaclethra macrophylla*, native to tropical Africa. Cooked seeds are fermented to produce ugba.

African spider herb Common name for *Cleome gynandra*, also known as cat’s whiskers. The plant grows wild in most tropical countries, and is mainly consumed as a leafy vegetable. Leaves are a rich source vitamin A, vitamin C and minerals such as calcium and iron. Leaves also contain glucosinolates and phenols, which can impart astringency.

African yam beans Beans produced by *Sphenostylis stenocarpa*. Popular grain legume of West Africa and other areas of tropical Africa. Beans have a distinctive flavour and are high in starch and moderately high in proteins. Prolonged cooking time is recommended to inactivate antinutritional factors present in the beans. The plant also produces edible tubers.
Aftertaste  A flavour, often unpleasant, that lingers in the mouth after a food has been swallowed.

Afuega’l Pitu cheese  Unpasteurized Spanish cheese usually made mainly from cow milk. Fresh red chillies are added to the cheese and more are rubbed into the rind as the cheese is allowed to mature, giving the rind a buff to deep orange colour. The rind also has a dusting of white mould.

Agar  Extract obtained from various species of red seaweeds belonging to Eucheuma, Gelidium and Graciliria genera. Contains agarose and agarpectin polysaccharides. Sets following dissolution in warm water to form agar gels, which are widely used as thickeners and stabilizers in the food industry. Additionally used in gelling agents to prepare culture media for bacteriological plate counts. Also known as agar-agar.

Agar-agar  Alternative term for agar.

Agarases  Enzymes, often produced by marine bacteria, including α-agarases (EC 3.2.1.158) and β-agarases (EC 3.2.1.81). α-Agarases are derived from organisms such as Thalassomonas spp., and catalyse endohydrolysis of 1,3-α-L-galactosidic linkages in agarose, forming agarotetraose as the major product. β-Agarases cleave the 1,4-β-D-galactosidic linkages in agarose in a random manner, forming the tetramer as the predominant product. Polysaccharides formed have potential for use in foods. Both enzymes are also able to hydrolyse porphyran.

Agar gels  Gels formed by dissolving agar in water. Widely used as thickeners and stabilizers, e.g. in ice cream, soups, jellies, sauces, glazes and meat products.

Agaricus  Genus which includes some edible fungi, such as the widely cultivated common mushroom, Agaricus bisporus, which is sold commercially in flat, cup or button forms. Other edible species include the wild mushrooms A. campestris (field mushroom) and A. arvensis (horse mushroom).

Agaritine  Genotoxic substance present in raw mushrooms.

Agarose  Purified gelling fraction of agar, a complex polysaccharide produced by algae of the class Rhodophyceae. Agarose is a neutral, linear polymer composed of alternating β-D-galactopyranose and 3,6-anhydro-α-L-galactose sugars. Used as a matrix in gel electrophoresis for the separation of large molecules such as DNA, as well as in purification of fermentation products such as enzymes.

Agastache  A genus of herbs to which several species belong, most of which are native to North America. The leaves may be used as flavourings or to prepare herb tea. Agastache rugosa (Korean mint) has a minty flavour and aroma, whilst A. foeniculum (anise hyssop) tastes like liquorice.

Agave  Plants of the genus Agave, the flowers, leaves, stalks and sap of which are used as a source of food or beverages. Starch in buds is converted into sugar causing a sweet nectar to be exuded from the flowers. Sap is used to make a refreshing beverage or can be boiled to make sugar syrups. Fermentation of the sap produces vinegar or the alcoholic beverage pulque. Fermented sap from A. tequilana is distilled to make tequila.

Ageing  Process in which properties change over time. Ageing includes the intentional storage of foods and beverages to induce desirable changes in sensory properties, such as for wines and cheese (also referred to as ripening). The term is also used to denote the artificial hastening of this process, such as treatment of flour with ammonium persulfate to produce a more resilient dough.

Agglomerates  Masses or collections of particles or items.

Agglomeration  The process by which particles or items are collected together and formed into a mass.

Agglutination  The clumping together of cells, such as bacteria, due to cross-linking by proteins such as antibodies. Agglutination is utilized in immunological techniques for detecting bacteria in foods. In food processing, however, agglutination of starters, such as those used in the manufacture of dairy products including certain cheese varieties, can have detrimental consequences for the process outcome.

Agglutination tests  Immunological techniques in which antigens on the surface of particulate material, such as bacteria, or inorganic particles, such as latex, are precipitated with antibodies. Antibodies react with the antigens causing the cells to clump together and form visible aggregates or agglutinates. Applications include detection of Escherichia coli O157:H7.

Agglutinins  Substances, such as antibodies and lectins found in plant seeds, which cause agglutination of cells to form clumps.

Aggregation  The process for forming a whole by combining several different elements or items.

Agitation  The process of stirring, shaking or disturbing briskly, particularly applied to a liquid.

Aglycones  The part of a glycosides molecule which is not a sugar residue, e.g. the anthocyanidins component of anthocyanins.

Agmatine  One of the biogenic amines, which occurs in a wide range of foods, including fish, cheese and alcoholic beverages. Concentrations in foods may increase with increasing storage time.
Agricultural produce

Agricultural produce  Collective name for crops and other commodities obtained as a result of agriculture and used for provision of food, fibre or other materials. Examples include fruits, cereals, cotton and livestock. Used in a similar way to the term agricultural products.

Agricultural products  Term used in a similar way to agricultural produce. Collective name for crops and other commodities obtained as a result of agriculture and used for provision of food, fibre or other materials. Examples include fruits, cereals, cotton and livestock.

Agrobacterium  Genus of Gram negative, aerobic, rod-shaped bacteria of the family Rhizobiaceae. Occur in soil. Typically plant pathogens that form galls or tumours on roots or stems. Agrobacterium rhizogenes causes hairy root, A. rubi causes cane gall and A. tumefaciens causes crown gall.

Agrocybe  Genus including edible fungi such as Agrocybe cylindracea, a mushroom with similar characteristics to matsutake (Tricholoma matsutake), A. aegerita and A. parasitica.

AIDS  Common abbreviation for acquired immunodeficiency syndrome, an epidemic disease caused by infection with human immunodeficiency viruses (HIV) and spread through direct contact with body fluids. The HIV retroviruses cause immune system failure. HIV can be transmitted from infected mothers to infants through breast feeding.

Alele fruits  Olive-like fruits produced by the aile tree (Canarium schweinfurthii) which are widely consumed in West African countries. Pulp and kernel are rich in oleic acid and palmitic acid. Oils produced from the fruits show similarities to olive oils. Also known as African black olives, mbeu or black fruit.

Air cooling  A process for reducing the temperature of foods or other items by increasing the flow of air over them using fans or other devices. The air used must be lower in temperature than the item to be cooled.

Air drying  Removal of moisture or liquid from a substance using air, or to preserve an item by evaporation.

Airflow properties  Characteristics of the flow of air through, or across the surface of, a substance or piece of equipment. Airflow properties are utilized in designing ovens and driers and in determining the most appropriate ways of storing large quantities of foods such as fruits, vegetables, cereals and carcasses in order to minimize spoilage.

Airline meals  Meals provided for consumption during aircraft travel, designed to be served and consumed in a limited amount of space. Menu items are prepared and packaged at a central location either by the catering branch of the airline company or a contracted foods service operator. Chilled or frozen items are then reheated in special ovens during the flight.

Air quality  Measure of the condition of the air, especially with respect to the requirements for specific environments. In food processing and packaging facilities, air quality is important for food safety and shelf life, and health of personnel. Special filtration systems are used to remove airborne hazards such as microorganisms, insects and dust from the atmosphere.

Air speed  Velocity of air, of particular importance during food processing operations such as air drying and air cooling. In a more general context, it also refers to the speed of a body (e.g. aircraft, missile) relative to the air through which it is moving.

Ajowan  Common name for the umbelliferous plant, Trachyspermum ammi (syn. Carum copticum). Cultivated in parts of Egypt and Asia for its pungent, aromatic seeds, typically used in flavourings for Indian foods. Related to caraway and cumin, but has a strong flavour of thyme. Also used as a source of thymol.

Akamu  Cereal products produced by boiling the starchy extract from fermented corn, millet or sorghum until complete gelatinization occurs.

Akara  Deep fried pastes made from cowpeas, seasoned and flavoured with chopped capsicums, onions and salt. Popular foods in West Africa, where they are consumed as snack foods, side dishes or fast foods. Steamed cowpea paste is known as moinmoin.

Alachlor  Selective systemic chloroacetanilide herbicide used pre-emergence to control annual grasses and broad-leaved weeds among various vegetables, nuts and corn. Classified by WHO as slightly hazardous (WHO III).

Alanine  One of the non-essential amino acids. Occurs in most food proteins.

Alar  Alternative term for the plant growth regulator daminozide.

Alaska pollack  Commercially important marine fish species (Theragra chalcogramma) belonging to the cod family (Gadidae); widely distributed in the Pacific Ocean. Flesh has a moderate to low fat content and a mild, slightly sweet flavour. Normally marketed in frozen form and processed into fillets, blocks and surimi, but also sold fresh or as a cured product. Also known as walleye pollack.

Albacore  Marine fish species (Thunnus alalunga) belonging to the tuna family which is widely distributed in tropical and temperate waters. Flesh is lighter in colour and has a milder flavour than that from other tuna species. Widely considered to be the best
tuna species for canning, but is also marketed fresh, smoked and frozen.

**Albendazole** Anthelmintic widely used in sheep and cattle for treating roundworms and flukes. Along with its various metabolites, is normally depleted rapidly from edible tissues and milk.

**Albumen** Alternative term for egg whites.

**Albumins** Proteins which are soluble in water or dilute salt solutions and coagulable by heat. Albumins occurring in foods include conalbumin, lactalbumins and ovalbumins.

**Alcaligenes** Genus of aerobic, rod-shaped Gram negative bacteria of the family Alcaligenaceae. Occur in the intestinal tracts of vertebrates, soil, water, milk, and as part of the normal skin flora. May cause ropiness in milk and cheese. Some strains are also used in biotechnology for the industrial production of enzymes.

**Alcohol** Common name for ethanol, especially in the context of alcoholic beverages.

**Alcohol dehydrogenases** Group of enzymes catalysing the oxidation of alcohols. Alcohol dehydrogenases (EC 1.1.1.1) catalyse the oxidation of alcohols to aldehydes or ketones with concomitant reduction of NAD⁺. Also known as aldehyde reductases, these enzymes act on primary and secondary alcohols, and also on hemi-acetals. Catalyse the final step of alcoholic fermentation. Alcohol dehydrogenases (NAD⁺), EC 1.1.1.2, catalyse the oxidation of alcohols to aldehydes with concomitant reduction of NAD⁺. Some members act only on primary alcohols, while others also act on secondary alcohols. Alcohol dehydrogenases (NAD(P)⁺), EC 1.1.1.71, catalyse the oxidation of alcohols to aldehydes with concomitant reduction of NAD(P)⁺. Reduce aliphatic aldehydes of carbon chain length 2-14, with greatest activity on C₄, C₆ and C₈ aldehydes. Also known as retinal reductases, since they can reduce retinal to retinol. Alcohol dehydrogenases (acceptor), EC 1.1.99.8, catalyse the oxidation of primary alcohols to aldehydes in the presence of an acceptor.

**Alcohol free beverages** Beverages of types normally containing ethanol, which have been formulated or processed to be free from ethanol.

**Alcoholic beverages** Beverages containing a significant concentration of ethanol. Major types include beer, wines, spirits, liqueurs and rice wines.

**Alcoholic fermentation** Process by which certain microorganisms (mainly yeasts) metabolize sugars anaerobically to produce alcohols. In this process, glucose is converted to pyruvic acid, which is decarboxylated to acetaldehyde. The acetaldehyde is subsequently reduced to ethanol. A wide variety of substrates can be used to produce alcoholic beverages, e.g. grain for production of beer, and grapes and other fruits for production of wines. However, the constituent sugars must be released from these substrates prior to fermentation. Fermentation can be carried out by endogenous yeasts or by addition of starters. The most common yeasts used in the manufacture of alcoholic beverages are *Saccharomyces cerevisiae* and *S. carlsbergensis*. Synonymous with ethanolic fermentation.

**Alcoholic soft drinks** Beverages with flavour and other properties typical of soft drinks (e.g. fruit-flavoured beverages), but with addition of a significant concentration of alcohol, usually approx. 5%. Commonly known as alcopops or flavoured alcoholic drinks. Introduced during the 1990s, the first product was alcoholic lemonade. A new wave of second generation products has revitalized the market recently. Concern exists that underage drinkers find these products appealing and easy to drink.

**Alcohol O-acetyltransferases** EC 2.3.1.84. Members of the acyltransferases which catalyse formation of acetyl esters from acetyl-CoA and short-chain aliphatic alcohols, such as methanol and ethanol. Involved in formation of volatile ester aroma compounds e.g. isoamyl acetate in fruits and also alcoholic beverages produced as a result of alcoholic fermentation by *Saccharomyces cerevisiae* which expresses these enzymes.

**Alcohol oxidases** EC 1.1.3.13. Flavoprotein oxidases which catalyse conversion of primary alcohols in the presence of O₂ to aldehydes and hydrogen peroxide. Act on lower primary alcohols and unsaturated higher alcohols, but not branched chain or secondary alcohols. Uses include in biosensors and assays for determination of primary alcohols. Term also used generally to describe any of the enzymes which oxidize alcohols, including long-chain alcohol oxidases (EC 1.1.3.20) and secondary-alcohol oxidases (EC 1.1.3.18).

**Alcohol reduced beer** Beer in which the ethanol content has been reduced.

**Alcohol reduced beverages** Beverages in which the ethanol content has been reduced.

**Alcohol reduced wines** Wines in which the ethanol content has been reduced.

**Alcohols** Alkyl or aromatic compounds containing a hydroxyl (OH) group. Classes of alcohols important in the context of foods include aliphatic alcohols, e.g. methanol, ethanol and higher alcohols, polyols, glycols, aromatic alcohols, terpene alcohols and sterols.
Alcoholysis  **Esterification** reactions involving **esters** and **alcohols**. Includes the breakdown of **triglycerides** to form **monoglycerides**, and reactions with **methanol** (**methanolysis**) and **glycerol** (**glycerolysis**). Catalysed by **lipases** or chemical **catalysts**. Can be used to improve the health promoting properties of **fats** (e.g. glycerolysis of **tuna oils** to generate **monoacylglycerols** rich in PUFA). Can also be used to produce **fatty acid esters** for application as **preservatives** or **emulsifiers**.

**AI compounds**  Alternative term for **aluminium compounds**.

**Aldehyde dehydrogenases** Include members of subclass EC 1.2. **Dehydrogenases** which catalyse oxidation of **aldehydes** to the corresponding acids. In most cases, the acceptor is **NAD**$^+$ or **NADP**$^+$. Used in techniques to determine aldehyde levels in foods and beverages.

**Aldehyde reductases**  EC 1.1.1.21. **Enzymes** with wide specificity, catalysing the conversion of **alditols** and **NAD(P)$^+$ to the corresponding aldoses and **NAD(P)H**. Can be used to convert **xylose** to **xylitol**, useful as a food sweetener.

**Aldehydes**  **Carbonyl compounds** containing the CHO radical. Many are important for **flavour** or **off flavour** in foods and beverages. Aldehydes formed by **oxidation** of **fatty acids** are important causes of **flavour** deterioration of lipid-rich foods.

**Aldicarb**  Systemic insecticide, acaricide and nematocide used for control of chewing and sucking **insects** (especially **aphids**, whitefly, leaf miners and soil-dwelling insects) in a wide range of fruit and vegetable crops. Classified by WHO as extremely hazardous (WHO Ia).

**Alditols**  General term for **polyols**, **sugar alcohols** produced by reduction of **sugars** on an aldehyde group. Examples of alditols include **D-sorbitol**, **D-mannitol** and **xylitol**.

**Aldolases**  **Alternative term for fructose-bisphosphate aldolases**.

**Aldose 1-epimerases**  EC 5.1.3.3. Convert **α-d-glucose** to **β-d-glucose** but also act on L-arabinose, **D-xylose**, **D-galactose**, maltose and lactose. Have been used extensively as components of **biosensors** for analysis of **sugars**. Also known as mutarotases and aldose mutarotases.

**Aldrin**  Cyclodiene organochlorine insecticide that has been used to control root worms, **beetles** and termites in soils around **fruits** and **vegetables**. Oxidized in **insects** to form the active compound **dieldrin**, a potent neurotoxin. Subject to the Stockholm Convention on Persistent Organic Pollutants and has been banned for use on crops in most countries.

**Ale**  Historically, a **beer** type made without **hops**; in modern usage, a range of British-style beers, commonly brewed with top-fermenting **brewers yeasts**.

**Aleurone**  Layer of cells found under the **bran** coat and outside the endosperm of cereal grains. Rich in **cereal proteins** and minerals as well as containing non-digestible carbohydrates and **phytic acid**.

**Alewife**  **Marine fish** species (**Alosa pseudoharengus**) belonging to the **herring** family (**Clupeidae**); occurs in marine and estuarine waters along the Atlantic coast of North America. Marketed in fresh, dried/salted, smoked and frozen form; popularly consumed as a fried product.

**Alexandrium**  Genus of **dinoflagellates** responsible for outbreaks of **paralytic shellfish poisoning**. Common species include **Alexandrium catenella**, **A. minutum** and **A. tamarense**.

**Alfalfa**  Common name for the leguminous plant, **Medicago sativa**, also known as **lucerne**, generally grown as a fodder plant, although young leaves and **alfalfa sprouts** can be used as a vegetable, e.g. in Chinese cooking.

**Alfalfa seeds**  **Seeds** produced by **alfalfa** (**Medicago sativa**) which are germinated to make **alfalfa sprouts** for human consumption. Sprouts are generally eaten raw in **sandwiches** and **salads**.

**Alfalfa sprouts**  **Crisp sprouts** obtained by germination of **alfalfa seeds**. Popular in **salads** and **sandwiches**.

**Al foils**  Abbreviation for **aluminium foils**.

**Algae**  A heterogeneous group of unicellular and multicellular eukaryotic photosynthetic organisms which most occur in aquatic habitats. Includes both **microalgae** and macroscopic forms (e.g. **seaweeds**). Certain algae are harvested for commercial production of **thickeners** (e.g. **agar**, **alginites**, **carrageenans**) or proteins (e.g. **single cell proteins**). They are also a source of **pigments** and may be cultured to generate **ω-3 fatty acids**. Some algae produce **toxins** that accumulate in **fish** and **shellfish**, and may cause **food poisoning** in humans via consumption of these foods.

**Algal oils**  Oils derived from single cell organisms, such as **Spirulina platensis**. Also known as single cell oils. Claimed to represent a cleaner and more concentrated source of **ω-3 fatty acids**, particularly **docosahexaenoic acid**, than **fish oils**. Used as ingredients of **functional foods**. Possess **anti-inflammatory** activity.

**Algicides**  Chemicals used to control growth of algae in water bodies or water containers. Examples include **bethoxazin**, **dichlone**, **quinoclamine** and **simazine**.
Alginate gels  Gels derived from alginites. Calcium alginate gels are commonly used for immobilization of biocatalysts.

Alginate lyases  Alternative term for poly(β-D-mannuronic) lyases.

Alginites  Any of several derivatives of alginic acid (e.g. sodium, calcium or potassium salts or propylene glycol alginate). Used as stabilizers, thickeners and gelling agents in foods.

Alginic acid  Polysaccharide (polymer of D-mannuronic acid) obtained from brown algae such as *Macrocystis pyrifera* or *Laminaria*. Possesses significant hydrocolloidal properties making it suitable for thickening, emulsifying and stabilizing applications. Authorized for use in foods in various forms, including as sodium, calcium and potassium alginates.

*Alicyclobacillus*  Genus of aerobic or facultatively anaerobic, rod-shaped, spore-forming Gram positive bacteria. *Alicyclobacillus acidoterrestris* and *A. acidocaldarius* may cause spoilage of fruit juices.

Alimentary pastes  Alternative term for pasta.

Aliphatic compounds  All organic compounds which do not possess an aromatic (Kekule ring) structure. Includes many types of hydrocarbons including acyclic, cyclic, saturated and unsaturated compounds.

Alitame  One of the high intensity, dipeptide artificial sweeteners (trade name Aclame), formed from L-aspartic acid, D-alanine and a novel amine. Has good water solubility, no aftertaste, does not contain phenylalanine, and sweetness is approximately 2000 times that of sucrose at typical usage levels. Offers good stability at elevated temperatures and over a broad pH range, and has good shelf life. Alitame is permitted for use at a max. level of 40-300 mg/kg in a wide range of foods and beverages, such as bakery products, dairy products, frozen desserts, chewing gums, hot and cold beverages, beverage mixes and tabletop sweeteners.

Alkalis  Bases which are soluble in water and include the strongly basic hydroxides of sodium, potassium or ammonium. Neutralize, or are neutralized by, acids. Solutions have a pH higher than 7. Alkalis are used in the food industry during processing (e.g. peeling of potatoes) or in cleaning applications. Alternative spelling is alkalis.

Alkaline phosphatases  EC 3.1.3.1. Catalyse formation of orthophosphate and an alcohol from an orthophosphoric monoester, and also catalyse transphosphorylation. Enzymes with wide specificity. Uses include analysis of tannins in grapes and red wines, detection of the adequacy of pasteurization of milk and dairy products, and detection of phosphates in drinking water.

Alkalinity  The degree to which a substance is alkaline. Level of alkalinity is expressed using pH.

Alkalization  Process by which the pH of a substance is increased to above 7 making it alkaline.

Alkaloids  Organic nitrogenous bases. Many have pharmacological activity. Some foods contain toxic alkaloids, e.g. solanine in potatoes. Some alkaloids are desirable food constituents, e.g. the purine alkaloids caffeine and theobromine in tea, coffee, chocolate and cocoa.

Alkanes  Saturated hydrocarbons of the methane series, including methane, ethane, propane and butane.

Alkenes  Acyclic hydrocarbons having the general formula CₙH₂ₙ and a single C to C double bond. Present in many foods, frequently in the volatile compounds fraction. Ethylene (C₂H₄) is particularly important in ripening of fruits. Synonymous with olefins.

Alkylcyclobutanones  Ketones produced from triglycerides by radioisolation that are thus used as a marker for irradiation of foods containing fats, e.g. meat, eggs and dairy products. Potential carcinogens, their presence has raised concerns about the safety of irradiated foods.

Alkylphenols  Alkyl substituted phenols with oestrogenic activity classed as endocrine disrupters. Present as environmental contaminants. May be produced via biodegradation of alkylphenol polyethoxylates which are widely used non-ionic surfactants (e.g. nonylphenol and octylphenol), or from degradation of antioxidants used in packaging (e.g. 2,4-di-tert-butylphenol). Some, e.g. cresols and ethylphenols, may be formed from conjugated alkylphenols in milk and act as flavour compounds in cheese.

Alkylresorcinols  Phenols with antifungal activity found in rye and other cereals, cashew nut shells and some bacteria and algae. Similar in structure to commercially used antioxidants such as BHA and BHT. Like other resorcinolic lipids, display biological properties and have been reported also to have antimicrobial activity, antimicrobial activity and anti-parasitic activity.

Allantoin  Member of the imidazoles class of heterocyclic organic nitrogen compounds having the chemical formula C₄H₆N₄O₃. Product of the metabolism of purines, excreted in urine and milk. Has therapeutic uses for treating wounds and ulcers. Can be utilized as a nitrogen source by microorganisms and some legumes, including soybean plants.
Alleles Alternative forms of genes or DNA sequences that occupy the same position (locus) on either of two homologous chromosomes in a diploid organism. If both chromosomes have the same allele, then the organism is homozygous for this allele. If the allele is different, the organism is heterozygous for this particular allele.

Allergenicity The ability of substances to act as allergens.

Allergens Antigens that are capable of inducing an allergic reaction when they come in contact with specific tissues of susceptible individuals. Allergens may induce formation of reaginic antibodies. Common food allergens include proteins from shellfish, nuts, eggs, fish and milk.

Allergies Hypersensitivity states induced by the body in reaction to foreign antigens that are harmless to other individuals in similar doses. Allergic reactions are of four basic types and can be immediate or delayed in their onset. Type I reactions, which involve release of histamine from mast cells by immunoglobulin E, can be induced by many food allergens often resulting in respiratory and dermatological symptoms. Severe type I reactions include anaphylaxis. Most foods have been demonstrated to produce allergic reactions in certain individuals, however, common causes of food allergy in adults include shellfish, nuts and eggs. In children, the pattern of food allergy differs from that in adults, with allergies to eggs, milk, peanuts and fruits being common. In contrast to adults, children can outgrow allergies, especially to milk and soy infant formulas.

Allicin One of the organic sulfur compounds occurring in onions and other Allium spp. vegetables. Important flavour compounds fraction with antibacterial properties.

Alligator meat Meat from alligators. Most of the meat from alligator carcasses is in the tail; however, jaw meat is favoured because of its very low content of fats and eating quality. Usually, alligator meat is trimmed heavily of fat because the fat has an unpleasant flavour. Each carcass includes both light and dark meat. In comparison with free-range alligator farming, indoor farming may be associated with an increased prevalence of salmonellae. Due to biomagnification, alligators living in polluted areas can accumulate substantial concentrations of heavy metals.

Alligator pears Alternative term for avocados.

Alligators Large semi-aquatic predatory reptiles in the genus Alligator of the family Alligatoridae. There are two species, namely the American alligator (A. mississippiensis) and the Chinese alligator (A. sinensis). They are hunted or farmed (free-range or indoor production systems) for alligator meat and skins.

Allin One of the organic sulfur compounds contributing to the flavour compounds fraction in garlic and Allium spp. vegetables.

Alliinases Alternative term for allin lyases.

Allin lyases EC 4.4.1.4. Also known as allinases, these lyases are found in onions and garlic, where they are responsible for formation of the characteristic flavour. They also catalyse formation of allicin, thought to have a number of health benefits. Have been used to determine allin contents in garlic extracts.

Allium Genus of low-growing perennial plants, that includes cultivated vegetables such as onions, leeks, shallots and garlic, and many wild edible species. Noted for their distinctive flavour and pungency, due to the presence of organic sulfur compounds such as allin. These compounds are also associated with the therapeutic properties noted for garlic and other Allium spp.

Allspice Spice obtained from the dried fruits of the tropical tree Pimenta officinalis (syn. P. dioica). Flavour resembles a blend of cinnamon, cloves, nutmeg, ginger and pepper. Used in flavourings for meat products and bakery products. Also known as pimento or Jamaican pepper.

Allura Red General-purpose, water-soluble artificial colorant. Also known as FDC red 40. Used to impart a reddish-yellow colour to foods such as desserts, confectionery and cereal products.

S-Allylcysteine Sulfur containing amino acid which is one of the major organic sulfur compounds in garlic. Responsible in part for some of the health benefits of garlic, including hypolipaemic activity, anticarcinogenicity and radical scavenging activity.

Allyl isothiocyanate Naturally occurring volatile organic sulfur compounds found in Brassica vegetables and some other plants, such as cassava. Largely responsible for the pungency of foods such as mustard and horseradish. Possess antimicrobial properties and are used in food preservatives and as antifermentative agents in winemaking. Like other isothiocyanates, display goitrogenic properties.

Allyl sulfides Organic sulfur compounds found in garlic, onions and leeks. Also flavour compounds. Demonstrate anticarcinogenicity, antitumour activity and antioxidative activity. Include diallyl disulfide.

Almond oils Oils rich in oleic acid and low in cholesterol derived mainly from the seeds of bitter almonds (Prunus dulcis). Used in cooking and in foods as well as in the cosmetics industry.
Almonds One of the most widely grown type of nuts. Produced on the tree Prunus dulcis (syn. P. amygdalus, Amygdalus communis). Sweet almonds (P. dulcis var. dulcis) are grown for their edible nuts which are important ingredients in many confectionery products, such as marzipan, macaroons and sugar almonds. Bitter varieties (P. dulcis var. amara) are cultivated for their almond oils, which are used as flavourings.

Aloe Plants of the genus Aloe (family Liliaceae), such as Aloe vera. Used in the manufacture of foods, beverages, and pharmaceutical and cosmetic products due to their characteristic flavour, aroma and biological activity (attributed mainly to the presence of aloins).

Alolin Bitter tasting compound which is a major component of aloe leaves. An anthroquinone which on its own is used as a laxative but which also displays antifungal activity and analgesic effects.

Alpacas Long-necked, sheep-like, domesticated animals of the family Camelidae that are native to South America. Alpacas (Vicugna pacos) are larger than the wild vicuna, but smaller than the cameldids, and are bred mainly for their fibre. Alpaca meat is edible, and is rich in proteins and low in cholesterol.

Alternan Glucans fraction derived from fungi of the genus Alternaria. Has potential for use in thickeners or stabilizers for foods.

Alternansucrases EC 2.4.1.140. Glycosyltransferases that transfer α-D-glucosyl residues to the non-reducing terminal residues of α-D-glucans, producing glucans with alternating α-1,6- and α-1,3- linkages. Enzyme from Leuconostoc mesenteroides produces alternan, a glucon with potential applications in food additives.

Alternaria Genus of fungi belonging to the Pleosporaceae family. Occur in soil and vegetable matter. Many species are pathogenic to plants. Alternaria solani may cause early blights of potatoes and tomatoes. Some species (e.g. A. alternata, A. citri, A. solani and A. temuis) may produce mycotoxins, including alternariol and alternariol monomethyl ether, on foods such as rice, fruits and vegetables.

Alternariol One of the mycotoxins produced by Alternaria spp. These fungi are present in soils and on plants and hence as contaminants of plant foods, e.g. cereals, oilseeds, fruits and vegetables, and products produced from them, including beverages. Causes cytotoxicity and carcinogenicity.

Alteromonas Genus of aerobic, rod-shaped, Gram negative bacteria occurring in coastal and marine habitats. Some species may cause spoilage of fish and other sea foods.

Alum Double salts of aluminium sulfate combined with sulfates from monovalent metals. Used as coagulants for purification of water, including drinking water. Also used in the coagulation stages of tofu manufacture and as an adjuvant in immunizations.

Aluminium Light metal, chemical symbol Al, which may be used in food packs or food processing equipment. Occurs in the trace elements fraction in the diet; there is no known nutritional requirement. There is concern that excessive intake may be toxic, and dietary aluminium has been implicated as a causative factor in Alzheimer’s disease.

Aluminium compounds Chemical compounds of aluminium. May be food constituents, additives or contaminants. There is concern about possible adverse health effects of high intakes of aluminium compounds via foods or beverages.

Aluminium foils Aluminium packaging materials which are used to decorate, protect and preserve foods, providing a barrier to external factors, such as light, oxygen and water vapour. Food applications include: foil containers and lids; metallized films; and wrappings. Also used in laminated packaging to enhance the barrier properties and rigidity of other packaging materials such as plastics and paper. There is very little migration of aluminium from aluminium foil containers into food. Environmental considerations include the importance of recycling and the use of aluminium foil laminates to fuel incineration processes.

Aluminium phosphide Synonym for phostoxin. Used in fumigants for stored grain, as it releases the toxic gas phosphine.

Alveograms Records of air pressure inside bubbles formed by inflating pieces of dough until rupture, a test performed on alveographs.

Alveographs Apparatus used to analyse the physical properties of dough and the baking properties of wheat. A piece of dough is inflated using air until it forms a bubble and bursts. Traces of the pressure inside the bubble (alveograms) are used to indicate dough strength, stability and distensibility.

Alzheimer’s disease One of several brain disorders that are classified as neurodegenerative diseases. It is a progressive, irreversible disease that gradually impairs cognitive performance, ultimately destroying a person’s memory and ability to learn, reason, make judgments, communicate and carry out daily activities. It is the most common form of dementia among older people. Maintaining good nutrition may delay the progression of disease.
Amadori compounds  Intermediates of the Maillard reaction occurring between amino groups and reducing sugars. Amadori compounds are produced by rearrangement of nitrogen-containing carbohydrate ring structures and their fate is dependent on the conditions present in the reaction medium. Acid hydrolysis of these compounds can result in unsaturated ring systems that have a characteristic flavour and aroma, which under less acidic conditions may polymerize to form an insoluble dark-coloured material.

Amala  Traditional Nigerian paste-like product made by reconstituting yam meal in boiling water. Sometimes fortified with legume meal, e.g. cowpea meal or soy meal, to improve the protein content and nutritional quality. Typically, amala is dark brown in colour and is eaten with soups.

Amanita  Genus of soft, fleshy fungi, which includes both edible and highly poisonous species. Edible species include Amanita rubescens, which should not be eaten raw, and A. caesarea. Care should be taken in the identification of these mushrooms as many cases of poisoning have occurred due to unintentional ingestion of related, lethal species, such as A. phalloides (death cap mushroom).

Amanitins  Class of amatoxins. Also known as amanitoxins or amanitines.

Amaranth  Red food colorants which are stable to light. Made from small, pigmented flowers of plants of the genus Amaranthus.

Amaranth flour  Amaranth grain that is milled for food use.

Amaranth grain  Seeds from plants of the genus Amaranthus, which are high in starch, proteins, lysine and minerals. Also known as grain amaranth.

Amaranth starch  Starch extracted from amaranth grain. Most commonly utilized in parts of South America, Africa and Asia where amaranth is cultivated as a food crop.

Amaranthus  Genus of dicotyledenous plants of the family Amaranthaceae. Certain species of Amaranthus are grown for amaranth grain or grain amaranth, which is high in starch, proteins, lysine and minerals. Other species are grown for their spinach-like leaves, which are good sources of protein, vitamin C, minerals and β-carotene.

Amasi  Traditional Zimbabwean fermented milk resembling thick curd. Fermentation is performed at ambient temperature and naturally fermented cream may be added to improve viscosity. Often eaten with stiff corn porridges.

Amatoxins  Powerful mycotoxins produced by several species of mushrooms of the genus Amanita (e.g. Amanita phalloides (Death Cap), A. virosa (Death Stroking Angel) and A. verna (Fool's Mushroom)). Ingestion results in abdominal pain, persistent vomiting and watery diarrhoea, usually followed by death due to organ failure.

Ambaritsa  Raw dry sausages, traditionally made in Bulgaria. They are prepared primarily from pork, but include smaller amounts of beef. Moisture content should be <33% (by wt.).

Amberjack  Alternative term for yellowtail.

Ambient storage  Storage in surrounding atmospheric conditions. Ambient temperature is often interchangeable with room temperature. Various packaging and preservation approaches have been employed to enable foods to be stored safely and without significant quality deterioration under ambient conditions.

American groundnuts  Common name for seeds produced by Apios Americana, a legume native to North America, which also produces small edible tubers. The tubers can be dried and ground into a powder which is added to flour or used in sweeteners and thickeners.

American lobsters  Lobsters of the species Homarus americanus. Found in the north Atlantic Ocean. Also known as Atlantic lobsters or true lobsters.

Ames test  Technique used to assess the mutagenicity of chemicals. Samples are incubated in medium containing liver homogenate and derivatives formed are mixed with a mutant strain of Salmonella Typhimurium that lacks autotrophic properties towards histidine. These properties are restored by metabolic derivatives formed in the sample during incubation in the presence of liver enzymes.

Amidases  EC 3.5.1.4. Convert monocarboxylic acid amides to monocarboxylic acids and ammonia. Have been used for production of D-alanine from DL-alaninamide.

Amidation  Addition of amide groups or amino acids to molecules to improve their functional properties or physicochemical properties. For example, amidation of pectins for use as food additives, modification of fatty acids with diethanolamine forming diethanolamides for use as emulsifiers, removal of the electrically charged free carboxy terminals of synthetic peptides to make them more like natural peptides, and amidation of lactoferrin and β-lactoglobulin to improve their antimicrobial activity.

Amides  Organic nitrogen compounds containing the CO.NH2 radical which are common constituents of foods. Include capsaicin and urea.

Amine oxidases  Two enzymes: EC 1.4.3.4 (flavin-containing), also known as monoamine oxidases and...
tyrosine oxidases; and EC 1.4.3.6 (copper-containing), also known as diaminooxidases. The former act on primary, and usually secondary and tertiary, amines to form aldehydes, while the latter act on primary monoamines, diamines and histamine. Several bacteria are able to degrade biogenic amines through production of diamine oxidases and these enzymes have been used in biosensors for determination of biogenic amines in foods.

**Amines** Organic nitrogen compounds derived from NH₃ by substitution of organic radicals for the H atoms. Depending on whether 1, 2 or 3 H atoms are replaced, they are classed as primary, secondary or tertiary amines. Include a wide range of compounds important for **flavour** and **aroma** of foods. Amines are formed during breakdown of proteins and contribute to the characteristic odour of spoiled foods such as fish.

Biogenic amines such as histamine may be toxic.

**Amino acid oxidases** Oxidases which catalyse the oxidative deamination of amino acids in the presence of water and O₂ to form oxo-acids. Includes EC 1.4.3.2 (L-amino-acid oxidase) and EC 1.4.3.3 (D-amino-acid oxidase) which act on L- and D-amino acids, respectively. Involved in metabolism of amino acids. Uses include in bioconversions of D- to L-amino acids, in biosensors, including those for detection of amino acids, and for production of keto acids such as α-ketoglutaric acid.

**Amino acids** Organic acids characterized by possession of one or more COOH and NH₂ groups. Amino acids are the main constituents of proteins. 10 amino acids (arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine) are essential nutrients in the human diet.

D-Amino acids Amino acid enantiomers with a specific configuration around a chosen chiral element, usually the α-carbon atom. These amino acids have the opposite configuration to L-amino acids. Many D-amino acids are naturally occurring in microorganisms, plants and animals, and some are of especial interest for the synthesis of novel sweeteners.

**Aminocyclases** EC 3.5.1.14. Hydrolyse N-acyl-L-amino acids, releasing the corresponding L-amino acids. Can be used for purification of L-amino acids from racemic mixtures of the corresponding N-acyl-DL-amino acids. Can also be used for acylation of amino acids in organic solvents.

**Aminobenzoic acid** Aromatic acid used in antimicrobial *preservatives* for use in foods.

2-Aminobutane Alternative term for (RS)-sec-butylamine.

Aminobutyric acid Member of the organic acids, this organic nitrogen compound encompasses 4 structural *isomers* (α, β, γ, ε) and has the chemical formula C₄H₉NO₂. γ-Aminobutyric acid, commonly abbreviated to GABA, is a non-protein amino acid and inhibitory neurotransmitter with antihypertensive activity. GABA is produced from L-glutamic acid in a reaction catalysed by glutamate decarboxylases, and is found naturally in foods, including soybeans and cereals. Certain strains of lactic acid bacteria and yeasts produce GABA, and thus can be used to enrich fermented foods.

1-Aminocyclopropane-1-carboxylate oxidases EC 1.14.17.4. Accepted name now aminocyclopropanecarboxylate oxidases, but commonly referred to as ACC oxidases. These oxidases catalyse the final step in ethylene biosynthesis in higher plants, converting 1-aminocyclopropane-1-carboxylic acid (ACC) to ethylene, and are involved in ripening of fruits.

1-Aminocyclopropane-1-carboxylate synthases EC 4.4.1.14. Catalyse the rate-limiting step in ethylene biosynthesis in higher plants which leads to ripening of fruits.

1-Aminocyclopropane-1-carboxylic acid Plant growth regulator important in ripening of fruits. Often abbreviated to ACC.

Aminoethanol Synonym for ethanalamine. Amine which in pure form exists as a colourless, combustible, hygroscopic liquid with an aroma of ammonia. A member of the biogenic amines group, which occurs in various foods, including wines and cheese.

Aminoethoxyvinylglycine Plant growth regulator which acts by blocking ethylene synthesis through inhibition of 1-aminocyclopropane-1-carboxylate synthases.

Amino N Nitrogen which is present in foods and other substances in the form of amino (NH₂) groups.

α-Amino N Index of the amino acid N content of foods, beverages or their raw materials and intermediate materials. Used, for example, in brewing.

Aminopeptidases EC 3.4.11. Exo-acting proteinases that hydrolyse peptide bonds and remove amino acids one at a time from the chains of proteins, working from the amino terminus. Used for reducing the bitterness of protein hydrolysates, and important in flavour development in dairy products and meat.

**Amino sugars** General term for *sugars* substituted with an amino group at the carbon-2 position. Examples of amino sugars include galactosamine, glucosamine and furosine, an important indicator of Maillard reaction in dairy products.

Aminotransferases Alternative term for transaminases, EC 2.6.1.-.
Amitraz  Non-systemic formamide acaricide and insecticide used for control of mites, scale insects, whitefly and aphids on various fruits and vegetables. Also employed in veterinary applications. Classified by WHO as slightly hazardous (WHO III).

Amla  Fruits of the sub-tropical deciduous tree Emblica officinalis Gaertn. (syn. Phyllanthus emblica), also known as aonla or Indian gooseberry. Fruits are usually processed into products such as pickles, fruit juices and syrups, as the raw fruits are highly acidic and astringent. Amla are a rich source of vitamin C and also contain tannins, alkaloids, auxins and minerals. Reported to have hypcholesterolaemic and antioxidative activity and are widely used in traditional Indian medicine.

Ammonia  Gas, chemical formula NH₃, which is formed on breakdown of nitrogen-containing compounds such as proteins, peptides and amino acids. Has a characteristic pungent odour and is toxic at high concentrations in air. May be used in refrigerants for freezing or cooling systems.

Ammonium compounds  Group of compounds containing the NH₄ radical. In the context of foods, important members include betaine, inorganic ammonium salts (e.g. ammonium bicarbonate used as a leavening agent and ammonium salts used as nutrients for yeasts) and quaternary ammonium compounds used as disinfectants.

Amnesic shellfish poisoning  Disease resulting from ingestion of shellfish (commonly mussels) containing the neurotoxin domoic acid (produced by certain toxigenic marine diatoms). Symptoms include abdominal cramps, vomiting, disorientation and memory loss.

Amoebae  Common name for a number of species of unicellular, usually microscopic, organisms of the order Amoebida and the class Sarcodina. Occur in fresh and salt water, moist soil, and as parasites in humans and animals. Characterized by ability to alter their shape, generally by the extrusion of one or more pseudopodia.

Amoebiasis  Specifically refers to an infection of the intestine, liver or other sites with Entamoeba histolytica, a pathogenic amoeba, acquired by ingesting contaminated water or foods. In general, may be any infection caused by any amoebic parasite. Characterized by severe bloody diarrhoea, abdominal pain, fever, vomiting and ulceration of the colon. Also known as amoebic dysentery.

Amoxicillin  Penicillin antibiotic used against a wide variety of bacterial infections in farm animals. Becomes widely distributed in animal tissues following administration, but is rapidly eliminated; typically undetectable in livers and kidneys of animals 5 days after withdrawal.

Amoxyccillin  Alternative spelling for amoxicillin.

AMP  Abbreviation for adenosine monophosphate.

Amperometry  Technique based on measurement of current resulting from oxidation or reduction of an electroactive species. A constant potential is maintained at a working electrode or on an array of electrodes with respect to a reference electrode. The current is correlated with the content of the electroactive species.

Ampicillin  Broad-spectrum semisynthetic penicillin antibiotic used in the treatment of several diseases in cattle, swine, sheep and poultry. Rapidly excreted, primarily in unchanged form in the urine; relatively small amounts are excreted in milk.

Amycolatopsis  Genus of aerobic Gram positive bacteria, type species Amycolatopsis orientalis, of the family Pseudonocardiaceae. Isolated from soil, vegetable matter and clinical specimens. Some species produce antibiotics or biotechnologically significant enzymes. One strain has been used in biotransformations to produce vanillin from ferulic acid.

Amygdalin  Glycosides fraction present in bitter almonds which is hydrolysed by water to yield hydrocyanic acid and benaldehyde.

Amyl alcohol  Synonym for pentanol. One of the higher alcohols, comprising five carbon atoms and a single alcohol group. Of importance in the flavour compounds fraction of alcoholic beverages. Forms part of the toxic fusel oils fraction of spirits. Used as a solvent and as a substrate for production of the flavouring amyl acetate.

Amylases  Enzymes that hydrolyse the α-1,4 glycosidic linkages in both amyloses and amylpectins. Act on starch, glycogen, and related polysaccharides and oligosaccharides. Specific types are α-amylases and β-amylases.

α-Amylases  EC 3.2.1.1. Glycosidases which catalyse endohydrolysis of 1,4α-D-glucosidic linkages in polysaccharides containing three or more 1,4α-linked D-glucose units. Act on starch, glycogen, and related polysaccharides and oligosaccharides in a random manner; reducing groups are liberated in the α configuration. Present in a wide range of foods, including cereals, fruits and vegetables, and in microorganisms used in food fermentations such as Saccharomyces and Lactobacillus spp. Isolated α-amylases can be used to convert starch to dextrans in the production of corn syrups, as a flour supplement to aid growth of yeasts and gas production in dough making, and for solubilization of brewing...
**amylopectins**

Species of filamentous fungi of the class Zygomycetes. Used in the production of Asian fermented foods such as tape.

**amylopectins**

High molecular weight polymers that, together with amylloses, form starch. Composed of α-1,4-linked glucopyranose chains connected by α-1,6-linkages. 3-6% of glucose residues are α-1,6-linked, giving rise to a highly branched polymer. Starch that is almost exclusively composed of amylopectin is termed waxy, e.g. waxy corn (>99% amylopectin and <1% amyllose); in starch of this type, retrogradation is slow or absent, thus pastes of gelatinized waxy starch are non-gelling but gum-like.

**amylases**

EC 3.2.1.2. Amylases which hydrolyse 1,4-α-D-glucosidic linkages in polysaccharides, removing successive maltose units from the non-reducing ends of the chains. Act on starch, glycogen, and related polysaccharides and oligosaccharides, producing β-maltose by an inversion reaction. Used for production of high maltose syrups.

**amyloses inhibitors**

Substances that inhibit the activity of amylases (including α-amylases and β-amylases) which catalyse the breakdown of starch into sugars. α-Amylases inhibitors present in foods can act as antinutritional factors by inhibiting the breakdown of starch into sugars by amylases present in the saliva and pancreatic secretions.

**α-amylases inhibitors**

Components of foods that inhibit α-amylases. Presence of α-amylase inhibitors in starch-rich foods can reduce the rate of starch digestion and release of glucose into the bloodstream. Types of α-amylase inhibitor include proteins of higher plants (such as cereals and legumes), and polypeptides and nitrogen-containing carbohydrates produced by Streptomyces spp.

**Amylodextrins**

Acyclic, branched polysaccharides composed of glucose monomers. Produced by partial hydrolysis of starch. Uses include as fat substitutes.

**Amyloglucosidases**

Alternative term for glucan 1,4-α-glucosidases.

**Amylograms**

Records of results obtained using amylographs to investigate flour or starch viscosity as a function of temperature.

**Amylographs**

Instruments used to measure the viscosity of cereal flours or other starch-based products during variations in temperature. Samples are mixed at a constant speed and viscosity is recorded on charts (amylograms).

**Amylolytic enzymes**

Term encompassing enzymes that degrade starch, in particular α-amylases, β-amylases, glucan 1,4-α-glucosidases, pullulanases and α-glucosidases.

**Amylomyces rouxii**

Species of filamentous fungi of the class Zygomycetes. Used in the production of Asian fermented foods such as tape.

**Amylopectins**

High molecular weight polymers that, together with amylloses, form starch. Composed of α-1,4-linked glucopyranose chains connected by α-1,6-linkages. 3-6% of glucose residues are α-1,6-linked, giving rise to a highly branched polymer. Starch that is almost exclusively composed of amylopectin is termed waxy, e.g. waxy corn (>99% amylopectin and <1% amyllose); in starch of this type, retrogradation is slow or absent, thus pastes of gelatinized waxy starch are non-gelling but gum-like.

**Amyloses**

Polysaccharides composed of chains of α-1,4-linked glucopyranose residues that, together with amylopectins are constituents of starch. Amyloses have much lower molecular weights than amylopectins (at least 100-fold less) and are non-branched. In contrast to amylopectins, retrogradation of cooked amyloses is rapid, and thus gel formation occurs.

**Amylovorins**

Small, heat-stable and strongly hydrophobic bacteriocins synthesized by Lactobacillus amylovorus. Show a relatively narrow inhibitory spectrum, mainly against related Lactobacillus species, although some species of Clostridium and Listeria are also sensitive.

**Amyrin**

Triterpene alcohols fraction which occurs in the unsaponifiable fraction of some fats, and may be used as a marker of origin or authenticity of fats (e.g. for detection of cocoa butter substitutes in chocolate).

**An**

Alternative term for ann.

**Anabaena**

Genus of filamentous cyanobacteria of the Nostocaceae family. Major components of freshwater plankton. Some species, such as Anabaena floa-aquae and A. circinalis, can form algal blooms in fresh water, producing anatoxins, which are neurotoxins.

**Anabolic agents**

Natural and synthetic hormonal-type growth promoting substances. Most are derivatives of reproductive steroid hormones (oestrogens, progesterone and testosterone), but non-steroidal compounds (naturally or non-naturally occurring) such as zeranol and stilbene oestrogens are also available. Widely used in many countries to promote weight gain and feed efficiency in farm animals (principally in cattle). Their use is not permitted in the EU, although many types may be being used illegally. Also known as anabolic drugs.

**Anabolic drugs**

Chemical substances based on natural or synthetic growth promoting hormones. Most are derived from reproductive steroids (oestrogens, progesterone and testosterone) while a few are based on polypeptide hormones (e.g. recombinant bovine somatotropin). Used to promote weight gain and feed efficiency in farm animals. Use is not permitted in the EU, although illegal use has been reported.

**Anabolic steroids**

Anabolic agents derived from or similar in structure to reproductive steroid hormones. Examples of naturally produced steroids used in animal production include oestradiol-17β and progesterone (female steroids), and testosterone (male steroid). Synthetic examples include melengestrol acetate and trenbolone acetate. Used...
to promote growth and feed conversion efficiency in a range of farm animals. Anabolic steroids are banned for use in animal production in the EU, although many may be being used illegally.

**Anacystis** Obsolete name for *Synechococcus*.

**Anaemia Diseases** caused by a reduction in the size or number of red blood cells (erythrocytes) and/or the quantity of haemoglobin. Results in reduced ability of blood to transfer oxygen to the tissues. The most prevalent form of anaemia worldwide is that of iron deficiency, although there are many other causes, including deficiencies of folates and vitamin B₁₂, infection and conditions that result in excessive destruction or insufficient production of red blood cells. Common symptoms include tiredness, lethargy, dizziness and breathlessness. Food fortification approaches have been proposed for reducing the prevalence of anaemia due to nutritional causes.

**Anaerobes** Organisms that do not require atmospheric oxygen to live, or cannot survive in the presence of oxygen. Often refers to anaerobic bacteria or other microorganisms. Facultative aerobes refer to anaerobes that can also grow under aerobic conditions.

**Anaerobic digestion** Type of bioremediation process based on microbial metabolism which occurs in the absence of oxygen. Any biological material can be treated via this process, including agricultural and food wastes and effluents, to produce biogas and a digestate which may be used in fertilizers. Bioreactors in which this process in performed industrially are termed anaerobic digesters, with UASB bioreactors being a type of these. Depending on the temperature at which it is performed, the digestion may be classified as mesophilic (30-35°C) or thermophilic (55°C).

**Analogues** In relation to foods, products that are made to resemble and act as substitutes for specific commodities. Similar to simulated foods. Reasons for producing analogues include to provide alternatives to meat for vegetarians, for consumption by those with special dietary requirements or to reduce costs.

**Analysers** Instruments used in analysis.

**Analytical techniques** Methods used in analysis.

**Anaphylaxis** A severe type I allergic reaction occurring rapidly in sensitized individuals following exposure to small amounts of allergens. Symptoms can range from itching and angioedema to widespread tissue oedema, airway constriction, respiratory distress and circulatory collapse. Foods that can induce anaphylaxis include peanuts, eggs and sea foods.

**Anardana** Dried seeds of wild pomegranates (*Punica granatum*). Added in condiments or acidulants to a number of Indian foods including chutneys and curries.

**Anasazi** Ancient variety of *Phaseolus vulgaris*, reintroduced onto the market following the successful cultivation of samples discovered in a New Mexico cave. The purple and white beans have a delicate flavour, similar to that of pinto beans, and a relatively low content of indigestible sugars compared with other beans.

**Anatoxins** Neurotoxins produced in fresh water by some species of filamentous cyanobacteria of the genus *Anabaena*, especially *A. flos-aquae*. Include the alkaloids anatoxin-a and anatoxin-a(s). Extremely poisonous, sometimes killing animals drinking contaminated water within a few minutes. May represent a hazard for drinking water safety.

**Anchoveta** Small herring-like fish which occurs abundantly in Pacific waters off the western coast of South America. Anchoveta (*Engraulis ringens*) are a commercially important source of fish meal and fish oils.

**Anchovy** Group of herring-like marine fish species belonging to the family Engraulidae. Commercially important species include European anchovy (*Engraulis encrasicolus*), northern anchovy (*E. mordax*) and Japanese anchovy (*E. japonica*). Anchovy are marketed in fresh, dried, smoked, canned and frozen forms and are also used to make anchovy pastes.

**Anchovy oils** Oils derived from the muscle of *Engraulis* spp. which are rich in eicosapentaenoic acid and docosahexaenoic acid.

**Anchovy pastes** Processed fish products comprising ground anchovy (*Engraulis* and *Anchoa* spp.) mixed with ingredients such as vegetable oils and seasonings. Often used in toppings for pizzas and as a component of pasta sauces and salad dressings.

**Androgens** A class of steroid hormones that are associated with the development and maintenance of male secondary sex characteristics, such as facial and body hair, deepening of the voice and muscle development. Testosterone is the most abundant androgen in the male body. Also the precursor of oestrogens.

**Androlla** Dry cured pork sausages traditionally made in Galicia, Spain.

**Androstenone** Steroid hormone with a characteristic odour; implicated in boar taint occurring in pork produced from non-castrated male swine.

**Anencephaly** A lethal neural tube defect characterized by the absence of the cranial vault and the majority or all of the cerebral and cerebellar hemispheres. Anencephaly results from failure of the neural tube to close during embryogenesis. The risk for developing...
Aneurin, anecephaly, as with other neural tube defects, is reduced by increasing the level of folic acid in the maternal diet during pregnancy.

Anethole Synonym for p-allylphenyl methyl ether. One of the flavour compounds which occurs in herbs and spices, especially anise and fennel.

Aneurine Alternative term for thiamin (vitamin B1), used commonly in Europe. Alternative spelling is aneurin.

Anhydrous milk fats Milk fats with a very high fat content and negligible moisture content. Sometimes called water free milk fats.

Aniline Synonym for aminobenzene or phenylamine. Toxic amines fraction which is used in chemical syntheses, e.g. for dyes. Aniline may occur as a contaminant in foods.

Animal carcasses Dead bodies of animals, particularly those used for meat production. The term is used by butchers to describe animal bodies after removal of the heads, limbs, hides and offal; these processed carcasses are also called dressed carcasses. Major animal carcass meats in Europe and the USA are produced from cattle, sheep and swine, whilst in the Middle East, Africa and Asia, water buffaloes, camels and goats are more important. Conditioning or ageing of carcasses results in break down of muscle glycogen into lactic acid, which tends to improve tenderness and shelf life of meat.

Animal diseases Pathological conditions that occur in animals that are used as sources of foods and may affect the quality or safety of the foods. Examples that affect food quality or safety include mastitis and malignant hyperthermia.

Animal fats Lipid products derived from animal sources. Include butter, lard, tallow, suet and fish oils.

Animal foods Foods derived from sources in the animal kingdom. Examples include aquatic foods (sea foods and aquaculture products), dairy products, eggs and egg products, animal fats, insect foods, meat and meat products, and other animals such as worms (earthworms).

Animal models Animals used to simulate human physiological and pathological processes. Animal models allow investigations that would not be ethical or practical in humans.

Animal proteins Proteins that are derived from animal sources such as meat, fish, eggs and dairy products.

Animal rennets Proteinases present in the abomasum of young ruminants, e.g. calves, and used for clotting of milk during cheesemaking. Comprise a mixture of the main enzyme, chymosin, and pepsins, the ratio of these enzymes affecting the final properties of the cheese. Due to shortages of animal rennets and the increasing popularity of vegetarian cheeses, microbial rennets, genetically-engineered enzyme preparations synthesized by various microorganisms and milk clotting enzymes of plant origin (vegetable rennets) have been developed.

Animals Eukaryotic, generally multicellular, heterotrophic organisms of the kingdom Animalia or Metazoa. Many are hunted for meat or farmed for milk, meat or eggs. Animal cells are distinguished from those of plants, algae and fungi by a lack of cell walls.

Animal science Discipline relating to the science and technology of the production, management and distribution of animals, including those intended for food use.

Animal stress Any unusual events or conditions which bring about physiological or behavioural changes in animals. In addition to fear and physical
trauma, it includes environmental factors such as cold, heat, humidity, light, sound and wind. The term stress also describes the results of such events or conditions. Stress often occurs when animals are faced with unfamiliar, threatening or harmful situations. Transport to markets or abattoirs and poor pre-slaughter management of animals are widely recognized as causes of animal stress. Animal stress is not only an animal welfare issue, but is also associated with various defects in meat including the DFD defect and the PSE defect. Susceptibility to stress differs greatly between species, breeds, genders and individual animals.

Animal welfare Protection of the rights of animals, whether in the wild or in captivity. For animals used in agriculture as food sources, conditions (and possibly food quality) can be improved by high quality care and humane use. Implementation of high standards of care for animals used in research is believed to improve the quality of the resultant scientific data.

Anion exchange Type of ion exchange in which hydrogen ions and anions may be displaced from the ion exchange resin.

Anions Negatively charged particles that have gained one or more electrons. These ions migrate towards positively charged electrodes (anodes).

Anisakiasis Infection in humans caused by the third larval stage of the parasitic nematode *Anisakis simplex*, usually as a result of eating contaminated raw or undercooked sea foods. *Pseudoterranova* larvae have also been implicated as causative organisms. Also known as anisakidosis.

Anisakidosis Alternative term for anisakiasis.

Anisakids Genus of parasitic nematodes of the family Anisakidae. *Anisakis simplex* has been implicated in anisakiasis, an infection caused by consumption of contaminated raw or undercooked sea foods.

Anisaldehyde Common name for *p*-methoxybenzaldehyde. One of the flavour compounds occurring in a wide range of foods.

Anise Alternative term for aniseed.

Aniseed Liquorice-flavoured, fragrant seeds of *Pimpinella anisum*. Used as spices and flavourings for many foods and beverages, including confectionery and alcoholic beverages such as anisette.

Anisette Aniseed-flavoured *liqueurs* manufactured in France.

Anisole Phenolic compounds which occur naturally in a range of foods. Chlorinated anisole derivatives may cause taints, e.g. in corks and wines.

Ann Traditional Japanese *bean jams* used as the base for many confectionery products. Usually made from *adzuki beans*, although other beans may be used. Typically prepared by boiling and pounding the beans and adding *syrups* to form a paste.

Anatto Yellowish red natural colorant obtained from seeds of the tropical tree *Bixa orellana*. Contains a fat-soluble component (bixin) and a water-soluble component (norbixin). Used to add *colour* to *cheese*, *sausage casings* and *bakery products*.

Annealing Heating an item and allowing it to cool slowly, so as to remove internal stresses.

Anserine Synonym for *N*-β-alanyl-1-methylhistidine. Peptide which occurs in *fish* and *meat*, and may contribute to their *sensory properties*.

Antelope meat Meat from antelopes, sometimes referred to as *venison*. Antelope meat has a lower content of *fats* than lean *beef*, but has a similar content of essential *amino acids*. It may be cooked by *roasting*, but requires *basting* to prevent the meat from becoming too dry.

Antelopes Various species of swift running, deer-like, hollow-horned, hoofed ruminant mammals of the sub-family Antilopinae. The major well-known species include elands, gnus, gazelles and impala. Many are hunted for their meat and some species, for example the blackbuck antelope (*Antilope cervicapra*), have been farmed successfully to produce *antelope meat* of a high quality.

Anthelmintics Drugs used to treat internal infections of animals caused by parasitic worms (nematodes and cestodes). Most frequently used in younger farm animals which are more susceptible to parasitic infections. Residues are most likely to be found in *fish* and *meat* when withdrawal periods have not been strictly observed; *livers* may also contain residues. Examples include *albendazole*, *dichlorvos*, *ivermectin* and *thiabendazole*.

Anthocyanidins Flavylium salts which are the aglycone component of pigments of the anthocyanins group.

Anthocyanins Class of organic pigments (glycosides of malvidin, pelargonidin, peonidin, cyanidin, delphinidin and petunidin) giving pink, red, blue and purple *colour* to many foods and beverages of plant origin (including fruits and red wines). Extracted anthocyanins may be used as food *colorants*. Colour is pH-sensitive, and stability differs from that of artificial *colorants*.

Anthocyanogens Alternative term for leucoanthocyanins. Anthocyanins found in a range of plant foods, and also in *wines*. In a polymerized form, constituents of *polyphenols* and condensed *tannins*.

Anthracene One of the polycyclic aromatic hydrocarbons (PAH). Occurs as an environmental contaminant in a wide range of foods, water and packag-
ing materials. May also be formed during smoking or cooking of foods.

Anthracnose  Any of several plant diseases caused by fungi (particularly Colletotrichum spp.). Characterized by dark spots that appear on leaves, stems or fruits. One of the main postharvest diseases, affecting the quality of stored produce such as bananas, citrus fruits and mangoes.

Anthraquinones Pigments of the quinones group which occur in a range of plants and plant products.

Anthrax  Disease caused by the spore-forming bacterium Bacillus anthracis and transmitted through foods, skin abrasions and inhalation of spores. Gastrointestinal anthrax is usually transmitted through consumption of meat from infected animals. B. anthracis is considered to be a potential bioterrorism agent.

Anthropometric parameters  Measurements of the human body, including length, height, body mass index, body weight, head circumference, waist-to-hip ratio, percentage body fat and skinfold thickness. Commonly used as indices of growth and development in infants, children and adolescents, and in nutritional assessment for examining an individual's nutritional status, degree of obesity and risk for various diseases.

Antiallergic activity  Ability to prevent or ameliorate allergies. Certain foods and food components may possess antiallergic activity.

Antiangiogenic activity  Ability of foods or food components to slow, inhibit or reverse the process of atherosclerosis, the pathological process underlying cardiovascular disease. Consumption of foods possessing antiangiogenic activity is potentially beneficial for health as a result of the consequent decreased risk for cardiovascular diseases.

Antibacterial activity  Ability to kill or inhibit the growth of bacteria.

Antibacterial compounds  Compounds that possess antibacterial activity, e.g. certain antibiotics, antiseptics and disinfectants.

Antibiotics  Substances produced by microorganisms that can kill or inhibit other microorganisms; used to treat bacterial and fungal infections in humans and animals. Grouped into several different classes, the most widely used being β-lactam antibiotics (including penicillins and cephalosporins). Other classes include aminocyclitols, aminoglycosides, ampholicols, macrolides, nitrofurans and quinolones. Residues may occur in animal foods; toxic effects are unlikely, but potential hazards include allergic responses in consumers and development of resistant strains of bacteria.

Antibiotics resistance  Ability of microorganisms to be unaffected by treatment with specific antibiotics. Resistance can result from a range of mechanisms, including decreased permeability of the organism to the drug, modification of drug or receptor, and production of a modified protein that is unaffected by the antibiotic. Organisms can become resistant either by undergoing spontaneous mutations or by acquiring resistance genes from other resistant organisms through the processes of conjugation and transduction. Plasmids containing multiple resistance genes can be transferred not only amongst similar, but also quite different, bacteria.

Antibodies  Proteins, also known as immunoglobulins, that are produced by the body in response to foreign substances (antigens) and are capable of forming complexes with the antigens. Mechanisms by which antibodies protect the body include agglutination or precipitation of foreign antigens, lysis of foreign cells and neutralization of toxins.

Anticaking agents  Anhydrous compounds that are added in small amounts to dry foods (e.g. salt, baking powders, pudding mixes) to prevent the particles caking together and thus ensure the product remains dry and free-flowing. Typical anticaking agents for the food industry include magnesium and calcium carbonates, magnesium stearate, calcium silicate and calcium stearate.

Anticarcinogenicity  Ability of a food or food component to slow, inhibit or reverse the process of carcinogenesis, in particular, the ability to attenuate carcinoma formation in response to application of known carcinogens. Anticarcinogenicity of a substance can be determined in vitro using cell culture or in vivo using animals treated with carcinogens or a carcinoma cell line.

Anticarcinogens  Substances that inhibit the formation of carcinomas induced by application of carcinogens. Potential dietary anticarcinogens include phytoestrogens (isoflavonoids, lignans), flavonoids, lycopene, glucosinolates, terpenes, allyl sulfides and simple phenols.

Antifoaming agents  Used in a similar manner to defoaming agents to control foams formation during food processing. Examples include dimethylpolysiloxane.

Antifreeze proteins  Proteins occurring naturally in a range of organisms (especially cold water fish), which prevent or minimize freezing of tissues on exposure to low temperatures. Of potential use in the food industry for lowering the freezing point of foods and inhibiting recrystallization of ice. Possible applications include in ice cream, frozen foods or chilled meat products.
Antimicrobial activity

**Antimicrobial activity** Ability to kill or inhibit the growth of fungi.

**Antifungal activity** Ability to inhibit or reduce fungal growth. Also known as antifungals.

**Antifungal agents** Substances that possess antifungal activity. Also known as antifungals.

**Antifungal compounds** Compounds that possess antifungal activity.

**Antigenicity** Ability of substances to act as antigens by eliciting an antibody-mediated or cellular immune response.

**Antigenotoxicity** Ability of a substance to reduce or inhibit the growth of microorganisms, especially pathogenic bacteria.

**Antigens** Substances that induce an immune response, either by stimulating formation of antibodies or by eliciting a cellular response.

**Antihypertensive activity** Ability of a substance to alleviate or reduce high blood pressure (hypertension). Food components that demonstrate antihypertensive activity often act as ACE inhibitors. Potential dietary antihypertensive agents include bioactive peptides in dairy products and plant foods, and garlic constituents.

**Anti-inflammatory activity** Ability to inhibit or counteract the inflammatory response, which is an innate immune response to tissue injury by stimuli such as chemicals, trauma, extremes of temperature or microbial attack. Many foods and food components possess anti-inflammatory activity. These include some fatty acids, tocotrienol, lactoferrin, colostrum, wines and honeys.

**Antimicrobial activity** Ability to kill or inhibit the growth of microorganisms.

**Antimicrobial compounds** Compounds that possess antimicrobial activity.

**Antimicrobial packaging films** Packaging films, e.g. polyethylene films, that contain antimicrobial compounds, such as enzymes, zeolites, bacteriocins, organic acids and chlorine dioxide. The aim of using such films for packaging foods is to inhibit microbial growth on the foods and thus extend their shelf life.

**Antimony** Toxic member of the trace elements group, chemical symbol Sb, which may occur in foods.

**Antimutagenic** Ability of a substance to reduce either spontaneous mutation rates or mutation rates induced by known mutagens. Antimutagenicity of a substance against a mutagen can be determined using the Ames test.

**Antimutagens** Substances capable of reducing background spontaneous mutation rates or reducing the ability of known mutagens to cause DNA damage. There is a wide range of antimutagens in foods and beverages, such as fruits, vegetables, spices and green tea, including catechols, flavonoids, Mailard reaction products and other polyphenols. Antimutagens are also produced by certain probiotic bacteria and bacteria used to produce fermented foods.

**Antimycotics** Alternative term for antifungal agents.

**Antinutritional factors** Substances that reduce the nutritional value of a food by reducing its nutrients content, bioavailability, digestibility or utilization. Antinutritional factors include enzyme inhibitors (proteinases inhibitors and amylases inhibitors present in a wide range of foods and microorganisms), inositol and its derivatives (including phytates and phytic acid present in legumes and cereals) and antivitamins such as thiaminase, dicoumarol, theophylline.

**Antioxidant compounds** Natural compounds present in foods that exhibit antioxidative activity.

**Antioxidants** Substances used in the preservation of foods which act by retarding deterioration, rancidity or discoloration due to oxidation. The most commonly used synthetic food antioxidants include BHA (butylated hydroxyanisole), BHT (butylated hydroxytoluene) and propyl gallate. Naturally occurring antioxidant compounds include tocopherols and ascorbic acid. Consumption of a diet rich in natural antioxidants is considered beneficial for health and for the prevention of degenerative diseases.

**Antioxidant status** A facet of nutritional status, which relates to the state of the body in terms of the consumption, utilization and stores of antioxidant nutrients, as well as levels and activity of antioxidant enzymes (e.g. superoxide dismutases, glutathione peroxidases, glutathione reductases and catalases). Many dietary components possess antioxidative activity and can contribute to antioxidant status, including vitamins, minerals, polyphenols and carotenoids.

**Antioxidative activity** Ability of a substance to inhibit oxidation. Substances possessing antioxidative activity can be utilized in foods, such as oils, to inhibit oxidation, thus improving shelf life and quality. Foods possessing a high antioxidative activity have also been investigated as potentially health promoting foods, as lipid oxidation has been associated with a range of pathological processes, including atherosclerosis. Also known as antioxidative properties.

**Antioxidative properties** Alternative term for antioxidative activity.

**Antiproliferative activity** Ability to slow or inhibit cell proliferation, especially proliferation of tumour cells during cancer development. Many foods and
food components have been shown to exhibit antiproliferative activity, including a variety of flavonoids present in plant foods.

**Antisense technology** A type of gene silencing which uses DNA or RNA sequences to bind in vivo to complementary DNA or mRNA strands, respectively, preventing correct gene expression. Can be used to turn off selectively production of certain proteins. Has been used to delay ripening in fruits, modify the composition of fatty acids in oils and modify the starch contents of potato tubers.

**Antiseptics** Antimicrobial compounds used to treat human and animal body surfaces (particularly skin).

**Antisera** Sera which contain antibodies that are either specific to antigens (monovalent antisera) or reactive against more than one antigen (polyvalent antisera). Antisera can be produced by immunization of an animal either by injection of antigen(s) or infection with microorganisms that contain the antigen(s).

**Antisprouting agents** Plant growth regulators used to prevent sprouting of crops (especially root or bulb crops, e.g. potatoes) during storage. Also known as sprouting inhibitors.

**Antithrombotic activity** Ability to prevent or regulate the formation of blood clots or thrombi, and thus protect against coronary heart diseases and cardiovascular diseases such as stroke. Foods and beverages displaying antithrombotic activity include plant derived products, fish oils and dairy products containing bioactive peptides.

**Antithyroid agents** Drugs that inhibit the production of hormones produced in the thyroid gland; used to increase meat yield in animals by reducing their basal metabolism, lowering gastrointestinal motility and stimulating extracellular water retention. May cause excess accumulation of water in muscle tissues, resulting in poorer quality meat; residues may be a potential risk to consumer health. Examples include thiouracil and methimazole.

**Antitranspirants** Plant growth regulators which reduce the intensity of transpiration of food crops; used to improve yield, and product quality or shelf life.

**Antitumorigenicity** Ability of a substance to slow, inhibit or reverse the process of tumorigenesis, in particular, the ability to attenuate tumour formation in the presence of tumour promoters or carcinogens. Antitumorigenicity of foods and food components can be determined either in vitro using cell culture or in vivo using animal models.

**Antitumour activity** Ability of a substance to inhibit or reverse the progression of established tumours.

**Antiviral activity** Ability to kill or inhibit the growth of viruses. Many food components possess antiviral activity. These include lactoferrin and other constituents of milk and other dairy products, polyphenols, tannins and polysaccharides from some mushrooms.

**Antivitamins** Nutritional factors that destroy or inhibit the metabolic effects of vitamins. Examples of antivitamins in foods include thiaminase (antivitamin B₁, present in raw fish and other animal foods), caramel colorants (antivitamin B₆) and dicoumarol (antivitamin K).

**Ants** Common name for narrow-waisted, generally wingless insects of the family Formicidae. May be consumed as insect foods. Can also act as insect pests.

**Anu** Alternative term for amla.

**Aperitifs** Alcoholic beverages intended to be consumed before meals to promote appetite. Proprietary aperitifs include products based on flavoured wines or spirits.

**Aphids** Common name for plant parasites of the family Aphididae. Includes insects that suck plant sap and exude sugary secretions favoured by ants. Some species are important vectors of plant viruses.

**Apiculture** The practice of keeping bees, often with the intention of producing honeys, propolis, beeswax or royal jelly. Bees may also be kept for use in farming systems for pollination of crops.

**Apigenin** Yellow pigments of the flavonoids group which occur in a wide range of plants and plant-derived foods.

**Apocarotenal** Member of the carotenoids group of natural pigments which occurs in oranges and other plant foods. May be used in natural colorants.

**Apoproteins** Term describing the protein component of conjugated proteins, e.g. the globin component of haemoglobin.

**Apoptosis** Controlled destruction of cells which occurs as a natural process during tissue growth and development. Also referred to as programmed cell death. Failure of apoptosis is thought to be involved in uncontrolled cell growth in some types of cancer, and also autoimmune diseases.
Appetite  A natural longing to satisfy bodily needs, particularly, but not exclusively, the recurring desire for food. Appetite is increased in the state of hunger and decreased during satiety. Appetite for foods, in general, and for particular foods, may become modified over time. A particularly intense appetite for certain foods occurs during cravings.

Apple brandy  Spirits manufactured by distillation of fermented mashes based on apples. Well known apple brandy types include calvados.

Apple cider  Used in the US to refer to unfermented apple juices. In the UK, an alternative name for cider.

Apple juice concentrates  Apple juices which have been concentrated. May be diluted to produce normal strength apple juices or used in the manufacture of other beverages or foods.

Apple juices  Fruit juices extracted from apples (Pyrus malus, syn. Malus domestica). Commonly consumed as beverages, but may be fermented to cider or used in manufacture of apple brandy.

Apple musts  Alternative term for apple juices, especially those to be fermented in manufacture of cider.

Apple pectins  Pectins obtained from apples. Apple pomaces are one of the main commercial sources of pectins.

Apple peel  Outer skins of apples; used as a source of apple pectins.

Apple pomaces  The solids residue remaining after extraction of apple juices or apple musts.

Apple pulps  Soft mass prepared from the flesh of apples by processes such as slicing, chopping and mashing. Typically available in dried, frozen or canned forms and used in products such as sauces, infant foods and desserts.

Apple purées  Thick, smooth preparations made from cooked, strained apples. Used in products such as infant foods and apple sauces.

Apples  One of the most widely grown and economically important fruits of temperate regions. The common domesticated apple is an interspecific hybrid designated Malus domestica. Many varieties are grown for use as dessert, cooking, ornamental or cider apples. Fruits are large round pomes that range in flavour from sweet to sharp, and in colour from green and yellow to red and brown. Useful source of vitamin C, potassium and dietary fibre. Cooking apples are usually green, and larger and more acidic than dessert apples. Crab apples grow wild in many regions; these are barely edible, but can be used to make jelly.

Apple sauces  Sauces made by stewing chopped apples with sugar to form a pulp. Available in canned or bottled form. Used in desserts and as an accompaniment to meat dishes, especially pork.

Apple vinegar  Vinegar made using apples as the starting material. Similar to cider vinegar.

Apple wines  Alternative term for cider.

Apricot jams  Jams made from fresh or dried apricots. Used as spreads, as glazes for pies and cakes, or as confectionery ingredients.

Apricot juices  Fruit juices extracted from apricots (Prunus armeniaca).

Apricot kernels  Constituents of apricot seeds, rich in oils and proteins, but limited in use by the presence of amygdalin (yielding toxic hydrogen cyanide (HCN)). Detoxified apricot kernels are used in the manufacture of bitter almond oils, persipan and marzipan substitutes. Also consumed as roasted, salted or dried products in some countries.

Apricot nectars  Fruit nectars prepared by addition of water and/or sugar to apricot juices.

Apricot pulps  Soft, succulent flesh from apricots, which is used in a range of processed foods, such as fruit juices, ice cream and infant foods. Sheets of apricot pulp are dried to make apricot leathers.

Apricot purées  Flesh of apricots that has been mashed to a thick, paste-like consistency by various means, such as sieving, mashing or processing in a blender. Used in a range of products including infant foods, cakes and fruit juices.

Apricots  Stone fruits from Prunus armeniaca (syn. Armeniaca vulgaris), a tree which originated in ancient China and is now widely cultivated in warm temperate zones. The orange/yellow coloured fruits are utilized in a similar manner to peaches and are eaten fresh, canned or dried. The distinctive aroma makes the fruit suitable for manufacture into apricot jams and apricot juices or for incorporation into flavourings for products such as ice cream, desserts and infant foods. Compared with other fruits, apricots have a high nutritional value, including high amounts of vitamin A, carotenones, proteins, potassium and iron.
Apricot seeds  Hard seeds found in the centre of the flesh of apricots. The kernels within the outer casing are utilized as a source of oils and in making a form of marzipan substitute as well as being eaten roasted, salted or dried. Also called apricot stones.

Apricot wines  Fruit wines manufactured by alcoholic fermentation of mashes prepared from apricots (Prunus armeniaca).

Aquaculture  Production of aquatic organisms under controlled or semi-controlled conditions; mainly for food purposes. A wide range of aquaculture products, including farmed fish, farmed shellfish, aquatic plants and algae are produced commercially across the world.

Aquaculture products  Aquatic organisms (such as fish, shellfish and aquatic plants) produced by aquaculture for food or industrial purposes.

Aquaisysins  Thermostable bacterial proteinases, in particular aquaasin I (EC 3.4.21.111), an alkaline serine endopeptidase secreted by Thermus aquaticus.

Aquatic foods  Foods derived from aquatic organisms, including fish, shellfish, aquatic plants and algae.

Aquavit  Scandinavian spirits, distilled from fermented mashes based on grain or potatoes, and commonly flavoured with aromatic seeds and spices. Also known as aquavit.

Aqueous two phase systems  Solvent systems comprising 2 aqueous polymer solutions or aqueous polymer and salt solutions which are immiscible at certain concentrations. Used for extraction, purification, concentration, downstream processing, etc. of biomolecules. Polyethylene glycol is a commonly employed polymer with phosphates or sulfates used as salts. Other polymers used include dextran, ethylene oxide-propylene oxide co-polymers and surfactants. The degree of partitioning of biomolecules between the immiscible aqueous solutions is determined by their size, charge and hydrophobicity. Particularly suitable for isolation of enzymes and other proteins, since extractions are performed under mild conditions which do not cause denaturation.

Arabans  Alternative term for arabinans.

Arabic bread  Flat round bread composed of yeasts-leavened dough which, when baked, is easily split to make sandwiches. Also known as pita bread.

Arabidopsis  Non-commercial genus of the mustard (Brassicaceae) family of plants. Arabidopsis thaliana is commonly used as a model for plant research studies, including lipid synthesis studies in related Brassica plants such as oilseed rape.

Arabinans  Polysaccharides in which the main constituent sugar is arabinose, and thus classified as pentosans. Found associated with the pectic substances in plant cell walls. Present in fruits and fruit juices, and may be used as food additives, e.g. as bulking agents. Also known as arabans.

α-N-Arabinofuranosidases  EC 3.2.1.55. These glycosidases hydrolyse terminal, non-reducing α-L-arabinofuranoside residues in α-L-arabinosides. Release arabinose from α-L-arabinofuranosides, α-L-arabinans containing (1,3)- and/or (1,5)-linkages, arabinoxylans and arabinogalactans. Occur naturally in plant foods including fruits and cereals, where they are involved in the degradation of pectins and lignocelluloses. Isolates, mainly microbial, are also used, e.g. in the production of fruit juices, wines and bread. Also known as arabinosidases.

Arabinogalactans  Polysaccharides in which the main constituent sugars are arabinose and galactose. Occur in the pectic substances fractions of a wide range of plant foods, including fruits, vegetables and cereals. May be of importance for the processing properties of plant foods.

Arabinose  Monosaccharide of five carbon atoms (pentoses) found predominantly in plants as a component of complex polysaccharides, such as gums and pectins.

Arabinose isomerases  Isomerases which catalyse the conversion of D- or L-isomers of arabinose (EC 5.3.1.3 and EC 5.3.1.4, respectively), to the corresponding isomers of ribulose. Also act on fucose, galactose and altrose. EC 5.3.1.4 enzymes from bacteria have been used to catalyse isomerization of D-galactose to D-tagatose, a low-calorie sugar.

Arabinosidases  Alternative term for α-N-arabinofuranosidases.

Arabinoxylans  Polysaccharides in which the main constituent sugars are arabinose and xylose. Form part of the pentosans fraction in cereals and cereal products, and may be of importance for technological properties in processes such as baking and brewing.

Arabitol  Polyol synthesized by reduction of arabinose or produced by microbial fermentation of plant hydrolysates.

Arachidic acid  One of the saturated fatty acids with 20 carbon atoms. Occurs at low concentrations in a wide range of fats, oils and tissue lipids.

Arachidonic acid  One of the ω-6 polyunsaturated fatty acids with 20 carbon atoms. Widely distributed in foods and essential in the human diet.

Arachin  One of the two major globulins present in peanuts, the other being conarachin. As well as having good nutritional quality, both globulins play an
Arachis oils

- Important role in flavour development during peanut processing.

**Arachis oils** Alternative term for groundnut oils.

**Arak** Asian spirits which may be manufactured from a range of raw materials, including palm juices, sugar juices, dates or rice. Also known as arrack.

**Arare** Alternative term for rice cakes.

**Arbutus berries** Fruits of the Mediterranean shrub Arbutus unedo, also known as strawberry tree fruits or madrona fruits. The bitter-tasting red berries are rarely eaten fresh, but are used in a range of fruit products, including jellies, jams and wines. Also used to make liqueurs in France and Portugal.

**Archea** Group of prokaryotes first identified in the 1970s which are taxonomically distinct from bacteria. These microorganisms are morphologically similar to bacteria, but genetically very different. Includes methanogens and species isolated from extreme environments, such as halophiles, thermophiles and psychrophiles. Pyrococcus, Sulfolobus and Thermococcus are all genera of archaea. Enzymes from archaea can show excellent stability under harsh conditions and are therefore of use in biotechnology and food processing applications.

**Arcoacter** Genus of microaerophilic, rod-shaped Gram negative bacteria of the family Campylobacteraceae. Occur in the reproductive and intestinal tracts of animals and humans. Some species are pathogenic, e.g. Arcoacter butzleri which frequently contaminates raw chicken meat. Raw milk is also a source of infections.

**Arctic char** A salmonid fish (Salvelinus alpinus) from northern Europe and North America which occurs in fresh and marine water; some forms are land-locked, spending their whole lives in freshwater, while highly migratory forms spend most of their lives at sea. Flesh flavour is highly regarded. Marketed fresh, smoked, canned and frozen.

**Areca** Any of various Asiatic palm trees of the genus Areca, including A. catechu, the source of betel nuts.

**Areca nuts** Alternative term for betel nuts.

**Arecastrum** Genus of palms which includes Arecastrum romanzoffianum (syn. Syagrus romanzoffianum), also known as queen palm or pindo palm.

**Aroma concentrates** Aroma compounds that are present in foods and contribute towards aroma.

Stems are utilized for starch (sago), while young buds are consumed as a vegetable. Seed kernels have been reported to have potential as a source of vegetable fats.

**Areneng** Genus of palms, some of which are used as a source of edible fruits, palm sugar and palm wines.

**Arepas** Alternative name used in Colombia for tortillas: round, thin unleavened pancakes which are traditionally made with corn flour and baked on a hot surface.

**Argemone oils** Oils derived from any species of the genus Argemone (prickly poppies) which are found in North America and the West Indies.

**Arginine** One of the basic amino acids, present in most food proteins and essential in the human diet.

**Arkshells** A group of bivalve molluscs similar to cockles. Edible species include Scapharca subcrenata, Arca noae and Anadara broughtoni.

**Armagnac** A high-quality brandy manufactured in a specified region of the Gers district in southwest France.

**Armillaria** Genus of mainly lignicolous fungi belonging to the family Agaricales and once called Armillariella. Species include the edible fungi Armillaria mellea, also known as the honey fungus, bootlace fungus and shoestring fungus.

**Armillariella** Former name for the genus of fungi Armillaria which includes edible species.

**Army rations** Foods intended for use by soldiers. Various categories are available for use in different scenarios. The foods are packaged so that they are compact and light, and so that they have a long shelf life (at least 6 months at 38°C, 3 years or more at 27°C). Canned foods and dried foods are common. All rations, with the exception of restricted rations which are intended only for short term use, must meet military RDA for nutrients.

**Arochlor** Commercial name for a range of polychlorinated biphenyls (PCB) which occur as contaminants in foods.

**Aroma** Physiological sensation, also known as smell, that results from stimulation of olfactory receptors in the nasal mucosae and the interpretation of this information by a specialized area of the cerebral cortex. Food aroma, which is generated by release of volatile aroma compounds from the food, makes a marked contribution to overall flavour.

**Aroma compounds** Volatile compounds that are present in foods and contribute towards aroma.

**Aroma concentrates** Concentrates typically obtained by extracting and/or concentrating volatile compounds from a source material, e.g. fruit juices, coffee or butter. Can be used as flavour-
Aromatic compounds

ings in various foods or to restore aroma lost during processing. Other methods of producing aroma concentrates include fermentation and enzymatic modification (e.g. for cheese flavour concentrates).

Aromatic compounds Organic compounds characterized by a cyclic, conjugated structure, such as occurs in benzene. Some aromatic compounds, such as polycyclic aromatic hydrocarbons (PAH), may occur as toxic or carcinogenic contaminants in foods. Also refers, more generally, to flavour compounds or aroma compounds present in foods and beverages.

Aromatization Procedure for increasing the aroma of a food or beverage. Strategies include the addition of aroma compounds to the product or container, and the facilitation of aroma compound release through chemical or mechanical means. Also refers to the chemical conversion of non-aromatic compounds into aromatic compounds.

Aromatized wines Wines, often fortified wines, which have been flavoured with herbs, spices or other plant-derived ingredients.

Aromatizing agents Alternative term for flavourings.

Aroma volatiles Alternative term for aroma compounds.

Aronia Genus of plants of the family Rosaceae. Violaceous black berries produced by Aronia melanocarpa, also known as black chokeberries, contain high amounts of anthocyanins, folic acid and minerals, and are believed to possess health giving properties. Used as a source of juices and in the production of natural food colorants. May also be used to impart colour and flavour to other beverages, dairy products, confectionery and snack foods.

Arracacha Common name for Arracacia xanthorrhiza, a member of the umbellifer family, which is grown in South and Central America, primarily for its large, stalky, edible roots, which resemble carrots or parsnips in appearance. Roots, which are also known as Peruvian carrots or Peruvian parsnips, are cooked and consumed as a vegetable or processed into a variety of products including infant foods, soups, bakery products and alcoholic beverages, such as chicha. The young stems can be used in salads and have similar characteristics to celery.

Arrack Alternative term for arak.

Arrowhead Common name for Sagittaria sagittifolia, a perennial herb with arrowhead-shaped leaves which grows in ponds, rice fields and swamps in parts of South-East Asia. The starchy roots (corms) are peeled, sliced and cooked in stews or fried. Widely cultivated in China and Japan.

Arrowroot Starch obtained from rhizomes of Maranta arundinacea, a West Indian plant. Neutral in flavour and easily digestible, it is used as a thickener in invalid diets, and also in fruit sauces, pie fillings and desserts, where it imparts a clear finish. Can also refer to starch obtained from roots or rhizomes of several other tropical plants.

Arrowtooth flounder A relatively under-exploited flatfish species (Atheresthes stomias) occurring in north to mid-Pacific waters. Flesh texture is less firm than that of most other flatfish, due to presence of a cysteine proteinase in flesh; this species therefore has a low market value compared with other flatfish. Marketed in fillet form; also frozen into blocks and processed into portions.

Arsenates Toxic salts of arsenic acid, which may occur as contaminants, especially in drinking water.

Arsenic Toxic element which may occur as a contaminant in a range of substances, including water and sea foods. Chemical symbol As.

Arsenicals Molecules or compounds which contain arsenic atoms or ions. Includes organic and inorganic arsenic species. Potentially toxic contaminants of foods, particularly sea foods and water.

Arsenobetaine Organic arsenic species, major form of arsenic found in sea foods and other biological materials. Chemical formula C₃H₁₇AsO₂. Has relatively low toxicity.

Artemisia Genus of plants used as the source of spices. Includes davana (Artemisia pallensis), tarragon (A. dracunculus), wormwood (A. absinthium) and mugwort (A. vulgaris).

Arthritis Inflammation of one or more joints resulting in swelling, redness and pain. A range of conditions that includes rheumatoid, autoimmune, infectious and osteoarthritis. Increased risk for certain arthritides has been linked with dietary and nutritional factors, including poor nutrition and consumption of meat, fried foods and fats. Oils rich in ω-3 fatty acids, such as fish oils, borage oils and evening primrose oils, vegetarian diets and nutrients with antioxidative activity have been associated with symptomatic relief.

Arthrobacter Genus of obligately aerobic Gram positive bacteria of the family Micrococcaceae which occur in soil. Some species, including A. nicotianae, may be used as cheese starters in the production of smear cheese. Other species may be used in the production of industrial enzymes.

Artichokes Term generally applied to the edible buds from Cynara scolymus (globe artichokes). May also refer to the edible tubers from Helianthus tuberosus
Artificial colorants

(Jerusalem artichokes), *Stachys sieboldii* (Japanese artichokes) and *S. affinis* (Chinese artichokes).

**Artificial colorants** Colorants which have been manufactured synthetically, as opposed to those extracted from natural sources (natural colorants). Tend to be less expensive and have better colour intensity, uniformity and stability than natural colorants. Examples include azo dyes and FDC colours.

**Artificial flavourings** Flavourings which contain one or more artificial components not yet identified in a natural material. Synthetic flavourings containing the same chemicals as those found in a natural product are known as nature-identical. Synthetic flavourings are usually less expensive than natural flavourings, and less likely to vary in quality, availability and processing stability.

**Artificial foods** Alternative term for simulated foods.

**Artificial neural networks** Systems of computer programs and data structures which are modelled on the human nervous system and brain. Incorporate large numbers of processors operating in parallel, each with an individual sphere of knowledge which has been fed into it along with rules about relationships. Networks can use this information to recognize patterns in large amounts of data. Used in the food industry in modelling of processes and predicting the behaviour of foods under specific conditions. Also known as neural networks.

**Artificial sweeteners** Synthetic non-nutritive sweeteners, also known as high-intensity sweeteners, usually many times sweeter than sucrose. Examples include aspartame, saccharin, sucralose, acesulfame K and alitame. Widespread applications include low calorie foods, soft drinks and sugar free foods.

**Arxula adeninivorans** Species of thermotolerant yeasts of the class Saccharomycetes. Used in biotechnology applications for the production of enzymes such as lipases and glucan 1,4-α-glucosidases.

**Aryl-alcohol oxidases** EC 1.1.3.7. Oxidases which catalyse the oxidation of primary alcohols with aromatic rings to form aromatic aldehydes, including some aroma compounds and flavour compounds, such as benzaldehyde, and hydrogen peroxide. Involved in lignin degradation by white rot fungi.

**Arzua cheese** Spanish semi-soft cheese made from pasteurized cow milk. Elastic fine rind and creamy body. Eaten as a dessert with honey, as a sandwich filling or in cooking.

**As** Chemical symbol for arsenic.

**Asafoetida** Bitter, strong smelling resin extracted from the roots of the umbelliferous plant *Ferula foetida*. The pungent garlic-like aroma and flavour are due to the presence of sulfur compounds. Used in spices for Asian foods, pickles and Worcestershire sauces.

**Asbestos** Fibrous magnesium calcium silicates, which may be used for thermal insulation or in filter aids. Some types are carcinogenic. Asbestos fibres may occur as contaminants in substances such as water.

**Ascidians** Small marine filter feeding organisms which are primitive chordates of the class Asciidiacea and are widely distributed around the seas of the world. Also known as sea squirts. Benthic non-motile organisms, often attached to outer surfaces of boats, jetties and oil rigs. Some species are utilized as sea foods, particularly Halocynthia roretzi, *Styela clava* and *S. plicata*.

**Ascochyta** Genus of fungi of the subphylum Pezizomycotina and phylum Ascomycota. Species cause diseases in many crops, including grasses, pulses (e.g. chick peas, beans) and cereals.

**Ascomycetes** Former term for a large class of fungi containing approximately 2000 genera. Still commonly used to describe members of the subdivision Ascomycotina. Typically terrestrial saprotrophs or parasites. Includes most yeasts, the edible morels (*Morchella*) and truffles (*Tuber*), the cup fungi, the powdery mildews, the black mildews and the sooty moulds.

**Ascorbates** Alternative term for L-ascorbate oxidases.

**Ascorbate oxidases** Alternative term for L-ascorbate oxidases.

**L-Ascorbate oxidases** EC 1.10.3.3. Enzymes which oxidize ascorbic acid to dehydroascorbic acid. These oxidases can be used to determine the levels of vitamin C in foods and beverages, and as part of an antioxidant protection system for food preservation.

**Ascorbates** Salts of ascorbic acid, including sodium ascorbate and calcium ascorbate, which can be used as food additives. Food uses include as antioxidants in products such as meat products, as browning inhibitors for fruits and vegetables, and as bakery additives.

**Ascorbic acid** Synonym for vitamin C, an antioxidant nutrient present in a wide range of foods. Necessary for growth of bones and teeth, for maintenance of blood vessel walls and subcutaneous tissues, and for wound healing; dietary deficiency results in scurvy. Used for the fortification of foods, and as food additives, including as bakery additives, browning inhibitors in cut fruits, curing agents in meat
Ascorbyl palmitate  Aspartate transaminases

Ascorbyl palmitate  One of the fatty acid esters that are used as food antioxidants. Formed by esterification of ascorbic acid and palmitic acid. Particular applications include in oils and meat products.

Aseptic packaging  Packaging technique in which an aseptic product is placed into an aseptic container in an aseptic environment. The sealed container is designed to maintain aseptic conditions until the seal is broken. Used to enhance shelf life of foods, e.g. fruit juices. Advantages over conventional sterilization techniques include high product quality, optimization of sterilization, minimum energy consumption and low production costs. Aseptic packaging is not suitable for use with products containing large particles, and shelf life stability is shorter than for sterilized foods.

Aseptic processing  High-temperature, short-time process which results in products with improved texture, colour, flavour and nutritional values compared with conventional canning. This technology involves filling of pre-sterilized containers with a commercially sterile cooled product, followed by aseptic hermetic sealing with a pre-sterilized closure in an atmosphere free of microorganisms.

Ash  Mineral content of foods, determined by combustion of the sample under defined conditions and weighing of the residue.

Ashbya gossypii  Species of filamentous fungi of the class Saccharomycetes. Used in biotechnology applications for the production of riboflavin using vegetable oils as a carbon source.

Asiago cheese  Unpasteurized Italian hard cheese originally made from ewe milk, but now made entirely from cow milk. Two types of Asiago are made, i.e. a lightly pressed cheese made from whole milk and matured for 20-30 days (Asiago Pressato cheese) and a mature cheese made with skim milk (Asiago d’Allevo). An intense flavour develops in cheese matured for 2 years.

Asiago Pressato cheese  Type of Asiago cheese that is mild and delicately flavoured. Interior of this fresh cheese is white with a hint of straw colouring.

Asian pears  Pears produced by Pyrus pyrifolia and P. serotina. Grown extensively in Asia, particularly Japan, China and Korea, and currently gaining popularity in the West, partly because of their distinctive crisp texture, which remains unchanged after picking and long-term cold storage. Frequently called apple pears due to their crisp, juicy qualities, they are also known as Oriental pears or Japanese pears.

Asparaginases  EC 3.5.1.1. Hydrolases which catalyse the conversion of L-asparagine to L-aspartic acid and ammonia. Involved in metabolism of amino acids in vivo. Potentially useful for reducing the acrylamide content of cooked foods, through removal of asparagine which is a precursor of this toxin.

Asparagine  One of the non-essential amino acids, occurring in most food proteins.

Asparagus  Lilaceous plants of the genus Asparagus, particularly A. officinalis, which is widely cultivated in Europe and the USA for its edible young shoots (spears). Lighly cooked asparagus spears are regarded as a luxury vegetable and can be eaten hot or cold. They are also widely used in soups.

Asparagus beans  Common name for seeds produced by Vigna sesquipedalis. Long thin legumes that resemble string beans, but which are actually related to cowpeas. Flavour is similar to that of string beans and has also been likened to that of asparagus. Also known as sitao, Chinese long beans or yard-long beans due to their ability to grow up to 3 feet in length. Asparagus beans are picked before reaching this stage and used in salads or stir-fries. Young leaves and stems are steamed and consumed as vegetables.

Asparagus peas  Common name for Lotus tetragonolobus, a southern European plant, occasionally grown for its edible pods, which are harvested before maturity and consumed as a vegetable (usually steamed).

Aspartame  One of the low calorie artificial sweeteners (chemical name aspartyl phenylalanine methyl ester; trade names NutraSweet and Canderel). A dipeptide (aspartic acid and phenylalanine) ester, approximately 180-200 times sweeter than sucrose. Non-cariogenic and without an aftertaste. Loses sweetness on prolonged storage and exposure to heat (unsuitable for baking). Safe for diabetics, but not for individuals with phenylketonuria as phenylalanine is released during metabolism of aspartame. An ingredient of many foods and beverages sold worldwide, and commonly used in diet soft drinks and sugar-free chewing gums. Often blended with acesulfame K to give a more sugar-like taste and to increase potency.

Aspartate aminotransferases  Alternative term for aspartate transaminases.

Aspartate transaminases  EC 2.6.1.1. Also known as aspartate aminotransferases. One of the transferases, this enzyme catalyses the reaction of the amino acid L-aspartic acid with 2-oxoglutaric acid to produce oxaloacetic acid and L-glutamic acid. Also acts on the aromatic amino acids L-tyrosine, L-phenylalanine and L-tryptophan. Raised plasma...
levels of these enzymes are indicative of hepatic damage, and thus may be measured to investigate the hepatotoxicity of a substance.

**Aspartic acid** One of the non-essential amino acids, occurring in most food proteins.

**Aspartyl phenylalanine methyl ester** Systematic name for aspartame.

**Aspergillil acid** Antifungal compound produced by *Aspergillus flavus*.

**Aspergillus** Genus of fungi of the class Hyphomycetes. Some species can cause food spoilage (e.g. *Aspergillus flavus, A. parasiticus* and *A. niger*). Many species produce mycotoxins (e.g. aflatoxins, cyclopiazonic acid, ochratoxins, patulin). Certain species are used in production of industrial enzymes (e.g. synthesis of amylases, catalases, proteinases and lipases by *A. niger*). Also involved in production of fermented foods (e.g. manufacture of koji, miso, sake and soy sauces by *A. oryzae*) and other agents for the food industry (e.g. citric acid and gluconic acid production by *A. niger*).

**Aspic** Savoury clear jelly made from meat or fish stocks, often made with gelatin. Used as a setting gel or for glazes on foods such as meat and vegetables. Also available in powdered form.

**Aspirators** Instruments or equipment for drawing fluids by suction from vessels or cavities.

**Ass milk** Milk obtained from asses. Close in composition to human milk.

**Astacene Pigments** fraction of the carotenoids group, derived from astaxanthin. Occurs in crustacea and may be extracted from wastes generated by processing sea foods such as shrimps.

**Astaxanthin Pigments** fraction of the carotenoids group, occurring naturally in certain crustacea, fish (e.g. salmon and trout), microalgae and yeasts. Used as a food additive in aquaculture and fed to laying chickens to improve the pigmentation of egg yolks. One of several colorants listed as food dyes within the E number system operated in Europe (E161j) and also marketed in nutraceutical products. Exhibits good radical scavenging activity and potential health benefits.

**Asthma** A breathing disorder that results from spasm of the muscles surrounding the airways of the lungs (bronchospasm) that is generally reversible. Narrowed airways cause shortness of breath, wheezing, coughing and congestion. Atopic (allergic) asthma is most common and can be associated with food allergens. A wide range of asthma triggers have been identified, including environmental pollutants, drugs, cold air and exercise. Asthma triggered by foods is rare; food trig-

**Atlantic salmon** A well known freshwater fish/marine fish species (*Salmo salar*) of high commercial importance; indigenous to geographical areas linked to the Atlantic ocean but also cultured in other areas. World Atlantic salmon production is more than half a million tonnes per year. Flesh has a highly valued flavour. It is marketed and consumed in a wide range of forms, including fresh, frozen, smoked and canned products.
Atomic absorption spectrophotometry  

**Atomic absorption spectrophotometry**  

Alternate term for **atomic absorption spectroscopy**.

**Atomic absorption spectroscopy**  

Technique in which the mineral composition of a sample is determined from the absorption of light by atoms. A monochromatic source of light at a specific absorption wavelength is passed through the sample following atomization by various means. Often abbreviated to AAS.

**Atomic emission spectroscopy**  

Technique in which the mineral composition of a sample is determined from the emission of light from excited atoms at wavelengths characteristic of the atoms.

**Atomic force microscopy**  

Imaging technique in which the surface of the sample is scanned using a small tip to construct a 3-dimensional image. The tip may be in contact with or just above the surface. Molecular forces exerted against the tip by the surface are used by **image processing** software to give information about the surface.

**Atomizers**  

Devices that convert a substance into very fine particles or droplets.

**ATP**  

Abbreviation for **adenosine triphosphate**.

**ATPases**  

Include EC 3.6.1.3 and members of EC 3.6.3 and EC 3.6.4. **Hydrolases** which catalyse the hydrolysis of ATP to ADP as a fundamental energy-producing reaction in all living organisms. Can be used to assess **denaturation of proteins in meat and fish** during **storage**. In **microorganisms**, these enzymes are widely measured in metabolic studies, and are involved in **acids resistance** and tolerance to ethanol.

**Atrazine**  

Selective systemic triazene herbicide used for pre- and post-emergent control of annual grasses and broad-leaved weeds in a range of **cereals** (particularly **corn** and **sorghum**), **fruits**, **vegetables**, **coffee**, **oil palms** and **sugar cane**. Often used in combination with other **herbicides**. Classified by WHO as unlikely to present acute hazard in normal use.

**Atta**  

Indian wholemeal **wheat flour** used in preparation of Indian **bread**.

**Attalea**  

Genus of **palms**, including **Attalea colenda** and **A. cohune**, used as a source of **palm oils**.

**Attieke**  

A traditional product of the Ivory Coast made by fermentation and steam-cooking of **cassava** roots.

**Aubergines**  

Egg-shaped fruits of **Solanum melongena**, a native plant of tropical Asia, but now cultivated widely in tropical and warm temperate regions. Fruits are usually black or dark purple in **colour**, although green, creamy white or yellow varieties are also available. Consumed as a vegetable, typically fried or stuffed, or used as an ingredient in ratatouille, mousaka and **curries**. Also known as egg plants in North America and brinjal in India and Africa.

**Aureobasidium**  

Genus of yeast-like **fungi** of the family Dothioraceae, which occur in **fruits**, **vegetables** and **sea foods**. **A. pullulans** may be used as a postharvest **biocontrol** agent in **fruits** to inhibit **spoilage fungi**, as well as for the industrial production of **pullulan** and various **enzymes** including **pullulanases**.

**Auricularia**  

Genus of **fungi** of the class Agaricomycetes. Includes edible species, e.g. **Auricularia auricula-judae** (wood ear fungus) and **A. polytricha** (cloud ear fungus) which grow on dead wood and are popular in **Asian cuisine**.

**Austamide**  

Tremorogenic** mycotoxins** produced by **Aspergillus ustus**. One of the indole **alkaloids**.

**Australian chestnuts**  

Seeds produced by the tree, **Castanospermum australe**. Also known as Moreton Bay chestnuts or blackbeans. Poisonous when fresh, but can be consumed after **roasting** to remove **toxins**. Common to some parts of Australia, where they are consumed by aborigines. Contain castanospermine, an antiviral which has been investigated for possible use in **AIDS** therapy.

**Authenticity**  

The genuineness of foods and beverages; can be with respect to various factors, such as ingredient content, processing methods and geographical origin. For certain foods and beverages, labelling schemes have been implemented to indicate authenticity. A range of methods is used to test authenticity depending on the potential method of **adulteration**.

**Autoclaves**  

Strong containers employed in processes using high pressures and temperatures, e.g. steam **sterilization**.

**Auto fluorescence**  

Natural **fluorescence** emitted by substances, including many biomolecules. Can be exploited in development of **analytical techniques** for their detection. However, can also be a problem when labelling biomolecules or cells with fluorescent probes, e.g. in **fluorescence microscopy**, since it increases background fluorescence.

**Autolysins**  

Endogeneous** enzymes** found in cell walls which can hydrolyse certain structural cell components (e.g. peptidoglycans in **bacteria**) to bring about **autolysis**.

**Autolysis**  

Process by which the structural components of cells are degraded by their **autolysins**. Usually occurs after the cells have experienced a traumatic event such as injury or death. May result in the release of intracellular enzymes from cells, which may play an important role in **cheese ripening**. Can be responsible for inactive cultures or for sensory defects (by autolytic products) in **wines** and **beer**.
Avenanthramides Phenols unique to oats. Fruits do not ripen if left on the tree and are usually treated with ethylene in ripening rooms to ensure uniform maturation.

Avocados Non-systemic insecticide and acaricide used for control of chewing and sucking insects and spider mites on fruit trees, vegetables, cereals and coffee plants. Classified by WHO as highly hazardous (WHO Ib).

Azaspiracids Group of toxins produced by marine algae. Cause food poisoning in people eating contaminated shellfish, especially mussels.

Azinphos-ethyl Non-systemic insecticide and acaricide used for control of chewing and sucking insects and spider mites on fruit trees, vegetables, cereals and coffee plants. Classified by WHO as highly hazardous (WHO Ib).

Azinphos-methyl Narrow-spectrum glycopeptide antibiotics active against Gram positive bacteria. Used in the past for growth-promoting purposes (improves absorption of nutrients from the gastrointestinal tract) in chickens, turkeys, swine and calves. Remains virtually unabsorbed within the gastrointestinal tract and is rapidly eliminated in the form of the parent compound; no withdrawal period is required. Banned for use as a feed additive across Europe during 1997, and subsequently in many other countries. This followed concerns that continued use of avoparcin in food-producing animals may lead to acquired bacterial resistance development in the gut of the animals and pose a possible threat to human health by being a contributing factor to the emergence of vancomycin resistant enterococci.

Avian flu Also known as bird flu or avian influenza. Caused by the Avian Influenza A (H5N1) virus. Primarily affects poultry, but can be spread by wild birds. First human cases seen in Hong Kong in 1997, due to close contact with infected birds. Not thought to represent a food safety risk, as long as proper handling, cooking and general hygiene procedures are observed. However, can cause severe economic problems for poultry producers.

Avadian Glycoproteins fraction which occurs in egg whites and binds biotin.

Avocados Common name for Persea americana, also known as alligator pears. A pear-shaped fruit with a leathery green or black skin enclosing yellow to orange flesh and a single pit. Compared with other fruits, avocados have high protein and oil contents. Traditionally marketed fresh and used like a vegetable, they can also be processed into guacamole or used as a source of avocado oils.
Azodicarbonamide

insects on fruit trees, vegetables, cereals, nuts, sugar cane and coffee plants. Classified by WHO as highly hazardous (WHO Ib). Also known as guthion.

Azodicarbonamide Oxidizing bakery additives used to age and bleach cereal flour, and to condition dough for breadmaking.

Azodrin Alternative term for the insecticide monocrotophos.

Azo dyes Series of artificial colorants containing at least 1 chromophoric azo group. Examples include amaranth, tartrazine, Sunset Yellow and Carmoisine.

Azotobacter Genus of aerobic, rod-shaped Gram negative bacteria of the family Pseudomonadaceae. Occur in soil and water. Capable of nitrogen fixation, thereby converting atmospheric nitrogen into a chemical form which is usable by plants. Azotobacter vinelandii is used to produce alginates.

Azoxystrobin A translaminar systemic and protectant member of the strobilurin class of fungicides. Active against a broad spectrum of fungi and used on a wide range of crops. Classified by WHO as unlikely to present acute hazard in normal use.
Babaco Common name for Carica pentagona. A seedless pentagonal-shaped fruit, which is related to paw-paws and believed to have originated in Ecuador. The ripe fruit is golden yellow in colour and has a delicate strawberry-like aroma. Flesh is very juicy, slightly acidic, low in sugar and rich in vitamin C. Immature green fruit can be used as a vegetable.

Babassu oils Edible oils derived from the babassu (Brazilian palm nut), which have similar fatty acids composition and physical properties to coconut oils. Used as a cooking oil, as well as in the manufacture of soaps and cosmetics.

Babassu palm kernels Softer, central parts of the babassu nut (Brazilian palm nut) which form the source of babassu oils.

Baby corn Small ears of immature corn, generally harvested between 2 days before and 3 days after silking. Baby (dwarf) corn is sold fresh or canned and generally measures around 4-9 cm in length and 1-1.5 cm in diameter. Popular in Oriental cuisine.

Baby foods Alternative term for infant foods.

Bacilli Generally refers to any rod-shaped bacterial cells. May be used specifically to refer to a member of the genus Bacillus.

Bacillus Genus of aerobic or facultatively anaerobic, rod-shaped, spore-forming Gram positive bacteria of the family Bacillaceae, which occur in soil and water. Some species are used commercially as sources of enzymes (e.g. glucose isomerases, subtilisins). B. cereus can cause spoilage of pasteurized milk and cream, while B. subtilis and B. licheniformis can cause spoilage of bread. B. cereus is responsible for 2 types of food poisoning: diarrhoeal food poisoning, associated with consumption of meat, vegetables, dairy products, puddings, soups and sauces; and emetic food poisoning, associated with consumption of rice, pasta, pastry and noodles. B. anthracis may occasionally cause gastroenteritis associated with undercooked meat. B. thuringiensis is an important insect pathogen used as an agent for biocontrol. Some species have been transferred to the genus Geobacillus, including G. stearothermophilus and G. thermoleovorans.

Bacitracin Peptide antibiotic produced by the bacteria Bacillus subtilis and B. licheniformis; active against Gram positive microorganisms and used (in the form of zinc bacitracin) to promote growth in calves, lambs, swine and turkeys. Also used to enhance egg production in poultry and for treatment of mastitis in cows. Remains virtually unabsorbed in the gastrointestinal tract of animals; distribution in edible tissues is considered negligible.

Backfat Fatty tissue covering the back area on animal carcasses. In swine, a particularly thick fat layer is present in the back region, which is thick enough to be separated and used independently. Swine backfat is fairly soft at room temperature. Backfat thickness is thought to affect attributes of pork such as flavour and eating quality.

Bacon Meat from the sides, backs and bellies of swine, preserved by curing; it may be smoked or un-smoked. When bacon is sold after curing but before smoking, it is called green bacon, pancetta or raw kaiserfleisch. Smoking produces a strong flavour in bacon. In order to decrease the retail price per kilogram, some bacon manufacturers increase the weight of their product using water, phosphates and other ingredients. Most bacon is sliced into rashers before retail; middle rashers have a round eye of lean meat, whilst streaky bacon is the tail end of the loin. A rasher of bacon can contain up to 40% fat.

Baconburgers Round, flat cakes of chopped or minced bacon, cooked by grilling or frying. Baconburgers are usually eaten in bread rolls, and can be served with lettuce, tomatoes, onions, pickles, mustard and tomato ketchups.

Bacteria Heterogeneous group of usually unicellular prokaryotic microorganisms, generally possessing a characteristic cell wall, and found in virtually all environments. Some cause diseases in humans and animals, while others are used in the manufacture of foods (e.g. dairy products).

Bacterial biomass Quantitative estimate of the total bacteria present in a given habitat, in terms of mass, volume, or energy.

Bacterial counts Estimations of numbers of bacteria in a sample.
Bacterial spoilage  

**SPOILAGE** caused by the action of bacteria.

**Bacterial spores**  

Spores (either endospores or exospores) formed by bacteria (e.g. *Bacillus* and *Clostridium* spp.) under conditions of nutrient limitation. Endospores are resistant and may be disseminative, rather than reproductive, while bacterial exospores are characteristically reproductive and disseminative. They are generally more resistant than vegetative cells to heat, desiccation, antimicrobial compounds and radiation, and can remain dormant for long periods.

**Bactericides**  

Biological, chemical or physical agents that kill bacteria, but not necessarily their endospores. Include formaldehyde, peracetic acid, hydrogen peroxide and activated carbon.

**Bacteriocins**  

Peptides produced by specific bacteria that possess antibacterial activity. Both purified bacteriocins and bacteriocin-producing bacteria are used in the food industry, applications including inhibition of the growth of pathogens and spoilage organisms.

**Bacteriocins resistance**  

Ability of bacteria to withstand treatment with, or exposure to, bacteriocins. Mechanisms of resistance include decreased permeability of the cell membrane, alteration of cell receptors and modification or destruction of bacteriocins by enzymes.

**Bacteriological quality**  

Extent to which a substance (e.g. a food) is contaminated with bacteria.

**Bacteriology**  

Scientific study of bacteria.

**Bacteriophages**  

Viruses that infect bacteria. In the case of lytic phages, bacterial synthesis of DNA, RNA and proteins ceases following infection, and new phage constituents are synthesized using the host’s transcription and translation apparatus. Following self-assembly of phages, host cells rupture, releasing several hundred new phage particles. Many phages, however, are lysogenic and integrate into the host cell DNA as prophages. These remain dormant and only undergo the lytic cycle under appropriate environmental conditions. Bacteriophage infection of start-ers causes significant losses in the manufacture of cheese and other fermented dairy products. Altered forms of bacteriophages are often used as DNA cloning vectors.

**Bacteriophages resistance**  

Resistance of bacteria to infection by bacteriophages. Resistance may be mediated by alteration of the cell wall or by various intracellular mechanisms, such as restriction modification systems. Several resistance mechanisms have been found to be plasmids-based and, potentially, can be introduced into bacteria in order to increase their resistance to infection.

**Bacteriostats**  

Chemical agents that inhibit the growth and multiplication of bacteria. Includes several disinfectants, spices and antibiotics.

**Bacteroides**  

Genus of obligately anaerobic, rod-shaped Gram negative bacteria of the family Bacteroidaceae. Occur in the oral cavity, respiratory cavity and intestinal tract of humans and other animals. Some species are opportunistic pathogens.

**Bactofugation**  

High speed centrifugation process used to remove most bacterial endospores, yeasts and fungi from milk, thereby extending its shelf life. Used to produce milk with a low spore count for cheese production to prevent late blowing of hard cheese.

**Bactris**  

Genus of palms which includes *Bactris gasipaes*, also known as pupunha or peach palm, a species utilized for its edible fruits and palm hearts.

**Bacuri**  

Fruits similar to mangosteens produced by *Platonia insignis* or *P. esculenta*, trees growing in the Amazonian forests of South America. Yellow, with a leathery shell enclosing creamy white flesh. Flesh is eaten fresh or canned, or used in manufacture of products such as purees, jams, ice cream, fruit juices and liqueurs.

**Bael fruit**  

Thick-shelled fruits of *Aegle marmelos*, a rutaceous tree native to India. The citrus-like fruits are rich in vitamin C, with slight astringency, and are consumed fresh or processed into products such as juices and jams. Fresh fruits have a yellow pulp, which turns reddish brown when dried. Particularly prized for their medicinal properties, especially as a treatment for dysentery. Also known as Bengal quinces or Indian quinces.

**Bagasse**  

Cane sugar processing waste that is composed of unextracted sugar and the remains of the sugar cane after milling. Used as a fuel source, in feeds, as a substrate for microbial fermentation and for paper and board manufacture. Also called sugar cane bagasse and megass. Occasionally refers to wastes from other plants, such as cassava, beets and agave.

**Bagels**  

Yeast-leavened rolls with a hole in the middle, characterized by a glazed crust and a tough chewy texture. Made by dropping into boiling water briefly before baking.

**Bagging**  

Packing of substances, such as foods, into bags.

**Bag in box packaging**  

Packaging consisting of a flexible inner bag, which closely fits inside a box. The product is contained in the inner bag, which acts to keep out atmospheric oxygen. The rigid outer box protects the contents. Used widely for breakfast cereals and also for storing and dispensing wines.
Bagoong  Fermented salted fish paste originating from the Philippines; usually made from an anchovy-like fish called dilis (Stolephorus indicus) or from young herring.

Bags  Containers with a single opening that are used for storing or carrying items. Made from a variety of flexible materials. Bags for food use are usually made from paper or plastics. The term is also used for small perforated paper sacks in which tea leaves or coffee grounds are placed, and which are used to make small quantities of tea or coffee beverages.

Baguettes  Small narrow loaves of crusty bread containing little or no shortening. Often used to make sandwiches.

Bajra  Indian millet, Pennisetum typhoidium.

Baked beans  Haricot beans (usually navy beans) that have been baked and canned in tomato sauces. Other ingredients include modified starches, water, sugar, salt and spices. A good source of proteins and dietary fibre.

Bakeries  Facilities in which bakery products are manufactured. Also refers to retail outlets in which bakery products are sold.

Bakers confectionery  Alternative term for bakery products, especially those of a sweet nature, e.g. cakes.

Bakers yeasts  Leavening agents, specifically Saccharomyces cerevisiae, used in making bread and other bakery products, which convert fermentable sugars present in the dough into carbon dioxide. Available in fresh (compressed), liquid and dried (granulated) forms.

Bakery additives  Ingredients used in making bakery products with the aim of prolonging shelf life or improving the quality of the finished products. Include humectants, antifoaming agents, anti-starching agents, crumb softeners and texture improvers.

Bakery fillings  Fillings used in bakery products, e.g. cakes and biscuits.

Bakery product mixes  Pre-mixed dry formulations which usually require the addition of liquid ingredients to make batters or dough.

Bakery products  Products in which flour based components are major ingredients, and which are cooked by baking. Include biscuits or cookies, bread, cakes, doughnuts, scones and tortillas.

Baking  Cooking of foods in ovens by surrounding with dry heat. The temperature of the oven is varied depending on the type of food that is to be cooked.

Baking ovens  Enclosed chambers or compartments in which foods are cooked or heated by application of dry heat (baking).

Baking powders  Bakery additives comprising mixtures of sodium bicarbonate, starch and one or more acidic substance (e.g. cream of tartar). When moistened and heated, they act as raising agents by generating carbon dioxide, bubbles of which have a leavening effect.

Baking properties  Characteristics of cereals, bakery additives, flour or dough associated with their suitability for use in baking.

Baking quality  Extent to which a flour is able to produce a well leavened bread, which has optimal texture and an even distribution of air pockets formed during fermentation, or good quality bakery products.

Balady  Middle Eastern unleavened sourdough flat bread, especially popular in Egypt.

Balsamic vinegar  Richly-flavoured dark vinegar produced in Modena, Northern Italy, by slow ageing of grape juices in wooden casks. Frequently used in salad dressings and marinades.

Balsam pears  Alternative term for bitter gourds.

 Bambara beans  Alternative term for bambara groundnuts.

Bambara groundnuts  Fruits of Voandzeia subterranea (syn. Vigna subterranea), also known as bambara beans. Grown extensively in the tropics, particularly Africa. Seeds are rich in starch and proteins, but low in minerals and contain only about half the oil content of true groundnuts (peanuts). Can be eaten fresh, boiled or roasted, or ground into meal to make porridge or bean cakes. Immature seeds are sweeter and easier to cook than mature, hard seeds.

Bamboo  Tall tree-like plants belonging to the grass family and characterized by hollow woody stems and edible young bamboo shoots. Of great economic importance in many areas. Species utilized for bamboo shoots include those belonging to the Bambussa, Phyllostachys and Dendrocalamus genera.

Bamboo shoots  Emerging ivory-coloured shoots of several species of bamboo. These include Bambusa oldhamii, Dendrocalamus latiflorus and Phyllostachys edulis. An important component of Oriental cuisine, bamboo shoots are available fresh or canned and have a crispy texture. Bitter-tasting shoots require precooking due to the presence of cyanogenic glucosides.

Banaba  Common name for the plant Lagerstroemia speciosa, the leaves of which are extracted to make banaba tea which is drunk as a herb tea, principally in the Philippines and Japan. Banaba leaf extracts also have blood sugar lowering activity, making them useful in treating diabetes mellitus and as major components in weight reduction products.
**Banana tea** | Aqueous extract prepared from the leaves of the **banaba** tree (*Lagerstroemia speciosa*) which is drunk as a **herb tea**, principally in the Philippines and Japan. Claimed to have many beneficial properties for health, including insulin-like activity.

**Banana juices** | **Fruit juices** extracted from **bananas** (*Musa spp.*).

**Banana peel** | Thick outer skin of **bananas**, which helps protect the fruit and whose **colour** provides a good indication of ripeness. Occasionally incorporated into **jams**.

**Banana pulps** | Banana flesh or a preparation made from it by mashing. Used as the starting material for manufacture of various products, including banana **milkshakes**, **fruit juices** and **infant foods**.

**Banana purees** | One of various **fruit purees** used as ingredients of foods and beverages or marketed as **infant foods**. Prepared commercially from ripe **bananas** by **peeling**, mashing, de-seeding, deaeration and homogenization operations.

**Bananas** | **Fruits** produced by large tropical plants of the genus *Musa*. Wild fruits contain seeds and are inedible, whereas edible cultivars are seedless (sterile) hybrids, and a good source of **carbohydrates** and **vitamin A**. Yellow dessert bananas are relatively high in **sugar** and are consumed fresh, whereas starchier **plantains** (green bananas) are used like a vegetable in cooking. Bananas are also widely used in foods such as **fruit purees**, **fruit juices** and **bakery products**.

**Bannocks** | Traditional Scottish flat **bread** or **cakes** made usually from **barley flour** or **oatmeal**. Cooked on a griddle and eaten plain or flavoured, with breakfast or evening meals.

**Banvel** | **Alternative term** for the herbicide dicamba.

**Baobab** | **Common name** for *Adansonia digitata*, a giant tree of the Bombacaceae family, used as a source of foods in many parts of Africa. Baobab **fruits** are similar in appearance to **gourds** and yield an edible pulp known as monkey bread, which is used in foods and beverages. Leaves are also edible and can be made into **soups** or stews, while **seeds** are ground to produce a **meal** (frequently mixed with **millet**) or used for production of **baobab oils**. Mixtures of **milk** and baobab **fruit juices** are popular beverages in some areas.

**Baobab oils** | **Oils** produced from the gourd-like fruit of large trees of tropical Africa which belong to the genus *Adansonia*.

**Barbados cherries** | **Fruits** from *Malpighia glabra* (syn. *Malpighia emarginata*), a large shrub native to the West Indies and South America. Also known as acerola or West Indian cherry. The bright red fruits are about the size of **cherries**, but have 3 lobes and contain 2-3 hard seeds. The skin is very thin and susceptible to **bruising**. Can be eaten fresh or processed into products such as **jams** and **preserves**. Fruits are a very rich source of **vitamin C** and represent an important commercial source of the vitamin.

**Barbados cherry juices** | **Fruit juices** extracted from **Barbados cherries** (*Malpighia punicifolia*). A rich source of **vitamin C**.

**Barbecued foods** | Meat and other foods cooked out of doors on a barbecue (originally a revolving spit over an open fire, nowadays more likely to be a wire grid placed over hot charcoals or a gas fire source). Popular barbecued foods include **sausages**, **burgers** and **fish** or **meat steaks**.

**Barberry figs** | **Alternative term** for ** prickly pears**.

**Barbiturates** | Drugs derived from barbituric acid that act on the central nervous system to produce a sedative effect or induce anaesthesia; used to reduce **animal stress**, particularly prior to and during transportation. High levels of active **residues** in **meat** may pose a health hazard to consumers. Examples include barbital, amobarbital and **phenobarbital**.

**Bar codes** | Machine-readable codes which contain product specific information. Traditionally bar codes are formed by patterns of parallel lines of varying thickness with spaces of varying length between them, but 2D barcodes with greater data representation capacity are also used. Information is usually read from linear bar codes using light pens or laser/LED scanners and from 2D codes using camera-based readers. Standard international codes are used. Benefits of using bar codes include: rapid and efficient data capture; improved product **traceability**; the possibility of automated product storage; improved control of product storage and distribution; time and costs savings; and improved customer service. Consumer unit bar codes, which encode fixed information, are used on primary packaging of products intended for sale directly to consumers at retail outlets. Traded unit bar codes, which include fixed as well as supplementary product information (e.g. product weight, batch number and time of production), are often compulsory within product supply chains. Transport unit bar codes used to label pallets and encode shipping **containers** are used to track pallets through supply chains.

**Barley** | Edible grain from *Hordeum vulgare* used as a cereal and livestock feed and in **malt** production. Contains little **gluten**, and so is unsuitable for **bread-making**. Most popular form is **pearl barley** in which the outer husk and part of the **bran** layer are removed by **polishing**. Provides a source of **vitamins** (e.g. niacin, folates) and **minerals** (e.g. zinc, copper, iron).
Barley fibre  Rich source of \( \beta \)-glucans. Used in foods as source of dietary fibre, and in thickeners, viscosity stabilizers and improvers. Also added to animal feeds. Demonstrates hypocholesterolaemic activity and antihypertensive activity. May reduce risk of cardiovascular diseases and improve glucose metabolism.

Barley flour  Ground hulled barley used to make unleavened bread and porridges.

Barley malt  Malt prepared from special malting barley cultivars; mainly used in brewing. Barley malt is the main malt type used in brewing worldwide.

Barley starch  Starch prepared from special barley fibre. Also used as measures for liquids, e.g. cells, kegs.

Barrel  Cylindrical containers for liquids and dry materials. Traditionally made of wooden staves held together by metal hoops, but may also be made of cheaper and/or more durable materials, such as metal or plastics. Oak barrels are used for the ageing of wines and spirits; constituents of the wood (e.g. tannins, lignin and fragments, carbohydrates, acids and esters, volatile phenols, oak lactones, pyrazines, furfural and norisoprenoids) have major effects on flavour of wines and spirits. Barrels are also used as measures for liquids, e.g. beer and oils, based on the capacity of standard barrels. Also known as casks or kegs.

Barrier properties  Extent to which materials, including food and beverage packaging materials and edible films, resist the penetration of substances such as water, water vapour or certain gases.

Bartail flatheads  Bottom dwelling fish (Platycephalus indicus) found in coastal waters and estuaries in South Pacific and Indian Ocean regions; also occurs in the eastern Mediterranean, where it was recently introduced. A valued food fish that is normally marketed fresh and is cultured commercially in Japan.

Basidiomycetes  Terminology used loosely to refer to Basidiomycota, one of two large phyla of fungi that comprise the subkingdom Dikarya (the other is Ascomycota). Spores (basidiospores) are produced in the basidia. Contains many types of edible fungi, including Agaricus mushrooms, puff balls, Boletus and chantarelles.

Basil  Herb obtained from the genus Ocimum. The main varieties used in cooking are sweet basil (\( O. \) basilicum) and bush basil (\( O. \) minimum). Flavour of the fresh leaves has been likened to a blend of liquorice and cloves, while dried leaves are more lemony and less pungent. Much used in Italian cuisine (particularly tomato-based dishes) and a key ingredient of pesto.

Baskets  Perforated containers used to hold or carry food. Made from interwoven strips of wood (e.g. bamboo), twigs, wire, or other lightweight flexible materials. The open structure of baskets allows ventilation of the product. Compared with solid containers, the increased flow of air allows greater cooling rates.

Basmati rice  A premium long grain variety of rice which has a fragrant aroma and flavour. Cultivated mainly in the Himalayan foothills of India and Pakistan. White, brown and easy cook basmati rice are available.

Bass  Name given to a variety of marine fish and freshwater fish. In Europe, the name particularly refers to a marine fish species (Dicentrarchus labrax) widely distributed in eastern Atlantic regions from North Africa up to Norway. Enters coastal waters and river mouths in summer, but migrates offshore in colder weather and occurs in deep water during winter. A highly valued food fish; usually marketed fresh or smoked. Also known as European sea bass.

Bastard halibut  Marine flatfish species (Paralichthys olivaceus) from the flounder family (Paralichthyidae), which occurs in the western Pacific Ocean. Highly prized as a food fish in Japan. Usually marketed fresh. Also known as hirame and Japanese flounders.

Basting  The spooning of liquid over a food during cooking to keep it moist. This technique is often used in the preparation of meat, particularly during roasting when heating is prolonged.

Batters  Thin liquid mixtures of pouring consistency made from flour, milk and eggs. May be used as coatings for foods such as fish prior to frying, or cooked on their own to make products such as pancakes, waffles and Yorkshire puddings.

Baumkuchen  Moist almond sponge cakes, often baked in the shape of a pyramid.

Bavaricins  Bacteriocins produced by Lactobacillus spp.

Bavarois  Cold desserts made with eggs, gelatin and whipped cream. Also known as Bavarian cream.

Bavistin  Alternative term for the fungicide carben-
Bay  Alternative term for laurel (Laurus nobilis), a small, evergreen tree. May also refer to bay leaves, the herbs obtained from this tree.

Bayberries  Red bayberries (Myrica rubra) are an economically important crop in China. Fruits are drupes, consisting of soft and succulent segments surrounding a central, cherry-like stone. Size and colour depend on variety. Have a palatable sugar acid balance and contain several vitamins and other nutrients. Eaten fresh or processed into fruit juices, wines, canned foods, frozen foods and dried foods. Decompose readily under ambient conditions. Storage and transport are difficult. American bayberries from other Myrica species, also known as candleberries, can be ground for use as spices and condiments.

Bay leaves  Aromatic leaves obtained from the laurel tree, Laurus nobilis. Used as a herb to flavour to stews, sauces and many other foods. Generally added whole and removed before serving.

Bayrusil  Alternative term for the insecticide quinalphos.

Baytex  Alternative term for the insecticide fenthion.

Bdellovibrio  Genus of aerobic Gram negative bacteria of the family Bdellovibrionaceae. Occur in soil, sewage and in both fresh and marine waters. Characteristically intracellular parasites of other Gram negative bacteria, reproducing between the cell wall and plasma membrane of the bacterium and ultimately killing it. May have potential for the control of spoilage bacteria and pathogens in foods.

Beach peas  Seeds produced by Lathyrus maritimus or L. japonicus, leguminous plants growing particularly along the shores of Arctic and sub-Arctic regions, but also in coastal areas of Europe and Asia. New stalks may be cooked by stir frying, steaming or boiling. After the plant has flowered, young pods are cooked and eaten like snow peas. These young pods are rich in vitamin B complex, ß-carotene and proteins. Also known as sea peas and seaside peas.

Beakers  Tall, wide-mouthed plastics or glass containers, often with a pointed lip for pouring. Also used to describe simple drinking vessels without handles commonly made from clays or plastics.

Bean curd  Coagulated product obtained from beans. Used particularly with reference to soy curd (tofu).

Bean jamps  Sweet bean pastes, such as ann, which form the basis of many Japanese confectionery products.

Bean pastes  Pastes prepared from beans such as soybeans, e.g. miso or ann.

Beans  Seeds which grow in pods produced by plants such as Phaseolus spp. Some beans are eaten fresh, frozen or canned, but most are dried to form a long-life staple food in many parts of the world. Beans are typically kidney-shaped and a good, inexpensive source of proteins, fibre and folates. The term is also commonly applied to seeds which resemble beans, such as coffee beans and cocoa beans.

Bean sprouts  Young shoots of germinated beans, particularly mung beans. Rich in vitamins and minerals and a common ingredient in salads and Oriental dishes.

Bearberries  Berries produced by the bush Arctostaphylos uva-ursi, which grows wild in northern and Arctic areas of Europe, Asia and North America. Similar in size to currants, with a tough skin and mealy white pulp containing hard seeds. Eaten raw as an emergency food or used as an extender with other berries in bakery products such as fruit pies. Extracts of leaves from the bush have antioxidative activity, making them of interest in production of natural antioxidants for use in foods.

Bear meat  Meat from bears. In comparison with beef, it has high protein and low fat contents. Bear steaks can be cooked like beef, but the meat may be tough so it is often marinated for a couple of days in oil and wine or vinegar. In some countries, such as Thailand, wild bear meat may be consumed raw or partially cooked, and is consequently a source of trichinosis.

Bears  Members of the widespread mammalian family Ursidae; there are several species including Asiatic black bears (Selenarctos thibetanus), polar bears (Thalarctos maritimus) and grizzly bears (Ursus arctos). Bears are hunted for their skins and for bear meat.

Beating  Vigorous stirring of cooking ingredients, usually in a circular motion with the intention of incorporating air.

Beauty foods  Health foods, beverages or supplements specifically intended to provide beauty benefits for consumers, for example by improving the appearance of the skin. Also referred to as cosmeceuticals.

Beauveria bassiana  Species of entomopathogenic fungi of the family Cordycipitaceae. Anamorph of Cordyceps bassiana. Occurs naturally in soils. Used as a biocontrol agent against insect pests such as beetles, thrips and corn borers. Produces the mycotoxin beauvericin.

Beauvericin  Cyclic hexadepsipeptide mycotoxin produced by Beauveria bassiana and several Fusarium strains. Possesses insecticidal properties and antimicrobial activity, being active against Gram positive bacteria and mycobacteria. One of the enniatins group of antibiotics. May be produced in
Fusarium-infected cereals. A specific cholesterol acyltransferase inhibitor that is toxic to several human cell lines and can induce apoptosis and DNA fragmentation.

Beche de mer Name commonly given to edible sea cucumbers (Holothuroidea; Stichopus spp. and Cucumaria spp.); a popular delicacy in Japan, China and the Philippines. Marketed in gutted, boiled and dried forms.

Beech nut oils Yellow oils derived from the kernels of Fagus sylvatica, which are rich in olein and contain stearin and palmitin. Used as a cooking oil and salad oil.

Beef Meat from cattle, including bulls, calves, cows, steers and oxen. Quality is determined largely by breed, age and gender of the animal; it is also influenced by animal feeding, slaughtering technique and treatment of the meat post-slaughter. Tenderness and flavour are increased by hanging cattle carcasses (ageing conditioning). Raw fresh beef is usually bright red in colour with creamy coloured marbling; however, meat from older cattle, particularly bulls, tends to be darker in colour. Composition varies with fat content and between different cuts, e.g. brisket, forerib, rump and silverside. Cuts which contain few connective tissues can be cooked by roasting, frying or grilling; however, tougher cuts should be cooked by stewing or braising, in order to soften the connective tissue. During the 1980s and 1990s, markets for beef were affected negatively by consumer health concerns relating to high levels of saturated fats in red meat and to prion diseases, particularly bovine spongiform encephalopathy (BSE). Legislation is now in place to prevent BSE-infected beef from entering the food chain, but all beef on sale in the EU must be labelled with its country of origin to ensure traceability. Alternative term for beef muscles, bovine muscles, bull muscles, calf meat, calf muscles, cattle muscles and cattle tissues.

Beefburgers Round, flat cakes of beef mince, cooked by grilling or frying. Beefburgers are usually prepared from beef mince with a high content of fat. They are commonly eaten in bread rolls, served with lettuce, slices of onion and tomato ketchups.

Beef extracts Water-soluble extracts prepared from beef, used widely as flavourings. Preparation involves immersion of beef mince in boiling water to leach out the water-soluble extractives, and concentration. Direct extract can be produced by exhaustive extraction of beef; it contains a high concentration of gelatin. Beef extracts are rich nutritional sources of the vitamin B group; they can be formulated for use as spreads for bread, as flavourings, and, when mixed with water, as beverages. Beef extracts can also be used in preparation of beef tea, an extract of stewing beef that may be used as a food for invalids.

Beef loaf Meat products prepared primarily from beef mince, but also containing pork mince or pork sausagemeat. Other ingredients may include onions, tomato purees, garlic, white bread, milk, herbs, eggs and seasonings. The ingredients are mixed before baking in a loaf tin. Once cold, beef loaf can be cut into firm slices. Generally, it is served cold.

Beef mince Meat mince prepared from beef which is available in several grades; these primarily relate to the percentage of fat in the mince. For example, beef mince may be graded as: extra lean; lean, which has good flavour but does not shrink excessively on cooking; or regular, which is usually made from lower cost cuts of beef. Also known as ground beef or minced beef.

Beef muscles Alternative term for beef.

Beef patties Meat patties prepared from beef mince. They include hamburgers.

Beef products Processed foods such as jerky, patties and sausages that are made from beef.

Beef roasts Joints of beef which are intended for cooking or have been cooked by roasting.

Beef sausages Sausages made primarily from beef. They may include pork, but the proportion of this is less than that of beef.

Beef steaks Thick slices of high-quality beef taken from the hindquarters of cattle carcasses, including sirloin, porterhouse, T-bone, fillet and rump steaks. They are usually cooked by grilling or frying.

Beer Alcoholic beverages manufactured by alcoholic fermentation of worts using either top or bottom fermenting brewers yeasts. The malt is commonly barley malt, but other malt types, including wheat malt or sorghum malt may be used. Non-malted cereals or other brewing adjuncts may be used in combination with the malt. Beer is commonly, but not always, flavoured with hops.

Beermaking Alternative term for brewing.

Beer manufacture Alternative term for brewing.

Bees Insects of the order Hymenoptera that are of commercial importance due to the ability of some species to produce beeswax, honeys and royal jelly. Some bee species of Halictidae or Apidae families have evolved to living in social groups or colonies. One of these species, the honeybee (Apis mellifera), produces a bee colony or comb, constructed of hexagonal cells composed of beeswax, in which to store food (honeys), and house insect eggs and larvae and the reproducing female bee or queen. Bees also have an important role in pollination of plants, including fruit trees.
Beeswax

Beeswax is a yellow-coloured substance secreted by bees to make honeycombs. Solid, but easily moulded when warm. Consists of esters, cerotic acid and hydrocarbons. Used to make edible wax coatings for foods and edible films. Aqueous extracts may be used as flavourings.

Beluga whales

Beluga whales are freshwater fish of the Black and Caspian seas in Europe. Highly valued and sought after, mainly for its roe (caviar); flesh is also sold fresh, smoked and frozen. Bester, a hybrid of female beluga and male sterlet (Acipenser ruthenus), has been successfully cultured for production of high quality caviar.

Beet sugar molasses

Beet sugar molasses are alternative terms for beet molasses.

Beet sugar products

Beet sugar products are products generated by beet sugar factories. Refers to both intermediate and end products, including beet sugar juices, beet molasses, beet sugar syrups and exhausted sugar beet cossettes.

Beet sugar syrups

Beet sugar syrups are highly concentrated aqueous solutions of beet sugar produced by evaporation of purified beet sugar juices (thin beet sugar juices).

Behavioural effects

Behavioural effects are alterations in human behaviour that can result from dietary constituents. Examples include modulation of mood, cravings and cognitive performance.

Behenic acid

Behenic acid is a synonym for docosanoic acid. One of the constituent fatty acids of the family Beijerinckiaceae whose fermentation products include exopolysaccharides with potential use as food additives such as thickeners or stabilizers. The type species is Beijerinckia indica.

Bell peppers

Bell peppers are large, sweet-tasting fruits of Capsicum annuum with bell shaped pods that can vary in colour from green and white through to shades of red, orange, yellow and purple. One of the most popular types of sweet peppers, many different cultivars are available, most of which are non pungent. Can be eaten raw in salads or added to a variety of cooked dishes.

Belly fat

Belly fat are white adipose tissues found lining the bellies of animals, and in particular the pork bellies of swine. These fats are used as ingredients in various foods, e.g. processed meat products.

Belona

Belona is a commercial cereal-based product composed of wheat, wheat protein concentrate, defatted soy meal, refined soybean oils, vitamins and minerals. Used in weaning foods in Nigeria.

Beluga freshwater fish

Beluga freshwater fish species (Huso huso); the largest member of the sturgeon family (Acipenseridae); also known as great sturgeon. Found in the basins of the Black and Caspian seas in Europe. Highly valued and sought after, mainly for its roe (caviar); flesh is also sold fresh, smoked and frozen. Bester, a hybrid of female beluga and male sterlet (Acipenser ruthenus), has been successfully cultured for production of high quality caviar.

Beluga whales

Beluga whales are species of whales (Delphinapterus leucas) widely distributed in the Arctic Ocean, which

Beet molasses

Molasses are produced as a by-product of beet sugar refining. Beet molasses commonly contain approximately 60% sucrose. Also called beet sugar molasses.

Beetroot juices

Juices extracted from beetroot (bulbous roots of Beta vulgaris). Consumed on their own or mixed with other vegetable juices, e.g. carrot juices, or fruit juices. Also drunk after fermentation. Useful as natural colorants due to the presence of the red pigment betanin. High contents of nitrates and nitrites, which might limit this application, can be removed by incubation with denitrifying microorganisms.

Beet sugar

Sucrose is purified from roots of sugar beets (Beta vulgaris). Stages of beet sugar manufacture include: cleaning and cutting of roots; hot water extraction of sugars; purification of beet sugar juices by precipitation of impurities with lime-phosphoric acid or lime-CO₂ treatments; filtration to remove solids; concentration of the purified beet sugar juices; and crystallization of the pure beet sugar. Commercially available beet sugar comprises ≥99.80% sucrose and <0.05% moisture.

Beet sugar factories

Factories that contain processing lines equipped for refining of sugar from sugar beets (Beta vulgaris). Factories also usually contain sugar storage and packaging facilities.

Beet sugar juices

Aqueous solutions of beet sugar produced during processing of roots of sugar beets. Raw juices are solutions produced by direct hot water extraction of the roots and contain beet sugar and impurities. Thin juices are purified beet sugar solutions and thick juices are formed by concentration of the thin juices.

Beet sugar products

Products generated by beet sugar factories. Refers to both intermediate and end products, including beet sugar juices, beet molasses, beet sugar syrups and exhausted sugar beet cossettes.

Beet sugar syrups

Highly concentrated aqueous solutions of beet sugar produced by evaporation of purified beet sugar juices (thin beet sugar juices).

Behavioural effects

Alterations in human behaviour that can result from dietary constituents. Examples include modulation of mood, cravings and cognitive performance.

Behenic acid

Synonym for docosanoic acid. One of the constituent fatty acids of the family Beijerinckiaceae whose fermentation products include exopolysaccharides with potential use as food additives such as thickeners or stabilizers. The type species is Beijerinckia indica.

Bell peppers

Large, sweet-tasting fruits of Capsicum annuum with bell shaped pods that can vary in colour from green and white through to shades of red, orange, yellow and purple. One of the most popular types of sweet peppers, many different cultivars are available, most of which are non pungent. Can be eaten raw in salads or added to a variety of cooked dishes.

Belly fat

White adipose tissues found lining the bellies of animals, and in particular the pork bellies of swine. These fats are used as ingredients in various foods, e.g. processed meat products.

Belona

Commercial cereal-based product composed of wheat, wheat protein concentrate, defatted soy meal, refined soybean oils, vitamins and minerals. Used in weaning foods in Nigeria.

Beluga freshwater fish

Species of whales (Delphinapterus leucas) widely distributed in the Arctic Ocean, which
Bengal gram  Indian name for chick peas.

Bengal quinces  Alternative term for bael fruit.

Benlate  Alternative term for the fungicide benomyl.

Benomyl  Systemic benzimidazole fungicide which is used for control of a wide range of fungal diseases of fruits, vegetables and cereals. Often used in conjunction with other pesticides. Degradation in plants and animals is relatively slow. Classified by WHO as slightly hazardous (WHO III).

Bentonite  Type of absorbent clay (a colloidal hydrated silicate) formed by the breakdown of volcanic ash that has the ability to absorb water with an increase in volume. Bentonite uses in the food industry include fining agents for winemaking, clarifiers for fruit juices and vegetable oils, bakery additives to reduce staling, stabilizers and filter aids.

Benzaldehyde  Aromatic aldehyde which is one of the flavour compounds in a wide range of foods.

Benzene  Aromatic hydrocarbon which exists as a colourless liquid with a sweet odour and which can evaporate into the air and dissolve in water. Widely used in industry in the manufacture of chemicals and a range of substances including plastics, rubber, dyes, detergents, drugs and pesticides. Carcinogenic in humans at high doses. Present as a pollutant of air from detergents, bakery additives and composition of fruits, vegetables and cereals.

Benzoates  Salts of benzoic acid, used as antimicrobial preservatives in foods.

Benzoic acid  Organic acid which, along with its salts, is used in antimicrobial preservatives for a wide range of foods.

Benzophenone  Organic compound of chemical formula \( \text{C}_{13}\text{H}_{10}\text{O} \), also a member of the ketones and polyphenols chemical classes. Has a geranium- or rose-like aroma and been used in flavourings. Also used as a photoinitiator for curing (cross-linking) of inks via UV irradiation and as a UV filter in plastic packaging materials. Benzophenone residues in inks or from plastics are considered sources of contamination for foods through migration from food contact materials.

Benzopyrene  Carcinogenic and mutagenic polycyclic aromatic hydrocarbons (PAH) fraction which occurs as a contaminant in foods.

Benzothiazole  Member of the heterocyclic compounds class of flavour compounds, occurring in a range of foods. May cause taints in some foods.

Benzyladenine  One of the plant growth regulators which may be used to improve ripening and quality of fruits. May also be used as a thinning agent in cultivation of fruits.

Benzyl alcohol  Aromatic alcohol which is a constituent of the flavour compounds and aroma compounds in various fruits and spices, and in plant-derived products such as alcoholic beverages.

6-Benzylaminopurine  Plant growth regulator used to control processes such as ripening and senescence, and composition of fruits, vegetables and cereals.

Benzylic isothiocyanate  One of the typical flavour compounds in vegetables and spices of the family Cruciferae; formed by hydrolysis of glucosinolates. May display cytotoxicity and anticarcinogenicity.

Benzylicpenicillin  Alternative term for the antibiotic penicillin G.

Berberies  Berries produced by Berberis vulgaris. Ripe fruits are edible, but unripe berries contain toxic alkaloids. Bright orange red when ripe with a tart flavour. Can be made into jellies, pickled, used as a garnish or made into spirits and liqueurs. Their juice is rich in vitamin C. Also known as barberries.

Ber fruit  Alternative term for jujubes.

Bergamot essential oils  Essential oils obtained from the bergamot orange. Main use is in flavourings for Earl Grey tea. Also used in citrus flavourings for soft drinks and in some natural fruit flavourings, such as apricot. Contains bergapten, a skin sensitizer. Alternative term for bergamot oils.
Bergamot oils  Alternative term for bergamot essential oils.

Bergapten  Furocoumarin of the psoralens group of flavour compounds, characteristic of bergamot essential oils. Also occurs in celery and parsley.

Bergkaese cheese  Hard cheese made from unpasteurized cow milk in Switzerland, Austria and Germany. Traditionally made from milk of cows grazing mountain pastures. Similar to Emmental cheese. Alternative spelling is bergkase cheese.

Berries  Name commonly applied to various small, juicy, stone-less fruits. Include strawberries, bilberries and loganberries. In a botanical sense, the term relates to fruits having a pulpy edible part containing one or more seeds, such as cranberries, grapes and bananas.

Berry juices  Fruit juices extracted from any of a range of berries, including: bilberry juices, blackcurrant juices, cranberry juices, elderberry juices, hawthorn juices, raspberry juices, redcurrant juices and strawberry juices.

Betacoccus  Former name for the genus Leuconostoc.

Betacyanins  Red/violet pigments of the betalains group, which occur naturally in red beets and other plant foods. Used as natural colorants in foods.

Betaine  Soluble nitrogen compounds occurring in a range of foods, especially sugar beets, molasses and beet sugar factory wastes. May be included in flavour compounds, and have antioxidative activity.

Betalaines  Alternative term for betalains.

Betalains  Class of pigments naturally occurring in fruits and vegetables, especially those derived from plants of the Caryophyllales family. Include red/violet betacyanins and yellow betaxanthin. May be used as food colorants.

Betanin  Member of the betacyanins group of pigments, characteristic of red beets. May be used as natural colorants.

Betaxanthin  Yellow pigment of the betalains group.

Betel leaves  Aromatic leaves of the Asian climbing plant, betel vine (Piper betle). Used to wrap betel nuts for the ritual chewing of betel quid. Also used as an edible wrapping for food in some Asian countries.

Betel nuts  Acorn-shaped seeds of the betel palm, Areca catechu, also known as areca nuts. Seeds are used medicinally as an anthelmintic, but are most commonly used for the ritual chewing of betel quid, a popular masticatory, comprising betel nuts, slaked lime and spices wrapped in betel leaves (Piper betle). Chewing of this preparation is widespread throughout Asia, and causes mild stimulation due to the presence of alkaloids such as arecoline. Chewing of betel quid is associated with an increased risk of oral cancer.

Beutelwurst  Types of blood sausages derived from pork and swine offal (including intestine and brain), and encased in swine intestines. A regional speciality in Germany.

Beverage concentrates  Concentrated solutions or syrups which may be diluted to prepare beverages, e.g. soft drinks.

Beverage mixes  Mixtures of ingredients which may be dissolved to prepare beverages, e.g. soft drinks.

Beverage powders  Beverage mixes in the form of powders, which are dissolved in water or other liquids prior to dispensing or consumption.

Beverages  Liquids intended for drinking. Types include alcoholic beverages, soft drinks, teas, coffee, cocoa beverages, dairy beverages, health beverages, fruit beverages, soy beverages and drinking water.

Beverages factories  Factories in which beverages are manufactured or processed.

Bewyaz cheese  Turkish semi-soft cheese made from raw ewe milk. Usually made with vegetable rennets and stored in brines for at least 6 months before consumption. Used in salads, pastries and many local dishes. Similar to feta cheese.

BHA  Abbreviation for butylated hydroxyanisole.

BHC  Abbreviation for benzene hexachloride. Alternative term for the insecticide HCH.

BHT  Abbreviation for butylated hydroxytoluene.

Bierschinken  Ham sausages containing coarsely cut pieces of meat, originally made in Germany. Top quality bierschinken contains more than 60% coarsely cut, cured, tendon-free meat, with good cohesion in slices of thickness 1 mm. Medium quality bierschinken contains half or more coarsely cut meat, including pieces of meat which vary in size from cubes of side length 2 cm to egg-sized pieces.

Bierwurst  Chunky, tubular, dark red coloured, cooked German sausages. They are prepared from beef and pork; the meat is chopped and blended, and seasonings, such as garlic, are added. The sausages are cooked at high temperature and smoked. They are usually sliced and served cold in sandwiches. Alternative term for beewurst or beer salami.

Bifidobacterium  Genus of anaerobic, rod-shaped Gram positive bacteria of the family Bifidobacteriaceae. Occur among the normal microflora of the urogenital and gastrointestinal tracts. B. bifidum may be incorporated into some starters used for the manufacture of fermented dairy products. Some species (e.g. B. lactis, B. longum and B. breve) may be used as probiotic bacteria.
Bifidus factors  Dietary constituents, particularly a component of human milk, that promote growth of *Bifidobacterium* in the gastrointestinal tract. This activity is demonstrated by certain prebiotic oligosaccharides, lactulose and derivatives of glycoproteins.

Bifidus milk  Fermented milk containing *Bifidobacterium* spp. that make the product beneficial for intestinal health.

Bigeye snapper  Common name widely used for the fish species *Priacanthus tayenus* and *Priacanthus macracanthus* belonging to the family Priacanthidae. These marine fish, which are widely distributed across the Indo-West Pacific ocean, are of minor commercial importance, and are generally frozen and subsequently processed for surimi or a fermented fish mince, with by-products including gelatin produced from the processing wastes. Some authorities attribute this common name to the marine fish species *Lutjanus lutjanus* or *L. lineolatus* belonging to the snapper family (Lutjanidae).

Bigeye tuna  Marine fish species (*Thunnus obesus*) from the tuna family. Found in the Atlantic, Indian and Pacific Oceans but absent in the Mediterranean. Flesh from this tuna species is highly prized; used for sashimi production in Japan. Marketed mainly canned or frozen but also sold fresh.

Bighead carp  Freshwater fish species (*Aristichthys nobilis*) belonging to the carp family (Cyprinidae) and of high commercial importance. Widely distributed throughout the world. Marketed fresh and frozen.

Bilberries  Dark blue berries produced by the European shrub *Vaccinium myrtillus*. Also known as whortleberries and similar in flavour to American blueberries. Rich in vitamin C, they can be eaten raw or used in products such as pies, jams, jellies and fruit wines.

Bilberry juices  Fruit juices extracted from bilberries (*Vaccinium myrtillus*).

Bile acids  Steroidal acids present in bile, which play an important role in digestion and absorption of fats. Cholic acid andchenodeoxycholic acids (primary bile acids) are produced by the liver from cholesterol and are secreted as glyco- and tauroconjugates into bile. On secretion of bile into the lumen of the gastrointestinal tract, bile salts bind colipase, allowing lipolysis of triglycerides, and also participate in formation of micelles facilitating absorption of lipids. Dehydroxylation of primary bile acids by intestinal bacteria generates secondary bile acids (deoxycholic and lithocholic acids). Bile acids can be reabsorbed as part of the enterohepatic circulation.

Bile salt hydrolases  Alternative term for chooloyglycine hydrolases.

Bile salts  Alkaline salts present in bile involved in emulsification of fats in the intestine. Include sodium glycocholate and sodium taurocholate.

Biltong  Traditional South African intermediate moisture meat product prepared from meat of domestic animals or game, but mainly from beef. Meat is cut into strips, trimmed and dipped in a solution of salt, and sometimes preservatives and spices, prior to drying to the desired moisture content. The dried product may also be smoked. Consumed by chewing the strips or by grating to a powder which can be spread on bread.

Binders  Alternative term for binding agents.

Binding agents  Substances used as additives in a range of foods to hold ingredient mixtures together, providing adhesion, solidification and correct consistency. Can include various polysaccharides (such as celluloses and gums) and proteins. Binding systems comprising enzymes, such as transglutaminases or thrombin, in combination with other proteins have also been employed. Also known as binders.

Binding capacity  Ability of one substance to attach to another.

Bins  Large containers used for storing specified substances or containers used for depositing rubbish. Also used to describe partitioned stands for storing bottles of wines.

Bioaccumulation  The net accumulation of compounds or metabolites in an organism due to ingestion or environmental exposure. Particularly used to refer to the accumulation of contaminants such as pesticides and toxins.

Bioactive compounds  Substances which display biological activity, e.g. immunomodulation, opioid activity, antihypertensive activity or hypolipaeemic activity, upon ingestion. Found in a range of foods, and are of interest to the functional foods sector. Include bioactive peptides (occur widely in dairy products), many vitamins and fatty acids, flavonoids and phytosterols.

Bioactive peptides  Peptides produced from plant or animal proteins, which display biological activity (e.g. opioid activity, immunomodulation or antihypertensive activity), and are of interest to the functional foods sector. Milk proteins are a particularly rich source of bioactive peptides, such as casein phosphopeptides, β-casomorphins and lactoferrin. Peptides that inhibit activity of peptidyl-dipeptidase A (ACE inhibitors) are found in a
number of food sources and have potential use as anti-hypertensive functional food ingredients.

Bioassay  
Technique for measuring the biological activity of a substance by testing its effects in living material such as a cell culture.

Bioavailability  
Extent to which a dietary component can be absorbed and utilized by the target tissue of the body. Nutrients with low bioavailability may be in a form that is poorly absorbed from the gastrointestinal tract (e.g. lysine combined with reducing sugars as a results of the Maillard reaction, minerals in the presence of antinutritional factors such as phytates) or may be biologically inactive once absorbed.

Biocatalysts  
Substances that catalyse biochemical processes in living organisms. The most well known examples are enzymes, although RNA may also fulfil this function.

Biochemical oxygen demand  
Alternative term for biological oxygen demand.

Biochemistry  
Science of the chemistry of living organisms.

Biocides  
Chemical agents, such as pesticides, herbicides and fungicides, that are toxic or lethal to living organisms.

Biocontrol  
Deliberate exploitation by humans of one species of organism to eliminate or control another. Commonly involves introduction into the environment of parasites, insects or pathogens which can infect and kill or disable particular insect pests or weeds of crop plants. Also known as biological control.

Bioconversions  
Utilization of the catalytic activity of living organisms to convert a defined substrate to a defined product in a process involving several reactions/steps. The term is often used interchangeably with biotransformations. Advantages include the ability to operate under mild conditions, the ability to produce specific enantiomers and the ability to carry out reactions not possible using conventional chemical synthesis. Bioconversions differ considerably from fermentation, since in the latter, the products often bear no structural resemblance to the pool of compounds given to the microorganisms.

Biodegradability  
Ability of a substance to undergo biodegradation.

Biodegradation  
Degradation of a substance as a result of biological (usually microbial) activity, rendering it less noxious to the environment.

Biodeterioration  
Deterioration (spoilage) of an object or material as a result of biological (usually microbial) activity. Biodeterioration of foods causes them to become less palatable and sometimes toxic, and can involve alterations in flavour, aroma, appearance or texture. The organisms involved are typically bacteria and fungi, and their activity is dependent on factors such as nutrients present, aw, pH, temperature and degree of aeration.

Biofilms  
Films of microorganisms, usually embedded in extracellular polymers, which adhere to surfaces submerged in or subjected to aqueous environments. Possess increased resistance to detergents and antibiotics, as the extracellular matrix and outer layers of the cells protect the interior of the community. Frequently cause fouling of the surfaces of water pipes. In cooling water systems, can reduce heat transfer and harbour Legionella. Presence on food preparation surfaces can cause hygiene problems.

Bioflavonoids  
Flavonoids present in a wide range of plant foods, some of which exhibit potential health benefits.

Bio foods  
Term used to describe biotechnologically derived foods or functional foods.

Biogarde  
German yoghurt-like acidophilus milk usually made with starters containing Streptococcus thermophilus, Lactobacillus acidophilus and Bifidobacterium bifidum.

Biogas  
A mixture of gases produced by anaerobic digestion of organic wastes, comprising mainly methane and carbon dioxide with traces of hydrogen, nitrogen and water vapour. Used as a fuel. Product of bioremediation of many types of food processing wastes.

Biogenic amines  
Amines (e.g. histamine, tyramine, tryptamine, putrescine) synthesized by decarboxylation and hydroxylation of amino acids by microbial enzymes. Can cause allergic reactions. May be formed in cheese, wines, chocolate and fermented foods.

Biogurt  
German yoghurt-like acidophilus milk usually made with starters containing Streptococcus thermophilus and Lactobacillus acidophilus.

Biohydrogenation  
Hydrogenation reactions catalysed by living organisms. Frequently refers to microorganisms acting on free fatty acids in the rumen of dairy cattle. May reduce the synthesis of milk fats in these ruminants and affect milk composition, leading to increases in trans fatty acids.

Biological activity  
Activity of compounds, generally organic in origin, within living organisms. For food-derived chemicals, this is generally a non-nutritional property, such as antimicrobial activity, antioxidative activity, immunomodulation or other physiological effects.

Biological membranes  
Selectively permeable membranes containing mainly lipids and proteins.
that surround the cytoplasm in eukaryotic and prokaryotic cells. Can also contain carbohydrates and sterols. The precise composition depends on the species and, in some cases, on growth conditions and age of the cells. The lipids (phospholipids and glycolipids) usually form a bilayer within which proteins are partly or wholly embedded, some spanning the entire width of the bilayer. Artificial biological membranes (liposomes) are often used to transport biological molecules.

**Biological oxygen demand** Amount of dissolved oxygen required for microbial oxidation of biodegradable matter in an aquatic environment containing organic matter, such as sewage, water or milk. Gives an indication of contamination by microorganisms which take up oxygen for their metabolism. Also known as biochemical oxygen demand or by the abbreviation BOD.

**Biological values** Indication of the nutritional value of food proteins. Relative measure of the amount of absorbed proteins retained by the body, assuming no loss of protein nitrogen during digestion. Values are highest for egg proteins (0.9-1.0) and milk proteins (0.85), with meat proteins and fish proteins (0.7-0.8), cereal proteins (0.5-0.7) and gelatin (0) having lower values.

**Biology** Science of the properties of living organisms and the interactions of these organisms with their environment.

**Bioluminescence** Production of light as a product of biochemical reactions by organisms including bacteria, fungi, some fish and fireflies.

**Biomagnification** Form of bioaccumulation, describing the accumulation of residues in living organisms and increases in their concentration through food chains. Particularly used for increases in levels of toxins or other contaminants.

**Biomarkers** Objective and measurable biological indicators. Can be indicators of normal biological processes, pathogenic processes, and exposure and response to chemical, physical or biological agents. Used widely, such as: to monitor the progression of diseases; to assess exposure to dietary constituents and contaminants; and to evaluate response and compliance during diet therapy and pharmaceutical interventions.

**Biomass** Quantitative estimate of the total population of living organisms present in a given habitat, in terms of mass, volume or energy.

**Biomycin** Alternative term for chlortetracycline.

**Biopolymers** Polymers which occur in living organisms. Included in this group of macromolecules are polysaccharides, proteins and nucleic acids.

**Bioreactors** Vessels for generating products using the synthetic or chemical conversion capacity of a biological system, e.g. involving enzymes or a cell culture. Examples include fermenters, stirred tank bioreactors and membrane bioreactors. During fermentation, microorganisms can be grown freely suspended in bioreactors or as immobilized cells, and their fermentation products can include biomass, large molecules such as enzymes or other proteins, and a wide variety of organic compounds. Also used for bioremediation of industrial effluents, such as food industry waste water.

**Bioremediation** Use of microorganisms and/or enzymes to reduce the pollution potential of industrial effluents, such as food industry waste water, converting them to less hazardous forms. Can also be used to generate biomass and biogas.

**Biosensors** Biomolecular probes that can be used to measure a variety of parameters in biological systems by translating a biochemical interaction at the probe surface into a quantifiable physical signal. Immobilization of enzymes, antibodies, receptors, DNA, cells or organelles on the surface of a transducer forms the basis of various biosensors. Used widely in the food industry for measuring levels of various components in foods and beverages, detection of contamination and adulteration, and for monitoring and process control of fermentation processes, bioconversions and biotransformations.

**Biosurfactants** Potent surface active agents produced by a variety of microorganisms, including *Pseudomonas, Rhodococcus, Candida, Corynebacterium, Mycobacterium, Acinetobacter* spp., *Bacillus subtilis, Serratia* and *Thiobacillus* spp. Low molecular weight biosurfactants are often glycolipids, and high molecular weight biosurfactants are generally either polyanionic heteropolysaccharides containing covalently-linked hydrophobic side chains or complexes containing both polysaccharides and proteins. Biosurfactants have a number of advantages over their chemical counterparts, such as biodegradability, effectiveness at extremes of temperature and pH, and lower toxicity. Biosurfactants are used in the food industry as emulsifiers and stabilizers.

**Biotechnologically derived foods** Foods produced by means of biotechnology.

**Biotechnology** In its broadest sense, any industrial process in which microorganisms are used. More commonly used for those industrial processes in which genetic engineering techniques have been used to construct novel strains to improve their properties and produce new products.

**Biotechnology products** Products produced by microorganisms in biotechnological processes.
Bioterrorism  Use of biological agents for terrorist purposes, e.g. by introducing pathogens or toxins into foods or water supplies, or by releasing pests to destroy crops.

Biotin  A water-soluble vitamin in the vitamin B group, involved in the biosynthesis of fatty acids and the metabolism of amino acids and fatty acids. Rich dietary sources include egg yolks, cattle livers and yeasts. Avidin, a protein present in raw egg whites, can act as a vitamin antagonist by binding biotin and reducing its bioavailability. Also known as vitamin H and coenzyme R.

Biotransformations  Specific modification of a defined compound to a defined product with structural similarity through the use of biological catalysts (enzymes, or whole dead or resting microorganisms). Advantages are the same as those for bioconversions.

Biphenyl  Fungicide which inhibits fungal sporulation, used primarily to control fungal growth on the surface of stored citrus fruits. Residues on fruits sometimes persist throughout the storage period. Classified by WHO as unlikely to present acute hazard in normal use. Also known as diphenyl.

Birds  Warm-blooded vertebrates in the class Aves that have wings and feathers and lay eggs.

Birds nests  Edible birds nests are nests made by birds that vary greatly in size, shape and texture, but are generally small, thin and short or crisp. Usually made with flour, butter or vegetable shortenings, sugar and sometimes a leavening agent; other ingredients, e.g. cocoa, chocolate chips, dried fruits, nuts, cheese or flavourings, are added according to the type of biscuits to be made. Usually eaten as snack foods, often with beverages. Can be eaten as part of a meal along with cheese. Called cookies in the USA, where the term biscuits refers to soft, scone-like products.

Bison  Humpbacked, shaggy coated members of the family Bovidae. There are two species: the North American bison (Bison bison); and the European bison (B. bonasus). Bison are reared on game farms for bison meat production, particularly in the USA and Canada.

Bison meat  Meat from bison. Bison meat is very lean and tender, and has a similar flavour to lean beef; it has no pronounced gamy flavour.

Bisphenol A  Common name for 4,4’-isopropylidenediphenol, an intermediate used in production of epoxy, polycarbonate and phenolic resins. Polycarbonates, plastics used in a wide range of products including microwave cookware and food containers, are formed by reaction of bisphenol A with phosgene. Bisphenol A is also used in coatings for cans. There are concerns over the possibility of migration of bisphenol A monomers from cans or containers into foods as intake might have endocrine disrupting effects.

Bisphenol A diglycidyl ether  Constituent of epoxy resin coatings used in food cans or food storage containers. Residues may migrate into the foods in the cans or containers. Often abbreviated to BADGE.

Bisphenol F diglycidyl ether  Occur as contaminants of canned foods, particularly fish, such as tuna, mackerel and sardine, and vegetables, such as tomatoes, due to migration from can coatings. Components of epoxy resins used asinner can coating materials. Potential endocrine disrupters with anti-androgenic activity. Also demonstrate cytotoxicity against epithelial cells in the gastrointestinal tract.

Bisulfites  Hydrogen sulfite salts used in antimicrobial preservatives and antioxidants in foods and beverages.

Bitter acids  Bitter compounds in hops, specifically α-acids (humulones) and β-acids (lupulones).
Bitter almond oils  Oils rich in oleic acid derived from seeds of bitter almonds. Contain benzaldehyde and hydrocyanic acid; the latter compound, which is toxic, is removed during extraction. Used in flavourings.

Bitter almonds  Common name for nuts produced by Prunus dulcis (syn. P. amygdalus). Too bitter for fresh consumption and also contain highly toxic hydrocyanic acid, or hydrogen cyanide. Cultivated mainly for manufacture of bitter almond oils (principal component benzaldehyde), which are used as flavourings following removal of the hydrocyanic acid.

Bitter compounds  Compounds with a bitter taste; these may be used as flavourings in foods or beverages, e.g. hops bitter acids in beer, or quinine in soft drinks.

Bitter gourds  Ovoid orange-yellow fruits from the tropical climbing plant Momordica charantia. Fruits are also known as balsam pears and have a characteristic bitter taste, which can be minimized by salt-water treatment, and by selecting young fruits. Bitter gourds can be eaten raw in salads, cooked as a vegetable or used in pickles and curries. Contents of vitamins, minerals and essential amino acids are similar or superior to those of other Cucurbitaceae. Young shoots can also be eaten as a substitute for spinach.

Bitterness  Flavour produced by bitter compounds such as caffeine and other alkaloids, often at low thresholds.

Bitter orange essential oils  Essential oils obtained from the peel of bitter oranges by cold pressing. They are yellow-orange in colour and have a more delicate aroma than sweet orange oils. The main constituent is limonene, but other components include myrcene, camphene, pinenes and cymene. Bitter orange essential oils are used as flavourings by the food industry.

Bitter oranges  Citrus fruits from the tree Citrus aurantium, also known as Seville oranges, sour oranges and bigarade oranges. The soursness of these fruits means they are not eaten raw and are instead used to produce marmalades, candied peel and flavourings. The peel is a source of bitter orange essential oils.

Bitter peptides  Peptides, formed during enzymic hydrolysis of proteins, which have a bitter taste and may impair the sensory quality of the food. Bitter peptides derived from casein may be a particular problem in cheesemaking. Bitter peptides may also cause problems in soy products and protein hydrolysates. Treatment with peptidases may eliminate quality problems attributable to bitter peptides.

Bitter pit  Physiological disorder of apples associated with low calcium concentrations in the fruit.

Bitter principles  Alternative term for bitter compounds.

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**Black eyed peas**  Variety of cowpeas (*Vigna unguiculata*).

**Black gram**  Common name for *Vigna mungo* (syn. *Phaseolus mungo*) also known as urd beans or munggo. A tropical pulse widely consumed in India and South East Asia. Many different cultivars, typically with a green or brown coloured seed coat. Consumed in split, boiled or roasted forms or processed into dhal for use in fermented foods such as idli. Black gram sprouts are popular in Asia. Green pods can be boiled and used as a vegetable.

**Black nightshade**  Common name for *Solanum nigrum*. Generally regarded as a nuisance plant, but consumed as a leafy vegetable in parts of Kenya and other parts of Africa and Asia. Ripe berries are also eaten in some regions. Plants and their fruits contain solanaceous glycoalkaloids and can have toxic effects.

**Black olives**  Term used for table olives that have either been harvested when fully ripe (also known as untreated or natural black olives), or which have been harvested at an unripe stage, darkened by oxidation and treated with alkalies to remove bitterness.

**Black pepper**  Pepper made from the unripe green berries (peppercorns) of *Piper nigrum*, which are sun dried to give a black, wrinkled appearance, and then ground to a fine powder. Flavour is more aromatic and pungent than that of white pepper.

**Black puddings**  Large cooked blood sausages with a compact texture, prepared from swine blood, suet, breadcrumbs and oatmeal. They are almost black in colour. Usually they are sold precooked, but are often reheated by sautéing before serving.

**Black rice**  Cultivars of rice (*Oryza sativa*) containing anthocyanins, which give a characteristic dark purple coloration to the grains. The pigments may be extracted and used as natural colorants.

**Black salsify**  Root crop from * Scorzonera hispanica*, a member of the Compositae family. The parsnip-shaped, black-skinned root is a source of inulin and is consumed as a boiled vegetable or used in coffee substitutes. Also known as scorzonera or black oyster plant. Salsify (*Tragopogon porrifolius*) is a similar white rooted plant.

**Black sea sprat**  Euryhaline fish species (*Clupeonella cultriventris*) from the herring family (Clupidae) found in the Black Sea (northwestern parts), Sea of Azov and Caspian Sea in eastern Europe; also known as kilka. Processed and marketed in similar ways to anchovy.

**Black soybeans**  Soybeans that have been fermented and preserved by salting. Blackish in colour and used for the preparation of black bean sauces and meju.

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**Black spot**  Alternative spelling for blackspot.

**Blackspot**  Disease of plants presenting as black blotches, loss of leaves and rotting, resulting from either bacterial or fungal infections. Can also refer to the result of mechanical injury to plant foods such as potatoes during handling, which is characterized by black patches. In addition, used to describe the black discoloration of crustacea, such as prawns, which can occur during chilled and frozen storage.

**Black tea**  Tea prepared from *Camellia sinensis* leaves which have undergone a fermentation stage in which changes in phenols and flavour compounds occur.

**Black truffles**  Common name for the pungent edible fruiting bodies of *Tuber melanosporum*. Sensory properties are largely due to the presence of organic sulfur compounds, and vary according to geographical origin (found mainly in Spain, France and Italy). Black truffles from the Perigord region of France are particularly prized. Certain other species such as *T. indicum, T. himalayense* and *T. brumale* share similar morphological characteristics making identification difficult.

**Bladders**  Edible offal from animals. Bladders are hollow non-fiberized collagen-containing muscular organs. Dried urinary bladders, such as cattle bladders, are used as sausage casings. In some cultures, consumption of raw gall bladders from certain species of fish is believed to improve health; however, there are reports of acute hepatitis and renal failure associated with this practice. Swim bladders in fish have a high collagen content, and in some countries are used to produce foods.

**Blakeslea**  Genus of fungi of the family Chooanephoraceae. Occur as saprotrophs on decaying vegetable matter, soil or dung, or as parasites or pathogens of plants and animals. *Blakeslea trispora* is used in production of β-carotene and lycopene.

**Blanching**  Plunging of foods (particularly vegetables and fruits) firstly into boiling water for a brief period, and then into cold water to stop the cooking process. Blanching is used to firm the flesh and to heighten and set colour and flavour (e.g. of vegetables before freezing), and to loosen peel prior to peeling (e.g. of peaches and tomatoes). Inactivates enzymes, thus prolonging the shelf life of frozen foods.

**Blancmanges**  Sweetened cooked desserts made with milk, thickened with cornflour or gelatin and flavoured, e.g. with vanilla. Served cold with sauces or fruit toppings.

**Bleaching**  Making a material whiter or lighter by a chemical process or by exposure to sunlight.
**Bleaching agents** may be employed. For example, oils can be bleached using fuller's earth, activated carbon or activated clays. Many impurities, including chlorophylls and carotenoid pigments, are adsorbed onto such agents and removed by filtration. When some oils are heated, heat bleaching takes place, in which pigments such as carotenoids are converted to colourless materials.

**Bleaching agents** Substances used to make a material whiter or lighter by a chemical process. Examples include fuller's earth, activated carbon and activated clays, which are used to bleach oils. Impurities are adsorbed onto such agents, which are then removed by filtration. Other bleaching agents used in the food industry include chlorine, chlorine dioxide, sodium metabisulphite and hydrogen peroxide.

**Bleeding** Removal of as much blood as possible from an animal's body during slaughter; also known as exsanguination. Bleeding should be performed soon after stunning. Thorough bleeding is an essential step in conventional slaughter. As blood is an excellent medium for growth of spoilage bacteria, retained blood can lead to early decomposition of meat; moreover, excess blood in meat is unappealing to consumers. In general, only about 50% of total blood volume can be removed; the remainder is held mainly in vital organs. In sheep and cattle, bleeding is usually effected by severing the carotid arteries and jugular veins; in swine, the anterior vena cava is usually severed.

**Blending** The mixing and combining of two or more ingredients with a spoon, beater or electric blender to form a harmonious combination. This term also relates to a mixture of two or more flavours combined to obtain a particular character and quality, as in wines, teas and blended whisky.

**Blesboks** Medium-sized antelopes (Damaliscus dorcas phillipsi) found in elevated grasslands of South Africa. Hunted as game. Meat is red, with a low fat content, and is tender and juicy when cooked. Eaten fried, grilled, roasted or in dishes such as casseroles and stews. Also made into biltong or jerky.

**Blight** Any of various plant diseases that cause rapid withering of aerial plant parts (leaves, stems, fruits). Can cause severe economic and quality losses in crops, e.g. potato blight, caused by Phytophthora infestans infection of potatoes, or Fusarium head blight in wheat.

**Blood** A red viscid liquid consisting of a straw-coloured liquid portion, plasma, in which various types of blood cells are suspended, including: red blood cells (erythrocytes); white blood cells (leukocytes); and platelets. Plasma also contains dissolved proteins, fats, minerals, salts and sugars. Blood collected hygienically from slaughtered food animals forms an article of food. As a food, it must not be contaminated with stomach ingesta, urine or foreign material. Preliminary processing includes whipping or defibrinatation to prevent clotting; anticoagulants, such as sodium citrate or sodium phosphate, may be added to blood for human consumption. Both blood and blood components are used in foods; e.g., as ingredients in blood sausages, comminuted meat products and dry protein concentrates.

**Blood pressure** The pressure of blood within the arteries which, in general, is governed by cardiac output and arterial tone. Arterial pressure cycles from a minimum at diastole (diastolic blood pressure), when the heart is filling, up to a maximum at systole (systolic blood pressure), when the heart is at peak contraction. Can be affected by a range of dietary components.

**Blood proteins** Include both plasma proteins and proteins from the cellular components of blood, particularly albumins, globulins and fibrinogen. Commonly, they are recovered from blood by ultrafiltration. Blood proteins from animals have many food uses; for example, they are used as binders in sausages and as ingredients, particularly as emulsifiers, in other foods.

**Blood sausages** Cooked sausages produced using cattle and/or swine blood, but also including ingredients such as diced, cooked pork fat, cooked meat mince, gelatin-producing materials, oatmeal, bread, apples, chestnuts, onions, cream and a wide range of spices. Flavourings used vary from region to region, and national preference for texture also varies. For example, French, Italian and Spanish-style blood sausages are moist and have a loose texture, whilst German and English versions are more compact. Blood sausages are usually sold precooked, but tend to be grilled or fried whole, or cut into slices and grilled before serving. Varieties produced in different countries include blutwurst in Germany, morcilla in Spain, black puddings in the UK, boudin noir in France and biroldo in Italy.

**Bloom** Spoilage of chocolate by deposition of fats or sugar. Fat bloom is the appearance of white spots (composed of crystals) on the surface of chocolate, caused either by cocoa butter triacylglycerols undergoing polymorphic transition at the surface, or by cocoa fats rising to the surface of the chocolate as a result of high or fluctuating temperatures. Sugar bloom is deposition of sugar crystals on the surface of chocolate, caused by excessive moisture.

**Blossom end rot** Physiological disorder of plants associated with calcium deficiency. Affects tomatoes and some other crops such as watermelons and peppers.
**Blotting**  Transfer of nucleic acids and/or proteins either directly or from a gel to a chemically reactive matrix (e.g. nitrocellulose), on which the nucleic acids/proteins bind covalently in a pattern identical to that on the original gel. After blotting, target molecules are detected through the use of complementary labelled nucleic acids or antibodies. Includes northern blotting, Southern blotting and western blotting.

**Blowing**  Defect of cheese, also known as late blowing, that leads to gas formation and abnormal flavour development during ripening. Caused by butyric acid fermentation by *Clostridium tyrobutyricum*, a pasteurization-resistant contaminant of milk that can occur when animals have been fed silage.

**Blubber**  Thick, subdermal lipid layer found in cetacea and other large marine animals, often forming up to 25% of the animal's total weight and acting as an insulator. May often become contaminated by organochlorine compounds such as polychlorinated biphenyls (PCB). Frequentely consumed by Arctic inhabitants.

**Blueberries**  Edible, smooth-skinned dark blue berries of several species of *Vaccinium*, grown predominantly in North America. Fruit of *V. corymbosum* are known as highbush blueberries, while those of *V. angustifolium* are known as lowbush blueberries. Berries are similar in flavour to European bilberries and contain a wide range of phytochemicals and antioxidant vitamins. Eaten raw or consumed in baked or other processed foods.

**Blueberry juices**  Fruit juices extracted from blueberries (*Vaccinium* spp.).

**Blue cheese**  Hard white cheese with blue veins. It usually has a tangy or spicy flavour. In addition to being eaten as a dessert cheese, it is also used in salad dressings, dips and sauces.

**Blue crabs**  Marine crabs (*Callinectes sapidus*) found on the Atlantic coast and Gulf coast of the USA. The most commercially valuable crab species consumed in the USA. Usually marketed fresh, in soft and hard shell stages.

**Bluefish**  Marine fish species (*Pomatomus saltatrix*) of high commercial value belonging to the family Pomatomidae. Widely distributed in all world oceans with the exception of the eastern and north-western Pacific Ocean. Mainly marketed fresh, but also sold frozen, dried or salted. A popular game fish, produced commercially by aquaculture.

**Blue green algae**  Older term for cyanobacteria, a large group of prokaryotic, photosynthetic, unicellular or filamentous organisms, which differ from other bacteria in that they possess chlorophyll a and carry out photosynthesis. Occur in fresh, brackish, marine and hypersaline waters. Some freshwater bloom-forming strains (e.g. *Anabaena*, *Microcystis* and *Nodularia*) produce potent cyanotoxins (*saxitoxin*, *microcystins* and nodularin, respectively) which may contaminate reservoirs. Tainting of drinking water supplies by such cyanobacterial blooms may cause illness or death in humans and animals which drink the water.

**Blue mussels**  Common name for mussels of the species *Mytilus edulis* or *M. galloprovincialis* which have high commercial value. Distributed worldwide. Due to high demand, wild populations are supplemented with mussels produced by aquaculture.

**Blue whiting**  Marine fish species (*Micromesistius poutassou*) from the cod family (Gadidae) which is widely distributed across the northern Atlantic Ocean and also occurs in the west Mediterranean Sea. Has tender white fine-textured flesh with a flaky delicate flavour. Marketed fresh and frozen (mainly headed and gutted), and also processed for fish oils and fish meal. In France, this fish is utilized for the production of fish balls.

**Blutwurst**  Salty, spicy blood sausages, originally made in Germany, that are prepared from pork, beef and cattle blood. Commonly, they are eaten as a snack or mixed with *sauerkraut*. Sold precooked, but usually heated before serving.

**Board**  Long, flat, usually rectangular, piece of rigid or semi-rigid composite material used to make containers, e.g. boxes or cartons. Available in various types that differ in composition and thickness, including cardboard, paperboard and fibreboard.

**Boar meat**  Pork produced from entire male swine carcasses. In comparison with pork produced from castrated male swine, boar meat comes from leaner carcasses which have larger eye muscles, and the meat has a better flavour. However, consumers may avoid boar meat because it is perceived to be associated with boar taint. Other problems may include poor slicing properties, poor rind finish and soft fat, skin blemishes from fighting, poorer yields of matured bacon, high carcass pH values, lower keeping quality, and presence of the PSE defect.

**Boars**  Mature entire male swine. Usually those used for breeding, but can also relate to those used for meat production. Production of boar meat has certain economic advantages to the producer, as boars grow faster and use feeds more efficiently than castrated male swine; they are thus a source of cheaper lean meat. However, boars are more excitabile than castrated male swine and fighting may occur during transport and lairage, causing stress, skin damage, high carcass pH values, rapid spoilage and the PSE defect in the meat produced. In broader use, the term is used to describe...
mature males of certain other mammalian species, such as guinea pigs or hedgehogs.

**Boar taint** An unpleasant off odour and off flavour, which arises when meat from certain swine is heated. Also known as boar odour. Boar taint occurs mainly in boar meat but may also occur, to a lesser extent, in pork from female and castrated male swine. Boar taint sensitivity differs markedly between consumers; notably, more women than men are able to detect it. The major compounds responsible are androstenone and skatole in swine fat. Taint associated with skatole is characterized by the descriptors mothball and musty, and that associated with androstenone by parsnips, sillage, sweaty and dirty. An integrated approach to management of boar taint has been proposed, involving techniques such as immunocastration, genetic selection and processing of tainted meat.

**Bockwurst** Mildly flavoured, fresh or parboiled German sausages, a type of bruehwurst, made from veal and pork, usually with a higher proportion of veal. Recipes often include chives, chopped parsley, eggs and milk. The sausages have a short shelf life and require thorough cooking before they are eaten. Traditionally, they are served with bock beer, especially during Bavarian bock beer festivals in Germany.

**BOD** Abbreviation for biological oxygen demand.

**Body** Texture term relating to the fullness of a product; especially applied to wines.

**Body composition** Anthropometric parameters describing the percentage of lean mass (which includes muscles, bones, organs and water) and fat mass in the body, which together make up a person's body wt.

**Bodying agents** Additives used to impart desirable body, viscosity and consistency to foods. Often used to improve texture of low calorie foods.

**Body mass index** Index of human obesity which is calculated as the weight in kilograms divided by the square of the height in metres. The normal range is usually quoted as 20-25 kg/m².

**Body wt.** The weight of any animal, including humans. Measured in kilograms, pounds, or stones and pounds. The body mass index is often employed to assess whether body weight deviates from optimal, such as in obesity.

**Bogue** Marine fish species (Boops boops) of high commercial importance belonging to the porgies family (Sparidae). Found in the eastern Atlantic Ocean, Mediterranean Sea and Black Sea. Marketed fresh and frozen and eaten pan-fried, broiled or baked.

**Boiled ham** Boneless ham, which is cured, shaped and fully cooked by steaming or boiling. It is sold whole or is sliced and packaged before retail.

**Boiled sausages** Sausages that are heat processed by boiling during manufacture. Examples include Pariska, Posebna and Hrenovke sausages.

**Boiled sweets** Sugar confectionery products formed by boiling sugar and glucose syrups with flavourings and other ingredients as required, to form a glassy mass upon cooling.

**Boilers** Fuel-burning devices for heating water in which foods can be immersed and cooked.

**Boiling** Process of raising the temperature of a liquid, by application of heat, to the point where it bubbles and turns to vapour. The term also means cooking food in a boiling liquid.

**Boiling point** Temperature at which a liquid boils. This occurs when the vapour pressure of the liquid is equal to the atmospheric pressure of the surrounding environment. Usually abbreviated to b.p.

**Boletus** A large genus of wild fungi, many of which are edible. *B. edulis* (also known as cep) is one of the best known edible species. It is found throughout Europe and can be fried, baked in casseroles, used in salads or soups, or dried. *B. badius* is another edible species with a similar flavour to *B. edulis*.

**Bologna** Smoked, cooked sausages prepared from finely minced, cured pork and/or beef. Their name originates from the city of Bologna in Italy, but true Italian bologna is known as mortadella. Bologna of various diameters can be purchased in rings, rolls or slices; they are retailed fully cooked and ready to serve. Types of bologna include chub bologna, beef bologna and ham-style bologna.

**Bolti** Common name, used especially in Egypt, for the freshwater fish Oreochromis niloticus (formerly *Tilapia nilotica*), also known as *Nile tilapia*. Of high commercial importance. Widely distributed in lakes and rivers in Africa and also produced by aquaculture. Marketed fresh and frozen.

**Bombay duck** Marine fish species (*Harpodon nehereus*) from the Indo-West Pacific; primarily caught along the coast of the Maharashtra region of India. Regarded as an excellent food fish with jelly-like flesh having high moisture content. Marketed fresh and as a dried/salted product.

**Bonbons** Generic term for sugar confectionery. Applied to a variety of types of sweets, often with a chewy centre.

**Bone health** The physical condition of the skeleton, including size, strength and structure. Bone health can be affected by a number of factors, including genetics, diet and lifestyle, demographic characteristics and diseases. Calcium and vitamin D are well known for their role in bone health; however, several other dietary components affect the health of the skele-
ton, including other vitamins and minerals and phytoestrogens. Inadequate bone nutrition is associated with a number of diseases, including rickets, osteoporosis, bone fractures and growth retardation. **Bone mineral density** is an intermediate marker of bone health.

**Bone marrow** Soft, gelatinous, highly vascular connective tissues that occur in certain long bones. Responsible for producing red blood cells as well as many white blood cells. When bones of high marrow content are used during mechanical recovery of meat, the lipid and haem concentrations of the recovered product are increased, and the tendency of the meat to undergo oxidation is increased.

**Bone mineral density** Level of mineralization of bone. Measurements can be taken by dual energy X-ray absorptiometry or ultrasound, and are used in the clinical assessment of osteoporosis risk. Many dietary and lifestyle factors have been proposed to modulate bone mineral density, including positive effects being reported for dietary calcium, tea, soy isoflavones and vegetable proteins.

**Bones** Components of the skeleton made from hard, rigid structural material. Bones are composed of an organic matrix of collagen, osseouslumbium and osseomucoid; this is impregnated with mineral salts, particularly calcium phosphate, calcium carbonate and magnesium phosphate. **Fluorides** and **sulfates** are also present. The central cavities of most bones contain red bone marrow; however, the cavities of the long bones contain yellow marrow. Bones are processed to produce fats and gelatin. Chopped bones may be boiled to prepare bone broth. Degreased animal bones are used to prepare bone meal, which is used as a supplementary source of calcium and phosphates in foods and feeds, and as a source of phosphates in plant fertilizers. Bone charcoal is used in sugar refining and in bleaching. Specialized bone powders are used to remove fluorine from drinking water.

**Bongkrek** Traditional Indonesian type of tempeh made by fermentation of presscake of coconuts or coconut milk residue with *Rhizopus oligosporus*. Consumption can lead to fatal food poisoning due to contamination of the product with *Pseudomonas cocovenenans* (*Burkholderia gladioli*), strains of which produce the toxins toxoflavin and bongkrekic acid; favourable conditions for optimum production coincide with conditions under which bongkrek is manufactured.

**Boning** Removal of the bones from meat or fish, usually before cooking.

**Bonito** Any of several species of medium sized tuna, especially those from the genus *Sarda*, including *S. sarda* (Atlantic bonito), *S. chilliensis* (Pacific bonito) and *S. orientalis* (Oriental bonito). Fat content of flesh ranges from moderate to high; the most strongly flavoured of the tunas. Marketed mainly fresh; also dried, salted, canned and frozen.

**Boondi** Deep fried fritters made with Bengal gram meal and eaten as snack foods in India.

**Borage** Common name for the Mediterranean herb, *Borago officinalis*. Leaves have a flavour reminiscent of cucumbers and are consumed as a vegetable or used in flavourings for beverages, soups and salads. The purple star-shaped flowers are used as a garnish, often in crystallized form. Seeds are used for production of borage oils.

**Borage oils** Oils derived from seeds of borage (*Borago officinalis*) which contain γ-linolenic acid, palmitic acid, oleic acid and linoleic acid.

**Borassus** Genus of palms which includes *Borassus flabellifer*, also known as *palmyra* palm, a species which yields edible fruits and whose inflorescence is a source of palm wines, sugar and vinegar. *B. aethiopum* (black rum palm) is also utilized as a source of ingredients for foods and beverages.

**Bordeaux mixture** Broad-spectrum fungicide originally developed in France to control disease in grapes. Made by mixing copper sulfate and hydrated lime in water. Used to control disease in a wide range of tree fruits and vine fruits, and blights in potatoes.

**Boric acid** Mineral acid with chemical formula H₂B₃O₃. Has mild antiseptic properties and uses include as an insecticide against ants and cockroaches and as a fungicide in food crops. Also used in buffers and for chemical analyses. Historically used in food preservatives.

**Borneol** Member of the terpene alcohols class of flavour compounds present in many fruits, herbs and spices.

**Borneo tallow** Seed lipid from *Shorea stenoptera* which is rich in palmitic acid, stearic acid and oleic acid. Shows a sharp melting profile due to its high content of a single triacylglycerol (stearic acid-oleic acid-stearic acid, SOS) and may be used in cocoa butter equivalents.

**Boronia** Genus of woody flowering plants. Flowers of some species, especially *Boronia megastigma*, yield essential oils which are used in fruit flavourings for foods and beverages.

**Borscht** Soups made from meat stocks, beet roots and cabbages. Popular in Russia, the Ukraine and Poland. Served hot or cold, usually with a dash of sour cream.
Botanical origin  Origin of plants or plant foods. Can be used to detect adulteration or establish authenticity.

Botrytis  Genus of fungi of the family Sclerotiniaceae and phylum Ascomycota. Includes species which are plant pathogens. Botrytis cinerea commonly affects winemaking grapes and strawberries, causing either grey rot (bunch rot) or noble rot. Bunch rot on grapes can cause serious losses to the wines industry. Noble rot infection of grapes can be beneficial to winemaking; the fungus dehydrates the grapes, giving the berries a higher percentage of solids (sugars, organic acids and minerals) and giving rise to a more intense, concentrated final product with distinctive flavour.

Bottled mineral waters  Mineral waters which have been packaged in bottles for distribution and retail sale.

Bottled water  Any type of potable water which has been packaged in bottles for distribution and retail sale.

Bottles  Portable containers often made from glass or plastics, used to hold or store liquids. Typically with narrow necks, which can be closed with caps, corks or stoppers. The term also refers to metal containers which are used to transport and store liquefied gases.

Bottling  Process of putting substances into bottles for storage and preservation. Most commonly applied to beverages, such as wines, fruit juices and beer, but also used to describe a method of preserving fruits in syrups or in the form of jams. After the products have been placed in the bottles, the containers are sealed with corks or other closures to prevent air or microorganisms from entering and causing spoilage.

Bottom fermenting yeasts  Brewers yeasts (Saccharomyces spp.) which flocculate and collect at the bottom of the fermentation tank during fermentation of beer. Used in brewing of a range of beer types, including lager.

Botulism  Foodborne disease caused by ingestion of food contaminated with botulotoxins produced by Clostridium botulinum. Symptoms include vomiting, abdominal pain, visual disturbances and difficulty in speaking and swallowing. Foods commonly implicated are low-acid, low-salt foods (e.g. improperly canned vegetables and soups, and fish and meat products).

Botulotoxins  Extremely potent neurotoxins produced by Clostridium botulinum, which cause botulism. Also known as botulinus toxins, botulinum toxins, botulins and botulismotoxins.

Bouillon  Thin, unclarified broths or soups typically made by boiling beef or chicken in water. Similar to stocks.

Bouquet  Aroma of foods or beverages, in particular, that of wines.

Bourbon whiskey  A type of American corn whiskey, originally made in Bourbon County, Kentucky, USA.

Bovine  Relating to or belonging to the cattle family.

Bovine immunodeficiency viruses  Lentiviruses which cause lymphadenopathy, lymphocytosis, central nervous system lesions, progressive weakness and emaciation in cattle.

Bovine muscles  Alternative term for beef.

Bovine serum albumin  Protein fraction present in cattle blood and frequently used as a model in studies on factors influencing properties and behaviour of food proteins.

Bovine somatotropin  Alternative term for bovine growth hormone. Recombinant bovine somatotropin may be administered to cattle to modify milk production, growth rate, or composition of cattle carcasses or beef. This application is permitted in some countries but prohibited in others due to concerns about the safety of food products.

Bovine spongiform encephalopathy  Commonly abbreviated to BSE, one of a group of prion diseases, this one affecting cattle. BSE can be transmitted to humans and other animal species via contaminated cattle-derived foods and feeds. Individual cattle in the UK were probably first infected with BSE in the 1970s, but BSE was not formally identified until November 1986. It is believed to have developed because of intensive farming practices, particularly the inclusion of meat and bone meal from animal carcasses in cattle feeds. BSE may have originated in an individual cow as a consequence of a gene mutation and spread to other cattle because cattle remains were recycled in cattle feeds. In cattle, BSE has a 5-year incubation period. BSE became widely recognized as a threat to human health when variant Creutzfeldt-Jakob disease (CJD) was identified in 1996 and linked with the consumption of BSE-infected beef. Extensive action was taken to prevent further entry of prions into the human food chain and legislation is in place, which it is hoped will eventually eradicate BSE. The farming industry in the UK, the worst affected country, has suffered severe damage as a result of the BSE epidemic, but is recovering, and the number of suspected cases reported each week has fallen significantly.
Bovista  Genus of fungi of the class Basidiomycetes. Bovista plumbea (lead puffball) and B. nigrescens (dark puffball) are edible mushrooms.

Bowels  Common name for the large and/or small intestines. They form a part of edible offal.

Bowls  Round, concave containers which can be used for holding foods. Usually hemispherical and open at the top. Made from various materials, including glass, wood and plastics. Also a specific type of drinking goblet.

Boxes  Containers, often with four sides perpendicular to the base and a cover or lid. Made from various materials, including wood, cardboard and plastics. Can be used to store or package foods.

Boxthorn  Common name for the solanaceous plant Lycium chinense, also known as matrimony vine. Can be used to store or package foods.

Boza  Fermented beverages consumed traditionally in Turkey, Bulgaria and other Balkan countries. Made from various types of cereal, most commonly bulgur wheat or millet, but also barley, oats or corn, which is cooked in water and then crushed before fermenting with yeasts. The thick beverage has an unusual sweet and sour flavour. It is served chilled, sprinkled with cinnamon and garnished with roasted chick peas.

b.p.  Abbreviation for boiling point.

Bracken  Edible ferns from Pteridium aquilinum and related species. Consumed as a vegetable in some parts of the world, including Japan, New Zealand and Canada. Also used as a source of starch. Bracken contains a number of toxins such as ptaquiloside, a potent carcinogen, which can also be transmitted via milk from cattle feeding on bracken. Curled, undeveloped bracken fronds (fiddleheads), which are consumed as a delicacy in some areas, are particularly hazardous to health, as they contain carcinogens that must be destroyed by roasting before consumption. Bracken fiddleheads can be consumed accidentally as they resemble those of the ostrich fern, which are not poisonous.

Brains  The main organs of the central nervous system (CNS), located within skulls. Brains of slaughtered animals are a part of edible offal; however, in many European countries, recent concerns relating to prion diseases have led to the exclusion of brains and other central nervous system tissues from the food chain. Nevertheless, the protein component of brains has a well-balanced amino acid composition. Brains have a very high content of fat, a large proportion of which is made up of complex phospholipids and glycolipids. Brains are a rich source of minerals (especially Fe, P, Ca and Mn) and vitamins B2 and B12.

Brassing  Light frying of foods (usually meat or vegetables) followed by stewing in a small amount of liquid at low heat for a lengthy period of time in a closed (tightly covered) container. The long, slow cooking develops flavour and causes tenderization of the food by gently breaking down fibres. Braising can be undertaken on stoves or in ovens.

Bran  Protective outer layer of the seeds of cereals that is separated from the kernels during milling. Often used in breakfast cereals and other products as a source of dietary fibre.

Branched chain fatty acids  Minor group of fatty acids whose fatty acyl chain has a branched structure rather than the usual linear structure. Most commonly they are saturated fatty acids and the branch is small, comprising only a methyl side group, and is located on the 2nd or 3rd carbon atom furthest from the carboxylic acid group. Examples include isobutyric acid and isocaproic acid, both of which contribute to cheese flavour.

Branching enzymes  Alternative term for 1,4-α-glucan branching enzymes.

Brandies  Spirits manufactured by distillation of fermented fruit-based mashes or wines (including grape wines or fruit wines) or wine by-products.

Branding  Process of applying a trademark or distinctive logo to a food or its packaging to identify its manufacturer or retailer.

Brandy  Spirits manufactured by distillation of wines; unless further qualified, the term brandy generally refers to spirits distilled from grape wines.

Brassica  Genus of plants belonging to the Cruciferae family. Native to the Mediterranean region and cultivated widely in Europe. Important Brassica crops include cabbages, cauliflowers, broccoli, swedes, turnips, rapeseeds and mustard seeds. Also of interest due to their contents of compounds believed to protect against cancer (e.g. indoles and glucosinolates).

Brassica seeds  Oilseeds produced by plants of the genus Brassica, including rapeseeds and mustard seeds.

Brassicasterol  Phytosterols fraction which is characteristic of vegetable oils derived from Brassica oilseeds (including rapeseed oils) and may be used as an indicator of adulteration of other oils with rapeseed oils.
Brassinosteroids  Hydroxysteroids which act as plant growth regulators in a wide range of plants, including food crops.

Bratwurst  Fresh sausages, usually made from a mixture of highly seasoned pork, veal and onions. Seasonings may include ginger, nutmeg, coriander or caraway. Numerous different types of bratwurst are produced in Germany; many districts produce their own special varieties. Traditional bratwurst must not contain nitrites as curing salts. Although some pre-cooked bratwurst is sold, most requires cooking before it is eaten. Other product names may also include the term bratwurst (e.g. bauernbratwurst and smoked bratwurst), but these sausages are produced by hot smoking and fermentation and are classified as raw dry sausages, rohwurst.

Brawn  Meat products prepared from pork, swine ears and swine tongues. Ingredients are boiled with herbs and peppercorns before mincing and pressing into a mould. Mock brawn differs from brawn as it is prepared from different types of offal.

Brazil nut oils  Oils derived from Brazil nuts, large, edible seeds of the South American tree Bertholletia excelsa. Contain olein, palmitin and stearin.

Brazil nuts  Nuts produced by the South American tree, Bertholletia excelsa. Eaten raw, salted or roasted, or added to other foods such as ice cream and confectionery. Good source of several B vitamins and minerals, with particularly high amounts of bioavailable selenium. Used as a source of brazil nut oils.

Brazzein  One of the sweet proteins, this high-potency, 54 amino acid, sweet-tasting, thermostable protein is isolated from berries of the West African plant Pentadiplandra brazzeana. On a weight basis, brazzein is 500-2000 times sweeter than sugar, and is stable over a broad pH range. A good alternative to, or addition to, available artificial sweeteners. Combines well with most high intensity sweeteners, and improves stability, flavour and mouthfeel when blended with acesulfame K and aspartame. Can be extracted from genetically modified corn through ordinary milling. Studies have also investigated production of a recombinant form of the protein using bacteria.

Bread  Bakery product made from cereal grains (mostly commonly wheat) ground into flour, moistened and kneaded into a dough and then baked. Often leavened by the action of bakers yeasts or by addition of sodium bicarbonate.

Bread crumb  The soft inner part of bread, which is surrounded by the bread crust.

Bread crumbs  Small fragments prepared by grinding bread. Used in coatings, usually for fried foods, stuffings and in some desserts.

Bread crust  Crisp, outer part of bread, which is dehydrated and browned during baking.

Bread dough  Unbaked thick, plastic mixture of flour and liquid (e.g. water) that is kneaded, shaped and rolled to make bread. The elasticity of bread dough is dependent upon the amount of gluten contained in the flour.

Breadfruit  Green, starchy fruits from the breadfruit tree (Artocarpus communis, syn. A. altilis). An important subsistence crop of the Pacific islands, where it provides a significant source of energy due to its high starch content. Also popular in the Caribbean and throughout the tropics. Fruit is typically roasted, boiled or fried and consumed as a vegetable; it can also be fermented or processed into meal. Breadfruit seeds are also eaten in some areas and are a good source of proteins (the seeded form of breadfruit is known as breadnut).

Breading  Coating of foods with breadcrumbs or other crumbs usually before frying or baking. The food is dipped first into a liquid (e.g. beaten eggs, milk or beer), then into the crumbs, which may be seasoned with herbs or spices. The breaded product is then fried or baked. Breading serves to retain the moisture content of the food and forms a crisp crust after cooking.

Breadings  Bread crumbs and other types of crumbs used in breading foods, usually before frying or baking.

Breadmaking  Process by which bread is prepared from flour and other ingredients that vary according to the type of bread to be made. Steps involved include fermentation, kneading of the dough, proofing and baking.

Breadmaking properties  Characteristics of cereals, flour or dough that determine their suitability for bread manufacture.

Bread manufacture  Alternative term for breadmaking.

Bread rolls  Bread products formed from pieces of dough shaped as required before baking. May have a soft or crisp crust. Also commonly referred to as rolls.

Breakfast  First meal of the day, traditionally large meals eaten before work. Today, many neglect or skip breakfast due to busy schedules. This trend exists in industrialized nations worldwide, where local breakfast traditions are being replaced with modern Western-style foods, often packaged or pre-made. Typical breakfasts vary widely by world region, and content
Breakfast cereals

Breakfast cereals and similar beer types) and other ingredients, including malt and other ingredients, hopping, clarification, boiling the worts, alcoholic fermentation, aging and filtration.

Brewing adjuncts Fermentable material other than malt used in the brewing process. Brewing adjuncts may include unmalted cereals, syrups or sugars.

Brewing by-products By-products of the brewing process, including brewers spent grains, surplus
brines

Brined cucumbers and Brines are solutions that are used to preserve foods by drawing out water and replacing it with a solution of salt and other substances. Brilliant Blue is an artificial colorant also known as FD&C Blue no. 1. It imparts a greenish blue tinge to foods and is used in a range of foods, including pickles, bakery products, desserts, and beverages. Brix values are properties that give an indication of the density of sugar in a solution at a specific temperature. Brix values are frequently used to express the sugar levels in fruits, beverages, and sugar juices, which include jams, jellies, and honey.

Briquetting Use of presses for compacting various materials, including foods, to improve their handling or other properties. Ice cream for example may be formed into bricks, blocks or slabs and sold as briquettes. The same process may be applied to food processing wastes (e.g. rice hulls) intended for use as fuels. Briquetting may also aid waste disposal or recycling.

Bromides Salts of hydrobromic acid. Foods may become contaminated with bromides as a result of fumi-

Brick tea Tea leaves which have been compressed to form a solid block. Widely traded and used in Tibet and parts of China and Central Asia.

Brie cheese French soft cheese made from cow milk. Produced as a 1 or 2 kg wheel packed in wooden boxes.

Brightness The intensity of a colour (in contrast to its hue or saturation). In addition, the term is used to indicate the level of light appearing to emanate from an object.

Brill A marine flatfish species (Scophthalmus rhombus) distributed across the northeast Atlantic, Mediterranean and eastern Atlantic along European coasts. Marketed fresh and frozen, whole or gutted and as steaks and fillets.

Brilliance The luminance of an object, which includes both brightness and saturation.

Brilliant Blue Artificial colorant also known as FD&C Blue no. 1. Imparts a greenish blue tinge to foods. Used in a range of foods, including sugar confectionery, bakery products, desserts and beverages.

Brined cucumbers Alternative term for cucumber pickles.

Brined meat Meat that is preserved by brining. Meat cuts may be immersed in brines, which contain salt or salt and other curing agents dissolved in water. However, it takes a long time for brines to diffuse the whole meat product; thus, in general, only specialty meat products are brined by immersion. A more rapid, uniform distribution of brines throughout meat products can be achieved by direct injection of brines into the meat cuts, methods for which include artery pumping, multiple injection and stitch pumping.

Brines Water saturated or strongly impregnated with salt used for pickling or preservation of foods. Sweeteners such as sugar or molasses can be added to the brines to make sweet brines.

Brining The process of treating foods with brines for preservation or pickling.

Brinjal Alternative term for aubergines.

Broilers Fast-growing strains of chickens reared under intensive conditions before slaughter, for meat production at about nine to twelve weeks of age. Development of intensive systems to produce broilers has led to large-scale production at low prices.

Broiling Cooking of foods (usually meat or fish) by exposure to direct heat. Food can be broiled in ovens, directly under a gas or electric heat source, or on a barbecue, directly over charcoal or other heat source.

Broccoli Common name for certain varieties of Brassica oleracea, particularly B. oleracea var. italic. Green sprouting broccoli (also known as calabrese) has a tight cluster of deep emerald green florets on a thick, edible stem and is prepared and used in a similar manner to cauliflower. Sprouting broccoli has a looser cluster of smaller flower heads. Broccoli is rich in vitamin A and vitamin C and is attracting interest as a source of glucosinolates that may protect against some forms of cancer.

Brochothrix Genus of Gram positive, facultatively anaerobic, rod-shaped bacteria of the family Listeriaceae. Brochothrix thermosphacta may cause spoilage of meat and meat products.

Broiler meat Meat from broilers, specific types of chickens. Also used as an alternative term for chicken meat.

Broiler muscles Meat from broilers, specific types of chickens, also used as an alternative term for chicken meat.

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Bromates Salts of bromic acid, including potassium bromate, which is used in flour improvers. Bromates can also be formed as disinfection by-products during ozonation of drinking water containing bromide ions.

Bromelains EC 3.4.22.32 (stem bromelain) and EC 3.4.22.33 (fruit bromelain). Cysteine endopeptidases with broad specificity found in the stem and fruit, respectively, of pineapples. These proteinases have been used in tenderization of meat and for production of protein hydrolysates from meat or legumes. Have anti-inflammatory activity and are included in some health foods.

Bromides Salts of hydrobromic acid. Foods may become contaminated with bromides as a result of fumi-
Browning

reaction and/or caramelization. Browning can be either a favourable process and encouraged using browning agents, or unfavourable and reduced using browning inhibitors.

Browning agents Ingredients or additives that promote browning of foods during processing, thereby imparting a darker colour to the finished product. Examples include caramel, milk and certain sugars. Commercial browning agents are often applied to foods cooked in microwave ovens in order to produce surface browning.

Browning inhibitors Substances used to prevent browning in foods, also known as anti-browning agents. Use of sulfur dioxide or sulfites is one of the most widespread chemical means of controlling both enzymic browning and nonenzymic browning. Other browning inhibitors include kojic acid, which inhibits tyrosinase activity, citric acid and cysteine.

Browning reactions Alternative term for browning.

Browning susceptrors Alternative term for microwave susceptrors.

Brown rice Rice from which the husks have been removed, leaving the germ and outer layers containing the bran intact.

Brown rot Any rot resulting in browning and decay of plant tissue, particularly common in fruit trees. Brown rot in pome fruits and stone fruits is frequently caused by fungi of the Monilinia genus.

Brown sugar Granulated white sugar that has been covered with a layer of cane sugar syrups to give it a brown appearance and a caramel-like flavour. Brown sugar has a higher moisture content and a higher ash content than white sugar.

Brown trout Freshwater form of the species Salmo trutta. Also has a silver bodied migratory form (sea trout) which swims out to sea for a period before returning to freshwater to spawn. Marketed fresh, frozen or smoked.

Brucella Genus of aerobic Gram negative bacteria of the family Brucellaceae. Occur as intracellular parasites or pathogens in humans and animals. Transmissible to humans through consumption of infected dairy products or meat, causing the zoonotic disease brucellosis. Consumption of unpasteurized milk and cheese is a common cause.

Brucellosis Any human or animal disease caused by infection with bacteria of the genus Brucella. Humans become infected by coming into contact with animals or animal foods that are contaminated with these bacteria. In humans, brucellosis can cause a
range of symptoms that may include fever, sweats, headaches, back pains and weakness.

**Bruhwurst** Frankfurter-type sausages which are heat treated during preparation. The various types of bruhwurst include beutelwurst and bockwurst. Skinless varieties are produced by heating the sausage emulsion in a mould; the outer layer of emulsion sets to form a firm skin. For optimum quality, bruhwurst sausages are made from slaughter-warm meat. Major defects include weakness of flavour and incorrect use of seasonings. In fat-reduced bruhwurst, texture may be very firm and rubbery.

**Bruising** Damage to the surface of foods, particularly fruits and vegetables, resulting from mechanical impacts.

**Brussels sprouts** Common name for *Brassica oleracea* var. *gemma*fera. A relatively recent variety of cabbage characterized by a stout stem yielding numerous compact heads (sprouts) resembling miniature cabbages. Consumed fresh as a winter vegetable and also available frozen. A good source of vitamin C, vitamin A, folic acid and potassium. Like other Cruciferae, contain phytochemicals such as indole glucosinolates, which may help protect against cancer.

**Bryndza cheese** Soft Slovak cheese made from ewe milk that is popular throughout Eastern Europe. It is matured for at least 4 weeks and has a fat content of about 45%. Similar cheeses are the Romanian Brinza, Hungarian Brynza, Sirene from Bulgaria and Greek Feta.

**BSE** Abbreviation for bovine spongiform encephalopathy.

**Bubble gums** Sweetened products made from chicle (gum-like exudate consisting of coagulated milky juice from the bark of the evergreen sapodilla tree, *Achras zapota*) or similar resilient substances (e.g. plasticized rubber or polymers), and chewed for its flavour. Bubble gums differ from chewing gums in the user's ability to blow bubbles from them during chewing.

**Buchu oils** Aromatic oils which are extracted from leaves of the African shrubs *Agathosma betulina* and *A. crenulata*. Used in flavourings.

**Buckwheat** Grains of *Fagopyrum esculentum* used as a cereal. Unsatisfactory for the manufacture of bread. Whole grains are cooked like rice and made into baked puddings. Also made into other products such as porridges, noodles or griddle cakes. Good source of proteins, niacin and vitamin B₁.

**Buckwheat flour** Flour made from buckwheat grains. Most commonly used in making pancakes, such as blini.

**Buffalo yoghurt** Yoghurt made by fermenting buffalo milk.

**Buffalo cheese** Cheese made from buffalo milk.

**Buffalo mozzarella cheese** Soft Italian plastic, spun-curd cheese made from pasteurized buffalo milk. The curd is treated with extremely hot water and kneaded into a shiny lump.

**Buffalo gourds** Common name for *Cucurbita foetidissima*. Potential starch crop or source of oilseeds. The root starch has physicochemical properties intermediate between those of cassava and corn.

**Buffalo meat** Meat from buffaloes, that has a similar flavour to beef, but a lower content of fat. During cooking, care must be taken to prevent the meat from drying out.

**Buffalo milk** Milk obtained from buffaloes. Compared with cow milk, buffalo milk has a higher fat content (approximately 8%), higher contents of proteins, calcium and some other minerals, vitamin A and biotin, and lower contents of potassium, and vitamin B₂ and vitamin B₆. Contains no carotenes. Used in making a range of dairy products, including mozzarella cheese and Domlaticheese.

**Buffalo milk cheese** Cheese made from buffalo milk.

**Buffalo yoghurt** Yoghurt made by fermenting buffalo milk.

**Buddu** A type of fermented fish sauce produced from salted anchovy. Product has an olive-brown colour. Popular in Malaysia and Thailand.

**Buffalo butter** Butter made from buffalo milk.

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Buffering capacity  Ability of a substance or solution to resist change in acidity or alkalinity.

Bulgar  Cracked wheat grains prepared from soaking, cooking, drying and light milling. May be ground into flour; also used in many Middle Eastern dishes.

Bulk density  Weight per overall unit volume of a substance. Bulk density is used in particular for porous substances where density is affected by pore volume and can be increased by the presence of pore fluid.

Bulking agents  Originally used to describe inert products added to contribute bulk and act as inexpensive fillers/extenders for more expensive ingredients. Now also used in low calorie foods and low fat foods to produce a feeling of satiety and to replace functional properties, flavouring characteristics and other qualities of the sugar and/or fat which has been removed. Substances used as bulking agents include methylcellulose, fibre, polyols and polydextrose.

Bull muscles  Meat from specific types of mature, uncastrated, male bovine animals, usually male cattle, and also an alternative term for beef. Beef from older bulls tends to be tough, but toughness is not a problem in beef from younger bulls. Bull beef has a good water binding capacity and a good water holding capacity. Consequently, meat from the forequarters of bull carcasses is often used as an ingredient in sausages. Bull beef tends to have a lower intramuscular fat content than beef from steers. In comparison with beef from steers or heifers, bull beef may be discriminated against as it tends to be darker in colour and coarser in texture, and may lack finish; it is also associated with an increased incidence of the DFD defect.

Bulls  Mature, uncastrated, male bovine animals, usually cattle. Production of beef from bulls has several advantages over production of that from steers; in particular, bulls grow faster, convert feed more efficiently and achieve greater carcass weight than steers.

Buns  Small yeast-raised rounded pieces of bread which are sometimes sweetened or flavoured, and may contain dried fruits. Choux buns are made from choux pastry and usually filled with whipped cream.

Burbot  Freshwater fish species (Lota lota) related to cod which is the only freshwater member of the hake family (Lotidae). Widely distributed in Europe and the USA, but rare in Great Britain. Has lean white flesh with a delicate flavour. Sold mainly as a salted product, but also marketed fresh in the USA. Liver is sold smoked or canned in Europe. Also utilized as a source of fish oils and for fish meal production.

Burdock  Common name for Arctium lappa. Long slender root vegetables with a reddish brown skin and greyish flesh. The plant grows wild in many areas of the USA and Europe, and is cultivated in Japan where it is also known as gobo. The root has a crispy texture and sweet pungent flavour, much prized in Japanese dishes. Also used in the manufacture of pickles and soft drinks.

Burfee  Concentrated dried dairy products prepared from khoa. Popular as sweets in India. Alternative spelling is burfi.

Burfi  Alternative term for burfee.

Burgers  Round, flat cakes of meat mince, cooked by grilling or frying. Specific types of burger include baconburgers, beefburgers, cheeseburgers and hamburgers. They are commonly eaten in bread rolls, served with lettuce, slices of onion and tomato ketchups.

Burgos cheese  Spanish fresh cheese made from raw cow milk or ewe milk. Pure white with a slightly acid and salty flavour. Used in baking or eaten as a dessert with sugar and honeys.

Burkholderia  Genus of aerobic Gram negative bacteria of the family Burkholderiaceae, species of which were formerly classified as belonging to the genus Pseudomonas. Some species, including B. cepacia, are of potential biotechnological use as producers of enzymes such as lipases, for bioremediation of sites contaminated with polychlorinated biphenyls or as biocontrol agents. However, some strains are plant and human pathogens. The species B. gladioli produces the toxin bongkrekic acid, responsible for outbreaks of food poisoning associated with the fermented coconut product bongkrek.

Bush butter  Fruits produced by the bush butter or African plum tree (Dacryodes edulis). Tough purple peel encases a layer of bitter greenish flesh surrounding a large seed which is fed to livestock. The fruits must be boiled for approximately 1 minute to make them tender enough to eat. Also known as African pears or safou.

Bush okra  Alternative term for ewedu.

2,3-Butanediol  Alternative term for 2,3-butylene glycol.

2,3-Butanedione  Synonym for the flavour compound diacetyl. Yellow, flammable liquid with a strong aroma and buttery flavour derived from fermentation of glucose. Soluble in water and alcohol. Used as an aroma carrier in foods and beverages.

Butanoic acid  Synonym for butyric acid. A member of the short chain saturated fatty acids which occur as flavour compounds in a wide range of foods and beverages. Especially characteristic of milk fats and dairy products. At high concentra-
Butter clams

Alternative term for butterbur. Plants of the genus Petasites in the butterbur family (Petasitaceae) are widely distributed in the Atlantic, Pacific and Indian Oceans. Flesh has a high fat content and is also popular as a smoked product.

Butter beans

Alternative term for lima beans.

Butter

Spreadable water-in-oil emulsion product made from milk fats or cream by the buttermaking process. Usually contains at least 80% fat, with the remainder being water. Salt is sometimes added as a flavouring and colour may be adjusted using annatto or β-carotene. Rich in vitamin A; also contains vitamin E and vitamin D. Main types of butter marketed are cultured cream butter (also known as lactic butter or sour cream butter) and sweet cream butter, the latter having a higher pH value.

Butterbur

Plants of the genus Petasites with large, soft leaves formerly used to wrap butter. Refers often to Petasites hybridus (common butterbur), but the leaves of another species, Petasites japonicus (giant butter-bur or fuki), are eaten as a vegetable in Korea and Japan. They contain pyrrolizidine alkaloids that have been linked with liver damage. Preparation involves addition of salt and soaking in water.

Butter clams

Marine bivalves (Saxidomus giganteus) found in middle to lower intertidal sediments along the Atlantic and Pacific coasts of North America. Smaller specimens are often eaten raw, while larger adults are usually steamed or fried; highly prized for production of clam chowders.

Butter factories

Factories in which butter is made.

Butterfat

Used as an alternative term for milk fats, butter oils or ghee.

Butterfish

Marine fish species (Brama brama; also known as pomfret) with a deep laterally compressed body which is widely distributed in the Atlantic, Pacific and Indian Oceans. Flesh has high fat content with a tender texture and a rich, slightly sweet flavour. Sold fresh and frozen and cooked in a variety of ways. In the USA, the marine fish Peprilus triacanthus is also commonly known as butterfish; this species is marketed in similar forms to B. brama, but is also popular as a smoked product.

Butterine

Fat product that was developed originally as a substitute for butter. Composed of approximately 80% vegetable, animal or marine fats and 20% water, together with additives such as emulsifiers, colourants and preservatives.

Buttermaking

Process by which butter is made from milk or cream. Consists of cream ripening, churning, washing and working. Cream ripening involves a series of temperature treatments, with or without incubation with butter starters, that affect the consistency and flavour of the final product. Churning breaks up the milk fat globule membranes, allowing formation of butter grains which eventually separate from the buttermilk. The butter grains are washed with water to remove proteins, sugar and microorganisms, and worked into a homogeneous mass by kneading.

Butter manufacture

Alternative term for the buttermaking process.

Buttermilk

Tangy flavoured residue remaining after separation of butter grains during buttermaking. Low in fat but rich in phospholipids and proteins, resulting from breakdown of the milk fat globule membranes during churning of cream. Buttermilk remaining after manufacture of sweet cream butter differs slightly in composition from that resulting from cultured cream buttermaking. A commercial product called cultured buttermilk is made by adding lactic acid bacteria to skim milk, the lactic acid produced during fermentation giving the product a tart flavour similar to that of churned buttermilk. Buttermilk is used as a beverage and as an ingredient in baking.

Butternuts

Nuts produced by Juglans cinerea, trees of the walnut family. Shells are hard, but not difficult to open. Characteristics and food applications of the kernels are similar to those of other walnuts. Also known as white walnuts.

Butter oils

Oils prepared from milk fats. Generally have a very high fat content, usually not less than 90%, and a very low water content (no greater than 0.5%). In anhydrous butter oils, moisture content is no greater than 0.1%.

Butterscotch

Hard confectionery made by boiling brown sugar and butter or corn syrups together in water. Generally distinguished from caramels by the absence of milk or milk substitutes among the ingredients.

Butter spreads

Spreads, often low in fat, based on milk fats.

Butter starters

Bacterial mixtures, usually Streptococcus, used in ripening of cream in manufacture of cultured cream butter. Responsible for formation of milk flora.
flavour/aroma compounds such as diacetyl and acetoin. Affect stability of milk fat globule membranes, facilitating their breakdown during churning, the next step in the buttermaking process.

**Butter substitutes** Products intended to be similar to butter in appearance and properties, but which differ in composition.

**Butyl acetate** One of the aroma compounds. This ester is a major contributor to aroma in fruits, particularly apples, strawberries, melons and pears. Used in flavourings added to various foods, including bakery products, cereal products, ice cream and cheese.

**Butyl alcohol** Synonym for butanol. Member of the alcohols class of flavour compounds which occurs in a wide range of foods.

**Butylamine** Synonym for 2-aminobutane. Fungicide which has been used to prevent spoilage of fresh fruits and vegetables. Classified by WHO as moderately hazardous (WHO II). Also known as tutane.

**Butylated hydroxyanisole** Commonly abbreviated to BHA. A synthetic fat-soluble phenolic antioxidant. Has good heat stability and is widely used in the food industry to add stability to fats and oils. Applications include cereals, confectionery products, bakery products and packaging materials. Often used synergistically with butylated hydroxytoluene (BHT) and other antioxidants.

**Butylated hydroxytoluene** Commonly abbreviated to BHT. A widely used synthetic antioxidant with similar properties to butylated hydroxyanisole (BHA), but less stable at high temperatures. Applications include bakery products, breakfast cereals, and food packaging materials. Displays good synergy when used in combination with BHA.

**2,3-Butylene glycol** One of the glycols, synonym 2,3-butanediol, and a precursor of the flavour compound diacetyl (2,3-butanedione). Formed by microbial fermentation in various foods and beverages, especially wines. Formation of 2,3-butylene glycol is a useful parameter for identification and differentiation of wine yeasts.

**Butyltins** Organotin compounds including tributyltin and its degradation products, dibutyltin and monobutyltin. Fish, shellfish and marine mammals may be contaminated by tributyltin, as a result of its use as an antifoulant paint additive on ship and boat hulls, docks, fishing nets and buoys to discourage the growth of marine organisms (e.g. barnacles, bacteria, tubeworms, mussels and algae).

**Butyric acid** Synonym for butanoic acid. One of the short chain saturated fatty acids which occurs as one of the flavour compounds in a wide range of foods and beverages. Especially characteristic of milk fats and dairy products. At high concentrations, it may be responsible for development of off flavour.

**Butyric fermentation** Process by which certain bacteria (mainly Clostridium spp.) produce butyric acid. Although a useful industrial process, it can cause cheese spoilage (blowing). Production of butyric acid in the colon by fermentation of dietary fibre may reduce the risk of certain cancers.

**Butyrivibrio fibrisolvens** Species of ruminal anaerobic bacteria of the family Lachnospiraceae which is butyrate producing. Thought to affect the final concn. of conjugated linoleic acid in dairy products.

**Butyrometers** Apparatus used to measure the fats content of milk. Samples are mixed with sulfuric acid in special graduated tubes which are then centrifuged. Fat separates as an upper layer, the size of which is measured from the markings on the tube.

**Butyrophilin** Acidic glycoprotein associated with milk fat globule membranes. Has potential roles in lactation and autoimmune diseases.

**Byssoschlamys** genus of fungi of the family Trichocomaceae, which can form heat resistant spores. B. fulva and B. nivea can cause spoilage of canned fruit products and fruit juices.

**Byssoschlamys** Genus of fungi of the family Trichocomaceae, which can form heat resistant spores. B. fulva and B. nivea can cause spoilage of canned foods and fruits, and may produce mycotoxins such as patulin.
C

C Chemical symbol for carbon.
Ca Chemical symbol for calcium.

Cabbage juices Vegetable juices extracted from cabbages (Brassica oleracea). May be blended with other vegetable juices or fruit juices, and may be used in the manufacture of lactic acid fermented beverages.

Cabbages Any of various cultivated var. of Brassica oleracea. Typically have a thick stalk with a large, compact head formed from green or reddish purple edible leaves (e.g. savoy cabbages, white cabbages). Cabbages that do not form a head are known as kale, winter greens or collards. Consumed as a vegetable, used as coleslaw ingredient or fermented to produce sauerkraut. Red cabbages are used for pickling. Chinese cabbages are Brassica pekinensis.

Cadaverine Toxic, foul-smelling biogenic amine produced by the decarboxylation of lysine by various microorganisms in decaying meat and fish.

Cadmium Toxic heavy metal, chemical symbol Cd. May occur as a contaminant in a wide range of foods and beverages.

Caesium Radioelement, chemical symbol Cs, which may occur as the radioactive isotopes $^{137}\text{Cs}$ or $^{134}\text{Cs}$ in foods as contaminants from radioactive fallout.

Cafestol Diterpene found in coffee which increases plasma triacylglycerol and cholesterol concentrations.
Cafeterias  Self service restaurants. Often located within larger establishments, such as department stores, schools or universities.

Caffeic acid  Member of the hydroxycinnamic acid class which occurs in many plants and plant-derived foods. Has antioxidative activity in foods.

Caffeine  One of the xanthine alkaloids naturally present in several plant foods, including tea, coffee and cola nuts. Acts as a stimulant. Used as an ingredient in some soft drinks, including cola beverages and energy drinks.

Caffeoylquinic acid  Synonym for chlorogenic acid. Phenol present in many foods of plant origin. Plays an important role in enzymic browning of fruits and vegetables. Has antioxidative activity, and may contribute to possible health-promoting or protective actions of dietary phenolic compounds.

Caja  Common name for Spondias lutea (syn. S. mombin), also known as yellow mombin. A South American fruit, the pulp and skin of which are used locally in the preparation of fruit juices, ice cream and liqueurs.

Cake batters  Batters usually prepared from flour, eggs, butter or margarines, and sugar that are used to make cakes. Other ingredients are added according to the type of cakes to be made.

Cake mixes  Powdered formulations containing all the ingredients required to make cakes.

Cakes  Soft bakery products produced by baking a batter containing flour, sugar, baking powders and beaten eggs, with or without shortenings. According to the final product, other ingredients are also included, such as flavourings, nuts, chocolate and dried fruits.

Caking  Solidification of powders or granules into a mass. Caking can be a problem during the storage of dried foods and sugar.

Calamintha  Genus of herbs with a mint like aroma. Includes Calamintha nepeta, which is used in soups and sauces.

Calamus  Medicinal herb (Acorus calamus) also known as sweet flag. Dried rhizomes are used in the formulation of vermouths, liqueurs and bitters, and also for medicinal and veterinary purposes.

Calciferol  Synonym for ergocalciferol and vitamin D₂; one of the group of sterols which constitute vitamin D. Synthesized by irradiation of the plant provitamin ergosterol.

Calcium  Mineral with the chemical symbol Ca. Constituent of most foods and an essential nutrient in the human diet, particularly important for strong bones and teeth of which it is a major component. Rich sources include milk and dairy products, oily fish and spinach; staple foods are sometimes enriched with calcium. Also important in the setting of pectins gels, and the firmness of processed fruit and vegetable products.

Calcium chloride  Calcium salt, chemical formula CaCl₂, and one of several calcium salts used as additives in foods and beverages. Applications include flavour preservation in pickles, as a firming agent in fruits and vegetables, and as a source of calcium for calcium alginate gels.

Calcium hydroxide  One of several calcium salts used as additives in foods and beverages. Chemical formula Ca(OH)₂. Member of the alkalies, and also known as slaked lime. Specific applications in the food industry include as an acidity regulator and a firming agent.

Calcium lactate  One of several calcium salts used as additives in foods and beverages. Chemical formula [CH₃CH(OH)COO]₂Ca (and up to 5 molecules of water). Particular uses include as dough conditioners, acidity regulators, antioxidants, emulsifiers, firming agents, stabilizers and thickeners.

Calcium tartrate  The calcium salt of tartaric acid. Calcium tartrate may precipitate in wines, forming an undesirable haze or sediment. Haze stabilization treatments may be required to prevent this problem.

Calf meat  Meat from specific types of young, sexually immature bovine animals, usually milk-fed cattle, and also an alternative term for beef.

Calf muscles  Meat from specific types of young, sexually immature bovine animals, usually milk-fed cattle, and also an alternative term for beef.

Calf rennets  Substance extracted from the abomasum of calves that is used in coagulation of milk for cheesemaking. The active enzyme is chymosin; pepsin is also present.

Caliciviruses  Genus of RNA-containing viruses of the family Caliciviridae. Include Norwalk viruses and Norwalk-like viruses, which are responsible for acute gastroenteritis in humans and are transmitted by the faecal-oral route via contaminated water and foods (e.g. shellfish and salads).

Callipyge phenotype  In sheep the callipyge locus is involved in muscling. In lambs expressing this gene, weight of some muscles is increased. However, tenderness of the meat from affected muscles is not as good as in normal lamb. Various techniques for tenderization of meat from callipyge lambs have been investigated, including freezing, electrical stimulation and calcium chloride injection of carcasses.

Callus culture  Mass of cells, generally plant cells, with no regular form resulting from the growth of un-
determined tissue on semisolid agar. Used in tissue culture as the starting material for the propagation of plant clones or to initiate suspension cultures.

Calmodulin Calcium ion binding protein which can moderate the activity of various metabolic enzymes in plants, animals and microorganisms.

Calocybe Genus that includes some edible fungi, such as the edible milk-white mushroom Calocybe indica.

Calories Metric units of energy used widely to indicate the level of energy in foods and nutrients. One normal calorie (also known as the 15° calorie) is the amount of energy required to heat pure water from 14.5 to 15.5°C at atmospheric pressure (equivalent to 4.185 J). The small calorie or therm is equivalent to 4.204 J and is the energy required to heat pure water from 3.5 to 4.5°C.

Calorific values Amount of calories in foods or nutrients, indicating the levels of utilizable energy. Also known as energy values.

Calorimetry Technique for measuring the energy content of foods from the number of calories formed during combustion of a known amount of sample.

Calpains Proteinases with broad specificity involved in meat tenderization and deterioration of fish quality during post mortem storage. There are three separate types of these cysteine endopeptidases, including: calpain-1 (EC 3.4.22.52), requiring Ca²⁺ concentrations in the micromolar range; and calpain-2 (EC 3.4.22.53), requiring Ca²⁺ concentrations in the millimolar range.

Calpastatins Proteinases inhibitors present in meat which act on calpains and play a role in modulating the tenderness of meat during storage.

Calvados Apple brandy manufactured in a defined district in the Normandy region of France.

Calves Specific types of young, sexually immature bovine animals, usually cattle which are <8 months of age, that produce beef. Male calves are called bull calves and females are called heifer calves, quay calves or cow calves.

Camelina oils Vegetable oils obtained from oilseeds of the plant Camelina sativa. Rich source of PUFA, in particular linolenic acid. PUFA account for around 50% of the total fatty acids content of camelina oilseeds.

Camelina sativa Species of plants of the family Cruciferae, native to Europe and temperate regions of Asia, but now also grown in other regions. A source of oilseeds from which camelina oils can be extracted. The defatted seed cake may be used in feeds. Common names include false flax.

Camel meat Meat from camels that has a similar appearance, colour, texture and palatability to beef. Mature camels produce rather tough meat; consequently, meat from young animals is often preferred.

Camel milk Milk obtained from camels. Similar in composition to cow milk, with approximately 4.2% fat, 3.5% protein, 4.5% lactose and 0.8% ash.

Camels The common name for two species of large, herbivorous, long necked, mainly domesticated, ungulate mammals that are well adapted to living in arid conditions. Camels belong to the genus Camelus of the Camelidae family. The one-humped camel is known as the Arabian camel (C. dromedarius) whilst the two-humped camel is known as the bactrian camel (C. ferus). Camels are reared as a source of camel milk and camel meat. They are major meat animals in many Arab and sub-Saharan African countries.

Camembert cheese Soft French cheese made from cow milk. Crumbly and soft at the beginning of ripening, it gets creamier over time (usually 2-3 weeks). A genuine Camembert has a delicate salty flavour.

Camoser cheese Soft fresh cheese made from raw or pasteurized goat milk in La Rioja (northeast Spain). The inside of the cheese is a bright white colour, and the texture is jellied. It is easily melted. The flavour is somewhere between sweet and acid. Since it is a fresh cheese, it is usually eaten as a dessert or with honey.

Camomile Herbs obtained from Anthemis nobilis (syn. Chamaemelum nobile). The plants are a source of essential oils used to flavour liqueurs, other beverages and confectionery. Flowers are used to make herb tea. Wild camomile (Matricaria recutita syn. M. chamomilla) has similar uses. Also known as chamomile.

cAMP Abbreviated name for cyclic adenosine 3’,5’-monophosphate, one of the nucleotides. A universally distributed metabolite formed by the action of adenylyl cyclase on ATP. cAMP is an important mediator in signal transduction pathways, and an activator of several kinases and physiological processes, including expression of some virulence-related genes in microorganisms.

Campesterol Sterol which occurs in many vegetable oils and vegetable fats. The relative concentrations of campesterol and other sterol fractions may be used as parameters for identification and authenticity testing of oils.

Camphechlor Non-systemic contact and stomach insecticide with some acaricidal action. Used for control of a wide range of insect pests in crops and soil, often in combination with other pesticides. Subject to the Stockholm Convention on Persistent Organic
Pollutants and usage on crops has largely been displaced by less persistent insecticides. Also known as toxaphene.

Camphene Monoterpenoid which is one of the flavour compounds present in a wide range of herbs and spices.

Camphor Monoterpene ketone which is one of the flavour compounds in a wide range of herbs and spices.

Campylobacter Genus of Gram negative, microaerophilic rod-shaped bacteria of the family Campylobacteriaceae. Occur in the reproductive and intestinal tracts of animals and humans. Some species are pathogenic, e.g. Campylobacter jejuni, which frequently contaminates raw chicken meat. Raw milk is also a source of infection. Campylobacteriosis is the infectious disease caused by bacteria of this genus. People who become ill with this disease, during which they can experience diarrhoea, abdominal pain, fever and vomiting, usually recover within 2-10 days; however, rarely, long-term complications can occur (e.g. arthritis and Guillain-Barre syndrome).

Campylobacteriosis Any human or animal disease caused by infection with Campylobacter spp. C. jejuni causes food poisoning in man characterized by diarrhoea, fever, abdominal pain, nausea, headache and muscle pain.

Camu-camu Fruits produced by Myrciaria dubia, an Amazonian shrub. The round, light orange to purple fruits are the richest source of vitamin C discovered so far. Compared with oranges, they contain 30 times the vitamin C content, 10 times the content of iron, 3 times more niacin, twice as much riboflavin and fifty percent more phosphorus. Fruits are eaten out of hand and the fruit pulp is used to prepare a range of products, including fruit juices and fruit nectars, marmalades, sherbet, vinegar and ice cream. Also known as rumberries.

Canapes Small pieces of bread, toast or crackers spread with savoury toppings, such as cheese or pates. Served as appetizers or cocktail snack foods.

Canary grass Annual grass (Phalaris canariensis) from the Mediterranean. Its grains are commonly used as food for caged birds, but are also consumed by humans.

Canavanine Non-protein amino acid, which is a potentially toxic arginine antimetabolite. Found in alfalfa and certain other legumes such as jack beans.

Canbra oils Former name for canola oils.

Cancer A range of malignant diseases characterized by uncontrolled cell proliferation that results in tissue invasion and destruction. Dietary factors have been linked with increased risk for certain cancers (e.g. high intakes of dietary fats) and with reduced risk (e.g. increased intakes of fruits and vegetables). Common examples include breast cancer, lung cancer, colorectal cancer and prostate cancer.

Candida Genus of yeasts of the class Saccharomycetetes. Occur in soil and on plants. May be used in the production of fermented foods (e.g. Candida kefir in the production of kefir and koumiss, and C. famata in the production of fermented sausages). C. lipo.lytica and C. xylanoïdes cause meat spoilage, while C. valida causes spoilage in wines. C. utilis and C. lipo.lytica may be used for production of single cell proteins. C. rugosa, C. antarctica and C. intermedia produce lipases which have potential use in the food industry.

Candied fruits Fruits, usually whole, preserved by softening in water and then soaking in syrups of progressively increasing sucrose concentrations. After drying, the fruits are coated in sugar to make crystallized fruits or dipped in concentrated sugar syrups to make glace products, such as glace cherries. Often regarded as luxury products, although glace cherries are frequently used as ingredients in bakery products.

Candling Technique for determining the quality of eggs wherein the egg is held before a light which penetrates the egg and makes it possible to inspect the contents and shell.

Candy Sweet crystallized product formed by boiling of sugar. Also a US term for sugar confectionery products in general.

Candy floss A fluffy mass of spun sugar that is formed from thin threads. Often served on a stick. Also known as cotton candy, particularly in the USA and Canada.

Cane molasses Molasses produced as a by-product of refining of sugar from sugar cane (Saccharum officinarum). Cane molasses are composed of approximately 40% sucrose. Also known as blackstrap molasses and sugar cane molasses.

Canestrato Pugliese cheese Italian hard cheese made from unpasteurized ewe milk. During manufacture, pepper corns are added after the curd has been cut, scalded and salted. Flavour and consistency vary according to the ripening period selected.

Cane sugar Sucrose extracted from stalks of sugar cane (Saccharum officinarum). Processing of sugar cane to produce cane sugar involves: washing and cutting the cane stalks; extraction of cane sugar juices by crushing the stalks using a series of heavy rollers; purification of the raw cane sugar juices by precipitation of impurities (liming and clarification); filtration to remove the precipitates; evaporation of the pu-
Canna starch  Starch isolated from cane sugar syrups  tubers  
Edible  Canna  

Canned foods  Products generated by cane sugar factories  
Canned pet foods  Foods with a high moisture content for cats and dogs. Main ingredients are meat or fish, but may also contain herbs, cereals and fruits. Special formulations are available with raised or reduced levels of particular nutrients to meet particular health needs. Seasonal products also exist, e.g. thanksgiving meals for dogs.

Canned foods  

Canned pet foods  

Canned pet foods  

Canned pet foods  

Canned pet foods  

Canned pet foods  

Canneries  
Factories producing canned foods.

Canning  
A sterilization process in which spoilage organisms and pathogens are eliminated from foods, and the foods are hermetically sealed in containers (cans). Most commercial canning operations are based on the principle that bacterial destruction increases tenfold for each 10°C increase in temperature. The safest method for most foods involves canning under conditions of high heat and pressure. Food exposed to high temperatures for short periods of time is known to retain more of its natural flavour.

Canning equipment  
Machinery for preservation of foods in sealed containers (cans).

Canning quality  
Canning quality scores represent the sum of scores for colour (chroma, uniformity, and attractiveness), wholeness, smoothness, firmness, moistness, lack of fibre, mouthfeel and flavour of canned foods.

Canola  
Alternative term for rapeseeds.

Canola oils  
Rapeseed oils originally derived from a Canadian variety of rapeseeds which contain low (<2%) amounts of erucic acid. Also low in glucosinolates.

Canopy  
Uppermost level of plant vegetation in a forest or area under cultivation, such as a vineyard, orchard or vegetable plot. Canopy density and structure affect intensity of light reaching the plant, which may impinge on crop quality.

Cans  
Rigid cylindrical metal containers made of steel sheet or plate, aluminium, copper or other metals. Used as packaging for foods and beverages; most are sealed hermetically for storage and retail over long periods of time.

Cantaloupes  
One of the main cultivated types of melons (Cucumis melo). Grown commercially in Europe, they have orange (occasionally green), aromatic flesh and a yellow-orange ribbed, warty rind.

Canteen meals  
Meals served in canteens, i.e. restaurants catering for workers in establishments such as schools or factories. Food is usually prepared in large amounts and served from a central point.

Canteens  
Restaurants located in establishments such as schools and factories. Usually self service and designed to cater for large numbers of people. Also refers to vessels with caps or other closures used for carrying water or other beverages, especially while traveling.

Cantharellus  
Genus of fungi, which includes chantarelles. True chantarelle (C. cibarius) is a much-prized species in France and continental Europe, character-
Canthaxanthin

Red pigment of the carotenoids group. Occurs naturally in crustacea and salmonid fish and has antioxidative activity. Used as a feed additive to improve the colour of egg yolks, skin colour of broilers and flesh colour of aquacultured salmon or trout.

Ca(OH)₂ Chemical formula for calcium hydroxide.

CAP Abbreviation for Common Agricultural Policy.

Capacitance Ability to store energy in the form of electric charge. One of the electrical properties used in a wide range of food industry analyses, examples of which include monitoring of yeasts in brewing, food composition, quality deterioration in frying oils and bottling efficiency.

Cape gooseberries Small, white or yellow fruits produced by Physalis peruviana (syn. P. edulis). Eaten fresh or used in jams and jelly products. Similar in appearance and utilization to ground cherries (P. pruinosa), but slightly larger in size and less sweet. Also known as goldenberries.

Capelin Marine fish species (Mallotus villosus) belonging to the smelt family (Osmeridae) which occurs extensively in the north Atlantic, north Pacific and adjoining regions of the Arctic. Marketed in fresh, frozen, lightly smoked, salted and dried forms. Also utilized as a source of fish oils and for fish meal production.

Capers Unopened flowers of the shrub, Capparis spinosa, pickled in vinegar and used as a spice. Commonly used in pickles, sauces and toppings for pizzas.

Capillaria Genus of parasitic nematodes of the family Trichuridae. Capillaria philippinensis and C. hepatica, found in freshwater fish, are the causative agents of capillariasis.

Capillariasis Severe and potentially fatal disease in humans caused by eating raw fish contaminated with the larvae of Capillaria philippinensis and C. hepatica. Symptoms include abdominal pain, nausea, vomiting, diarrhoea and anorexia.

Capillary electrochromatography Combines high performance liquid chromatography with capillary electrophoresis. An electric potential is applied across the long axis of the capillary column, causing mobile phase flow by electrophoresis. The flow dynamics generated lead to improved efficiency and resolution, and short analysis times. Used in the separation and analysis of multicomponent mixtures, e.g. flavanone glycosides in citrus juices; sterols, tocopherols and furulates in vegetable oils; and herbicides in vegetables.

Capillary electrophoresis Electrophoresis technique in which separation is performed in buffer filled capillaries across which high voltages are applied. Advantages over conventional electrophoretic techniques include faster analysis and the possibility of incorporating on-line detection of separated species.

Capocollo Italian cured pork sausages which are a speciality of the Parma region. Pork shoulder is cured, flavoured with spices and seasonings such as sweet red peppers, packed into natural casings and air dried. Eaten raw, especially in antipasti platters.

Capons Castrated male chickens, which are fattened for eating. Compared with cockerels, capons show slightly increased growth rates, less crowing and fighting behaviour, and greater meat tenderness.

Capping devices Alternative term for caps.

Cappuccino coffee Type of coffee beverage which is topped with whipped cream or frothed milk. Often served sprinkled with cocoa powder or cinnamon.

Caprenin Semi-synthetic triacylglycerols that were developed for use in low calorie fat substitutes. Composed of two medium chain fatty acids (capric acid and caprylic acid) and one very long chain fatty acid (behenic acid) esterified to glycerol. Melting profile was similar to that of cocoa butter, so was developed for particular use in confectionery. However, the product had difficult behaviour, and appeared to increase serum cholesterol levels slightly, and was withdrawn from the market.

Capretto Lean goat meat from goat kids fed on milk up to 5 months of age. Meat is pale pink in colour and finely textured. Low in fat, but rich in protein.

Capric acid Synonym for decanoic acid. Medium chain fatty acid which occurs in various fats, including milk fats. One of the flavour compounds found in various foods.

Caprine Relating to or resembling goats.

Caproic acid Synonym for hexanoic acid. Medium chain fatty acid which occurs in various fats, including milk fats. One of the flavour compounds found in various foods.

Caprylic acid Synonym for octanoic acid. Medium chain fatty acid which occurs in various fats, including milk fats. One of the flavour compounds found in various foods.

Caps Protective covers or lids, particularly for bottles. May include a thread and be used to reseal containers after use.
Capsaicin

Capsaicin is one of the flavour compounds of chillies and other capsicums, in part responsible for their pungent characteristics.

Capsaicinoids

Flavour compounds of chillies and other capsicums related to capsaicin and partly responsible for the pungent characteristics.

Capsanthin

Pigment of the xanthophylls group which occur in peppers (capsicums).

Capsicum annuum

Domesticated Capsicum sp. that includes many of the most economically important capsicums, including bell peppers, paprika, pimiento peppers, and many kinds of chillies. Fruits tend to be less pungent than those of C. frutescens.

Capsicums

Fruits of the Capsicum genus, also known as peppers. The genus contains several domesticated species, such as the economically-important Capsicum annuum and C. frutescens, and many hundreds of varieties. Capsicums are grown worldwide and vary in pod size, colour, shape, flavour and pungency. Some types are used primarily as a vegetable, while others are used as spices or for production of oleoresins. Common types of capsicum include bell peppers, paprika and chillies. Good source of many nutrients including the antioxidant vitamins A, C and E. Pungency is due to the presence of capsaicinoids.

Captan

Protective contact fungicide used for control of a wide range of fungal diseases in fruits, vegetables and cereals. Restricted or banned in many countries. Classified by WHO as extremely hazardous (WHO Ia).

Captan

A protectant fungicide used for control of a wide range of fungal diseases in fruits, vegetables and cereals. Classified by WHO as unlikely to present acute hazard in normal use. Also known as orthocide.

Capybaras

Semi-aquatic herbivores of the family Hydrochoeridae and the largest living rodents worldwide. Capybaras (Hydrochoerus hydrochaeris) are endemic to most temperate and tropical regions of South America that lie to the east of the Andes. Capybaras are occasionally hunted in these areas for their meat, which is similar in appearance and flavour to pork.

Carabao

A domesticated subspecies of water buffaloes of the family Bovidae that is native to south east Asia. Carabao (Bubalus bubalis carabanesis) are used as a source of both milk and meat.

Carambolas

Common name for Averrhoa carambola. Tropical fruits native to Indonesia, and now grown in many hot countries. Rich in vitamin C, with a waxy, golden yellow skin and translucent, juicy yellow flesh with large brown seeds. Can be eaten raw or cooked, or processed into tarts, jams and juice products. Also known as five fingers or star fruit, due to their five prominent spikes and star-shaped cross section.

Caramel

Complex mixture of brown flavouring/colouring substances produced when sugars are heated above their melting point during caramelization. Thermal degradation of the sugars results in a similar bitter-sweet flavour profile to that of molasses and maple syrups. Caramel is used in flavourings and flavour enhancers for a wide range of foods, including caramels, cakes and biscuits. Colouring properties are employed in caramel colorants.

Caramel colorants

Colorants resulting from the carefully controlled heating of carbohydrates (e.g. sugars or malt syrups) in the presence of small amounts of food-grade acids, alkalis or salts. Widely used to impart a yellow or brown colour to numerous foods and beverages, including cola beverages and other soft drinks, beer, soy sauces, bakery products, browning agents and sausage casings. Both positively and negatively charged caramel colorants are available (particles of the caramel colorant must have the same charge as the colloidal particles of the product to be coloured, in order to avoid precipitation). Also reported to act as vitamin antagonists to vitamin B6. Caramel is also used in flavourings.

Caramelization

Form of nonenzymic browning. Different chemical process to the Maillard reaction. Involves removal of water from sugar molecules, followed by isomerization and polymerization. Occurs during dry heating or roasting of foods with high contents of sugars. Generates a range of flavour compounds, including caramel substances, diacetyl and hydroxymethylfurfural, depending on the heating temperature and the types of sugars present in the foods. Leads to desirable colour and flavour in various foods and beverages, including bakery products, coffee, beer and peanuts.

Caramels

Sugar confectionery products similar to toffees made from sweetened, condensed or evaporated milk, butter or vegetable oils, and sugar. Boiled at lower temperatures than toffees, and may be soft or hard.

Caraway

Seeds of the umbelliferous plant Carum carvi. Used as a spice in a wide range of products including bakery products, cheese, meat and schnapps. Caraway essential oils are also widely used for flavouring purposes.

Carbadox

One of the antibacterial drugs which are used as growth promoters in animals. Residues may persist in meat from treated animals.
Carbamate pesticides Group of pesticides which inhibit activity of cholinesterases in insects. Used for control of chewing and sucking insects (especially aphids, whitefly, leaf miners and soil-dwelling insects) in a wide range of fruit, vegetable and cereal crops. Examples include aldicarb, carbaryl and carbofuran.

Carbamate pesticides Carbonic acid Group of pesticides which inhibit activity of cholinesterases in insects. Used for control of chewing and sucking insects (especially aphids, whitefly, leaf miners and soil-dwelling insects) in a wide range of fruit, vegetable and cereal crops. Examples include aldicarb, carbaryl and carbofuran.

Carbamate pesticides Synonym for urea. The excretory product of nitrogen metabolism produced in the liver of mammals following the breakdown of amino acids. Its formation during the fermentation of wines is significant, since it is a precursor of ethyl carbamate, a well known carcinogen. Used as a fertilizer and as a feed supplement for ruminants, and is found in milk.

Carbamate pesticides One of the N-methylcarbamate insecticides. Has slight systemic properties and also acts as a plant growth regulator. Used for control of chewing and sucking insects in a wide range of fruits, vegetables and cereals. Classified by WHO as moderately hazardous (WHO II). Also known as naphthylmethylcarbamate, sevin and vioxan.

Carbamate pesticides Systemic benzimidazole fungicide used for control of a wide range of fungal diseases in crops. Degrades relatively slowly in plants. Classified by WHO as slightly hazardous (WHO III). Also known as bavistin and carbanzole.

Carbamate pesticides Alternative term for the fungicide carbendazim.

Carbamate pesticides Alternative term for the insecticide malathion.

Carbamate pesticides Systemic N-methylcarbamate insecticide and nematicide used for control of soil-dwelling and foliar-feeding insects and nematodes in vegetables and cereals. Classified by WHO as highly hazardous (WHO I b).

Carbohydrases General name for enzymes that hydrolyse polysaccharides such as starch, celluloses and pectins. Examples of starch-hydrolysing enzymes include α-amylases, β-amylases, α-dextrin endo-1,6-α-glucosidases and glucan 1,4-α-glucosidases. Other carbohydrates include xylan endo-1,3-β-xylolidas, endo-1,3(4)-β-glucanases and pectic enzymes.

Carbohydrates One of the main classes of compounds present in foods, which includes monosaccharides, their derivatives such as glucosides, polys, nucleotides and nucleosides, and their oligomers and polymers (oligosaccharides and polysaccharides). Important carbohydrates in foods include sugars, starch, pectins, fibre fractions, celluloses and their derivatives, and polysaccharides used as additives such as gelling agents and thickeners.

Carbohydrates Synonym for the insecticide carbendazim. Systemic benzimidazole fungicide used for control of a wide range of fungal diseases in crops. Degrades relatively slowly in plants. Classified by WHO as moderately hazardous (WHO II). Also known as bavistin and carbanzole.

Carbohydrates Synonym for the insecticide carbendazim.

Carbohydrates Synonym for the insecticide carbendazim.

Carbon Element, chemical symbol C, which is a constituent of all organic compounds. A specially modified form, activated carbon, is used in various processing aids for foods and beverages.

Carbonation Process used in the manufacture of white sugar for purification (clarification) of sugar juices. Various carbonation methods have been developed for specific purposes, but the basic principle is the same. The process involves addition of lime (CaO) to sugar juice followed by bubbling of carbon dioxide through this mixture. A precipitate of CaCO3 forms that entraps suspended impurities within its crystalline structure and adsorbs soluble impurities. Soluble impurities may also react with the lime to form insoluble Ca salts.

Carbonated beverages Beverages, especially soft drinks, which have been impregnated with sufficient carbon dioxide to cause effervescence.

Carbonates Salts of carbonic acid which include carbonate anions (CO3^2-) together with a cation. Examples include sodium, potassium, calcium, magnesium or ammonium carbonates. Food industry uses include as additives, and specifically as acidity regulators, anticaking agents, raising agents and stabilizers.

Carbonation Conversion of a compound into a carbonate, or the impregnation of a liquid with carbon dioxide (CO2) under pressure. CO2 is added to beverages to make them effervescent. Examples of carbonated beverages include lemonade and sparkling mineral waters.

Carbon dioxide A colourless, odourless gas (chemical formula CO2) produced by the combustion of carbon and organic compounds and by organisms during respiration, and absorbed by plants for photosynthesis. Widely used in the food industry for modified atmosphere packaging of foods and for supercritical CO2 extraction, whilst solid carbon dioxide (dry ice) is used for cold storage and cleaning applications.

Carbon disulfide A colourless, extremely volatile and flammable compound, with chemical formula CS2, with a disagreeable, fetid odour, used in insecticides. Exposure to carbon disulfide can occur by breathing it in from the air and by drinking water or eating foods that contain it.

Carbonic acid Acid formed when carbon dioxide (CO2) is dissolved in water. Forms various salts (carb-
Carbonic maceration A winemaking process in which whole grapes are macerated under a carbon dioxide atmosphere before alcoholic fermentation; it is used in manufacture of Beaujolais and similar wines. Carbonic maceration enhances the fruity character of the wine aroma.

Carbon monoxide Toxic colourless, odourless gas, with the chemical formula CO, which may be formed by incomplete combustion of carbon-containing materials. May be used in modified atmosphere packaging of meat or other foods.

Carbon tetrachloride Synonym for tetrachloromethane. Organic halogen compound and versatile organic solvent whose use has diminished since the discovery that it is carcinogenic. May be used in fumigants. Can occur as a contaminant of treated drinking water.

Carbonyl compounds Organic compounds which contain the C=O functional group, including aldehydes and ketones. Many are important flavour compounds and aroma compounds in foods.

Carboxin One of the systemic anilide fungicides. Applied to a range of seeds, such as barley, corn, oats, rice, wheat, vegetables and cotton. Classified by WHO as unlikely to present acute hazard in normal use.

Carboxylesterases EC 3.1.1.1. Esterases which hydrolyse carboxylic esters to alcohols and carboxylates. Useful for removing acetyl groups from hemi-celluloses to form easily fermentable carbohydrate substrates, and for modifying the gelation properties and other rheological properties of heteropolysaccharides. Also involved in changes in the aroma and flavour of wines and other alcoholic beverages.

Carboxylic acids Organic acids characterized by presence of the COOH group.

Carboxymethylation A form of chemical modification involving the introduction of carboxymethyl (COOH-CH\(_2\)-) groups. Used to alter the physico-chemical properties and functional properties of biopolymers, including starch and proteins commonly found in foods.

Carboxymethylcellulose Water-soluble cellulose ether obtained by chemical modification. Widely used in food stabilizers, thickeners or binding agents in a variety of foods including ice cream, puddings, batters and icings. Also known by the abbreviation CMC.

Carboxypeptidases EC 3.4.16-3.4.18. Exoproteases that hydrolyse peptide bonds and remove amino acids one at a time from protein chains, working from the carboxyl terminus. Useful for production of protein hydrolysates and for modifying the flavour of foods, e.g. dairy products.

Carboxypeptidase Y Alternative term for carboxypeptidases.

Carcass by-products Alternative term for offal.

Carcass condemnation Occurs after inspection of carcasses of slaughter animals, due to diseases, emaciation or injury, when the carcass is declared unfit for human consumption. Usually takes place in slaughterhouses and is governed by a range of regulations and certification procedures in different countries. Condemned carcasses may be incinerated, buried or used for other purposes. e.g. as ingredients of animal feeds.

Carcasses Dead bodies of animals and birds, especially those prepared for cutting up as meat. The term is used by butchers to describe animals' and birds' bodies after dressing (removal of the heads, limbs, hides (or feathers in birds) and offal); these types of carcasses are also called dressed carcasses. Bird carcasses are usually chilled whole, whilst animal carcasses are usually split longitudinally into sides before chilling. Many countries operate carcass classification schemes, which are designed to categorize carcasses with common characteristics such as carcass weight, fatness (fat class) and conformation. Usually, carcass classification schemes discriminate against very fat and very lean carcasses.

Carcinogenesis Processes leading to the formation of cancer (tumours).

Carcinogenicity A measure of the relative activity of carcinogens.

Carcinogenicity testing Analyses, including the Ames test, to determine the carcinogenicity of suspected carcinogens. Also applied to other chemical compounds as part of routine safety evaluation studies. Tests can include the use of animal models, cell cultures or microorganisms.

Carcinogens Substances that are able to induce carcinogenesis, encompassing direct-acting agents that possess genotoxicity and indirect-acting procarcinogens that require activation by cell metabolic pathways, such as those involving the detoxification enzymes. Food sources of potential carcinogens are widespread, and include heterocyclic amines formed in meat during cooking, acrylamide in heated starchy foods, nitrosamines in nitrite-treated meat products, urethane in fermented foods and alcoholic beverages, and arginine in mushrooms.

Cardamom Green spice pods containing numerous aromatic seeds produced by Elettaria cardamomum, a
Cardoons  Common name for *Cynara cardunculus*. The plant is of Mediterranean origin and has many similarities to *globe artichokes*, to which it is related. Cultivated mainly for the fleshy leaf stalks, which can be blanched like celery, or used in dishes such as salads and stews. Roots can also be cooked and used as a vegetable, while extracts from the dried flowers are used as vegetable rennets in cheese-making.

Caribou  The common name for any of the four North American species of large deer in the genus *Rangifer* within the Cervidae family. Caribou are hunted for their meat. Caribou meat is a traditional food for some ethnic groups, e.g. the Baffin Inuit in the Canadian Arctic. Caribou meat is referred to as venison.

Caries  Alternative term for dental caries.

Carmine  Water-insoluble aluminium lake of carminic acid (the red pigment obtained from cochineal). Soluble in alkaline media and widely used in natural red colorants for foods and beverages.

Carminic acid  Water-soluble red pigment obtained from dried bodies of cochineal insects (*Coccus cacti*). Colour is orange to red, depending on pH. Carmine is the insoluble aluminium lake of carminic acid.

Carmoisine  Bluish-red artificial azo dyes used in confectionery, soft drinks, ice cream and canned fruits. Also known as azorubine.

Carnauba wax  Yellowish wax exuded by the leaves of the north-eastern Brazilian fan palm. Primarily composed of carnaubic acid, which is also found in many plant oils and resins. Used to prepare coatings for foods e.g. fruits or sugar confectionery, decreasing moisture loss and giving an attractive, shiny appearance. Also used to improve the barrier properties of packaging films.

Cardboard  Rigid, moderately thick material made from paper pulp but heavier than paper. Used widely to make containers, e.g. boxes, for packaging foods.

Cardiovascular diseases  Congenital and acquired diseases of the heart or blood vessels including coronary heart diseases and stroke. Many risk factors for cardiovascular diseases have been identified, including lifestyle (smoking, lack of physical exercise), diseases (obesity, hyperlipaemia) and diet. Cardiovascular risk may be modified by lowering intake of fats, modulating dietary fatty acids composition and increasing consumption of whole grains, dietary fibre and fruits and vegetables.

Caribou meat  The common name for any of the four North American species of large deer in the genus *Rangifer* within the Cervidae family. Caribou are hunted for their meat. Caribou meat is a traditional food for some ethnic groups, e.g. the Baffin Inuit in the Canadian Arctic. Caribou meat is referred to as venison.

Carotenoids  One of the carotenoids with antioxidant and provitamin A activities found in green and yellow plant foods in association with chlorophylls. Has approximately half the vitamin A activity of β-carotene. Rich dietary sources include carrots, green beans, Swiss chard and tomatoes. As with other carotenoids, intake of α-carotene is maximized if foods are eaten raw or lightly cooked.

Carotenoids  One of the carotenoids with antioxidant and provitamin A activities found in green and yellow plant foods in association with chlorophylls. Rich dietary sources include carrots, sweet potatoes, green leafy vegetables and yellow fruits. In general, plant foods with more intense green or yellow colour have greater concentrations of β-carotene.

Carotenes  Long chain unsaturated hydrocarbons with provitamin A activity found in green and yellow plant foods such as carrots, sweet potatoes, green leafy

Carnitine  Amino acid found in muscle, liver and other tissues. Also known as vitamin B7 or vitamin Bt. Required for the transport of fatty acids into mitochondria for oxidation. Rich dietary sources include meat and dairy products.

Carnobacterium  Genus of Gram positive, aerobic, rod-shaped lactic acid bacteria of the family Carnobacteriaceae. Species may be responsible for spoilage of vacuum packaged meat (*Carnobacterium divergens*), fish (*C. piscicola*) and chicken meat (*C. mobile*). Several carnobacterial bacteriocins are known to exist, such as carnobacteriocin, carnocin and piscicolins.

Carnosic acid  One of the diterpenes. Present in rosemary and sage and has antioxidative activity.

Carnosine  Dipeptide (β-alanylhistidine) which occurs in meat and fish and displays antioxidative activity.

Carnosol  One of the diterpenes present in rosemary and sage. Possesses antioxidative activity and antitumour activity.

Carob beans  Seeds from the leguminous Mediterranean tree *Ceratonia siliqua*. Seeds are encased in a sweetish pulp within the carob pods. They are used as the source of carob gums or can be ground and used as baking flour. Also known as locust beans.

Carob gums  Alternative term for locust bean gums, obtained from carob beans.

Carob pods  Pods from the carob tree (*Ceratonia siliqua*), containing seeds (carob beans) encased in a soft, sticky pulp. The pulp is high in sugar and has a taste similar to chocolate. Powdered pulp is marketed as a chocolate substitute and is also used in the manufacture of beverages and syrups.

Cα-Carotene  One of the carotenoids with antioxidant and provitamin A activities found in green and yellow plant foods in association with chlorophylls. Has approximately half the vitamin A activity of β-carotene. Rich dietary sources include carrots, green beans, Swiss chard and tomatoes. As with other carotenoids, intake of α-carotene is maximized if foods are eaten raw or lightly cooked.

Cβ-Carotene  One of the carotenoids with antioxidant and provitamin A activities found in yellow and green plant foods in association with chlorophylls. Rich dietary sources include carrots, sweet potatoes, green leafy vegetables and yellow fruits. In general, plant foods with more intense green or yellow colour have greater concentrations of β-carotene.
**Carotenoids**

- **vegetables** and yellow **fruits**. Carotenoids (which include \( \alpha \)-carotene and \( \beta \)-carotene) are the simplest of the **carotenoids** and are cleaved *in vivo*, generating two molecules of **vitamin A**.

**Carotenoids** Pigments of the polyenoic **terpenoids** class, which are present in a wide range of plant foods and animal foods. Impart a yellow, orange, red or purple **colour** to foods, and may be used as food **colorants**. Many have **antioxidative activity**; some have **vitamin A** activity.

**Carp** A group of omnivorous **freshwater fish** from the family Cyprinidae which are widely distributed across Europe and Asia. Several species of carp are valued as food fish; the major commercially important species are common carp (*Cyprinus carpio*), **crucian carp** (*Carassius carassius*), **grass carp** (*Ctenopharyngodon idella*), silver carp (*Hypothalmichthys molitrix*) and big head carp (*H. nobilis*). Commonly cultured (especially *C. carpio*), and marketed and processed in a variety of ways.

**Carpet shells** Any of several species of edible bivalve **molluscs** in the genera *Tapes* and *Venerupis*, most of which occur along the Atlantic coasts of Europe and North America. Commonly consumed species include *T. decussatus*, *T. virginea*, *T. aureus* and *T. japonica*. Also known as **clovis**.

**Carrageenan gels** Thermoreversible **gels** formed from **\( \kappa \)**- and **t-carrageenans**. \( \kappa \)-Carrageenan gels are strong and brittle, whereas those from \( t \)-carrageenans are softer and more cohesive. Applications include as **ingredients** in **dairy products**, **flans**, **puddings** and low calorie **jams** and **jellies**.

**Carrageenans Gums** extracted from red **seaweeds** (mainly *Chondrus crispus* and *Gigartina stellata*). Used as **stabilizers**, **thickeners** and **emulsifiers** in a wide range of foods including **milk** **beverages**,** processed cheese**, **ice cream**, **other dairy products**, **desserts** and ready to feed **infant formulas**. Can be classified into \( \kappa \)-, \( t \)- and \( \lambda \)-carrageenans on the basis of their solubility and gelation properties. Form thermoreversible **carrageenan gels**, which are also used widely in the food industry.

**Carrot chips** Deep fried carrot slices, typically consumed as **snack foods**. A **lactic fermentation** stage may be incorporated into the manufacture process in order to decrease levels of **reducing sugars**.

**Carrot juices** Juices extracted from **carrots** (*Daucus carota*). Rich in **vitamins**, especially **vitamin A**, and **minerals**.

**Carrot pulps** Puls prepared from **carrots**. Used in the manufacture of a range of products, including **infant foods**, **confectionery** and pulpy **fruit juices**.

**Carrot pulp wastes** remaining after juice extraction can be utilized as a source of **carotenoids**.

**Carrots** Root **vegetables** from the umbelliferous plant *Daucus carota*. The most important and well known vegetable umbellifer cultivated worldwide. Wild forms of the species are also abundant. Cultivated roots are typically orange in colour and the best-known plant source of **provitamin A carotenoids**. Widely consumed as **salad vegetables** or cooked **vegetables**. In addition, a large proportion of the crop is further processed by **canning**, **drying** or **freezing**. Also used to make products such as **carrot chips**, carrot cakes and **carrot juices**.

**Carthamin** A natural red pigment obtained from **safflowers** (*Carthamus tinctorius*). Can be used in natural food **colorants**, but stability is a problem due to susceptibility to discoloration in aqueous solutions.

**Cartonboard** Thin (usually about 0.25-1.00 mm thick), rigid or semi-rigid material made from one or more layers of fibrous **celluloses**. Used widely to make **cartons**.

**Cartoning** Process of packaging items such as foods or beverages in **cartons**.

**Cartons** Lightweight containers made from **cartonboard**. Usually delivered to the user in the form of flattened, pre-cut and pre-creased carton blanks.

**Cartridges** Components of **dispensers** for **beverages** and **sauses**. Can be used as **containers** for beverage ingredients. An aqueous medium may pass through the cartridge to form the beverage. May be cup-shaped and stackable, e.g. for **coffee** preparation in **vending machines**. Also used to contain extraction media in **filtration** systems for water and beverages.

**Carvacrol** Phenolic monoterpenoid which is one of the **flavour compounds** in many **herbs** and **spices**, especially **thyme** and **oregano**. Has **antioxidative activity** and **antimicrobial activity**.

**Carveol** Monoterpane alcohol which is one of the **flavour compounds** found in **essential oils** of **herbs** and **spices**, including **mint**, **caraway** and **dill**, and **citrus peel**. Formed by conversion of **limonene**.

**Carvone** Monocyclic terpenoid ketone which is one of the **flavour compounds** in many **herbs** and **spices**, especially **caraway** and **dill**. The enantiomer **L-carvone** has a sweet **spearmint aroma** and is the main flavour compound found in spearmint. Used in **antisprouting agents** for stored **potatoes**.

**Carya** Plant genus which includes American tree species that produce **hickory nuts**. *Carya illinoinsensis* is the source of **pecan nuts**.
Casein curd  Gel formed by coagulation of milk by acids or rennets, e.g., during cheesemaking.

Casein micelles  Conglomerate of individual casein fractions found in milk. \( \kappa \)-Casein is located on the surface of the micelles. Structure and stability of micelles are related to their calcium content.

Caseinomacropeptides  Large peptides constituting the C-terminal fragment of \( \kappa \)-casein, formed by hydrolysis with proteinases.

Cashew apple juices  Fruit juices extracted from cashew apples (Anacardium occidentale). A rich source of vitamin C. Tannins present in raw juice are removed by different methods. To prevent spoilage of the raw juice, potassium metabisulphite and citric acid may be added along with a clarifying agent. Clarified juice can be stored for further use. Depending on local customs, juice is either processed and distilled into liquors or consumed diluted and sugared as a refreshing beverage. Cashew apple juice can also be used for making wines and vinegar.

Cashew apples  Edible fleshy fruits of the cashew tree (Anacardium occidentale). Although this tropical tree is grown primarily for its crop of cashew nuts, the cashew apple is also of commercial interest. The acidic-tasting apple-like fruits are rich in vitamin C and can be eaten raw or processed into jams, jellies, and ices. They are also fermented to produce juices and liqueurs.

Cashew nuts  Kidney-shaped edible nuts from the cashew tree (Anacardium occidentale). The nuts protrude from the end of edible fleshy receptacles known as cashew apples and are a highly prized commodity on the world market. They are usually consumed roasted or used in confectionery products.

Casings  Items used to give processed meat products a uniform or characteristic shape, to hold comminuted products together during further processing and to protect meat products. Casings are most commonly used as forms and containers for sausages; these types of casings are specifically known as sausage casings. There are two major types of casings: natural and manufactured. Natural casings are derived almost exclusively from the gastrointestinal tract of cattle, sheep and swine. Natural casings are highly permeable to moisture and smoke; moreover, they shrink and thereby remain in close contact with the surface of a meat product as it loses water. Most natural casings are digestible and can be eaten. There are four major classes of manufactured casings, namely cellulose, inedible collagen, edible collagen and plastic. Strength, shrinkage and permeability characteristics differ between the different types of casings, pro-
viding a range of products suitable for the preparation of many different types of meat products.

**Casks** Large barrels for the transport and storage of liquids, especially alcoholic beverages, such as draught beer. Traditionally made from wood, but may also be made from plastics or metals.

**β-Casomorphins** Pharmacologically active fragments of β-casein which exhibit biological effects in mammals.

**Cassava** Starchy tubers produced by the tropical plant *Manihot esculenta* (syn. *utilissima*), also known as manioc. An important staple food in many tropical regions, cassava tubers are a good source of carbohydates and vitamin C, but are low in proteins, minerals and other vitamins. Tubers are the source of tapioca starch, while the leaves can be eaten as a vegetable in soups and stews. Fresh cassava roots and leaves (particularly those from bitter cultivars) contain the cyanogenic glycosides, linamarin and lotaustralin, and must therefore be detoxified prior to consumption in order to prevent cyanide poisoning. Detoxification is achieved by conventional grating, washing and cooking methods, or by fermentation into a variety of products including gari, fufu, attieke and tape ketela.

**Cassava chips** Product made, mainly in tropical countries, by peeling cassava tubers soon after harvesting, slicing and drying the slices by solar drying. This drying process is effective in reducing total cyanide levels in cassava, which contains the cyanogenic glycosides linamarin and lotaustralin, thus decreasing the risks of poisoning.

**Cassava meal** Also known as manioc or tapioca flour. Prepared from cassava (*Manihot esculenta*) tubers by washing, peeling, chopping, drying and milling. Major source of dietary carbohydrates, particularly in Africa and South America. Cassava tubers contain varying amounts of cyanogenic glycosides, but most of these are eliminated during processing into cassava meal. Used to prepare gari, fufu and tapioca dishes, as an ingredient of bakery products, such as bread, and as a replacer of wheat flour in gluten low foods for people with coeliac disease. Protein content is low, so may need to be used in conjunction with additional protein sources, such as legume meal.

**Cassava starch** Starch isolated from the cassava tuber. Also called tapioca.

**Casseroles** Meals that are slow cooked, usually in ovens, in lidded containers. Casseroles are made with meat and/or vegetables cooked in stocks or sauces.

**Cassia** Spices obtained from the evergreen laurel tree, *Cinnamomum cassia*, and some other *Cinnamomum* spp. Related to cinnamon, but less delicately flavoured. Cassia bark is often used as a substitute for cinnamon, while leaves can be used in flavourings similar to bay leaves, and buds are used in a similar manner to cloves. Cassia oil is used in cola beverages.

**Cassia gums** Galactomannan gums extracted from Cassia seeds. Swell in water and form high viscosity colloids on boiling. Structure and chemical properties have been likened those of carob gums and guar gums. Although used mainly in pet foods, cassia gums have potential for use as thickeners in a wide range of foods, either alone or in combination with other colloids.

**Cassia seeds** Seeds produced by leguminous plants of the genus Cassia, particularly *C. tora* and *C. obtusifolia*. Source of cassia gums.

**Cassis** Sweet liqueurs manufactured in France from blackcurrants.

**Castor beans** High-protein oilseeds from the castor plant, *Ricinus communis*, from which castor oils are extracted. Seeds also contain a toxic albumin (ricin) and a highly allergenic protein fraction, which limit its food use after oil extraction. Fermented castor bean meal is used in a number of Nigerian foods as a spice and can also serve as the basis of a condiment, known as ogiri.

**Castor oils** Yellow-brown viscous oils derived from castor beans (*Ricinus communis*). Rich in ricinoleic acid, which is released by hydrolysis in the small intestine when the oils are ingested, giving them a purgative action. Also used industrially in the manufacture of chemicals and resins.

**Catalases** EC 1.11.1.6. Peroxidases which break down H₂O₂ to water and O₂. Used for removing the H₂O₂ added to cold-sterilized dough and improving the baking properties of dough and improving the flavour of fermented whey. Exhibit antioxidative activity and play an important role in preventing oxidation of lipids in meat. In conjunction with D-amino-acid oxidases, catalases can be used for production of α-ketoacids, which are gaining importance as nutraceuticals. The enzymes also protect microorganisms, including several foodborne pathogens, against various environmental stresses.

**Catalysts** Substances that promote a chemical reaction by lowering the activation energy, but which are not consumed or altered during the reaction.

**Catechin** Catechol which occurs in tea and many other foods and beverages. Catechins are thought to have beneficial effects on health, because of their ap-
Catering  Provision of foods and beverages in a commercial or institutional setting, or at a function. Includes services provided by hotels, restaurants, canteens and hospital kitchens. Also encompasses foods service.

Catfish  Any of a group of 31 families of scaleless fish, often with whisker-like projections around the mouth (barbels) and posterior spines in dorsal and pectoral fins. Most catfish occur in freshwater, and many species around the world are valued as food fish. Flesh tends to be firm with a mild flavour. Commonly consumed catfish include channel catfish (Ictalurus punctatus), which are cultivated in large numbers in the USA, Clarias spp., which are important food fish in African countries, and Silurus spp., found in Asian countries.

Cat foods  Pet foods specifically formulated to meet the nutrition requirements of domestic cats. Include wet cat foods in cans or pouches and dried cat foods. Canned cat foods have a high moisture content (approximately 80%) and contain more meat and less cereals and other added products than dried cat foods. Dried cat foods are often cheaper and more convenient than canned cat foods, but tend to contain more filler, making them less nutritious. Also available are vegetarian, low fat and organic cat foods, and products with specific health promoting effects, e.g. prevention of urinary tract infection.

Catecholamines  Phenolic biogenic amines which occur in tissues of plants and animals. Some, e.g. adrenaline and noradrenaline, act as hormones and high preslaughter levels of these compounds (as a result of stress) may be associated with poor meat quality. Aerobic oxidation of catecholamines in the presence of catechol oxidases results in formation of melanins, and hence browning of plant foods.

Catechol oxidases  EC 1.10.3.1. A group of copper proteins that act on catechol and a variety of substituted catechols. Also known as diphenol oxidases, phenolases, polyphenol oxidases and tyrosinases, these enzymes also catalyse the reaction of monophenol monooxygenases (EC 1.14.18.1) under certain conditions. Involved in enzymatic browning in fruits, vegetables and cereal grains.

Cattle  Large ruminant mammals with cloven hooves and often with horns, from the family Bovidae. Worldwide, there are over 1000 cattle breeds, of which 250 are major breeds. Cattle fall into two groups, those developed from Bos indicus (Indian cattle or zebus) and those, mainly European breeds, developed from Bos taurus. Cattle are mainly domesticated for meat (beef) and milk production. Different gender and age groups of cattle are known as bulls (adult entire males), steers (adult castrated males), cows (adult females), heifers (in general, young sexually mature females to the end of their first lactation) and calves (in general, sexually immature animals which are less than 8 months old).

Catsups  Synonym for ketchups. Originally a spicy pickled fish condiment, nowadays the term refers to various thick piquant sauces containing sugar, spices, vinegar, and other ingredients such as tomatoes, mushrooms, nuts or fruits. Tomato ketchups are one of the most well known types of catsup and are a popular accompaniment for French fries, burgers and many other foods.

Catkins  Proteinases important in meat tenderization during ageing, and also in deterioration of fish proteins gels, with subsequent effects on sensory properties. Also exhibit proteolytic activity in dairy products.

Cations  Positively charged particles that have lost one or more electrons. Cations migrate towards negatively charged electrodes (cathodes).

Cat milks  Specially formulated milk beverages for cats. Contain lower levels of lactose than cow milk, because some cats are lactose intolerant. Include kitten milks and milks with added nutrients, such as vitamins, minerals and taurine. Often given as a treat rather than a staple food.

Catmint  Common name for Nepeta cataria and related species. Used for flavouring herb tea and other beverages.

Cats  Small mammals (Felix silvestris), also known as house cats or domestic cats. Popular pets. Obligate carnivores; their teeth and gastrointestinal tract are specially adapted for the mastication and digestion of meat. However, they also eat cat foods containing ingredients derived from plants.

Catering  Provision of foods and beverages in a commercial or institutional setting, or at a function. Includes services provided by hotels, restaurants, canteens and hospital kitchens. Also encompasses foods service.

Catsup  Flavon-3-ols which are present in a wide range of foods of plant origin. May be polymerized to form tannins by the action of polyphenol oxidases (catechol oxidases). Catechols may contribute to the antioxidative activity and health benefits of plant-derived phenols.

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Kidney mixtures. In contrast, calf kidneys are tender, have a delicate flavour, and can be cooked by grilling or sautéing.

Cattle livers are from cattle, part of edible offal. In particular, calf livers are valued for their smooth texture and delicate flavour; they are often considered a delicacy. Livers from milk-fed calves are very pale in colour. Calf livers are usually cooked by grilling or sautéing, but may also be braised slowly or roasted whole.

Cattle muscles are alternative term for beef.

Cattle tissues are alternative term for beef.

Caucas is alternative term for wild garlic.

Caulerpa is genus of seaweeds commonly found in tropical and subtropical waters around Japan, Indonesia, China, the Philippines and Taiwan. Some Caulerpa spp. are edible; traditionally utilized as a fresh salad accompaniment to Asian dishes. C. lentillifera is one of the most favoured species due to its soft and succulent texture, while in Thailand, C. racemosa is commonly sold for use in spicy salads; both these species are cultured.

Cauliflowers are common name for Brassica oleracea var. botrytis. A vegetable characterized by large edible flowerheads (curs), composed of a compact mass of tiny, underdeveloped florets, which are usually cream or white in colour, but may also be shades of green or purple. Can be eaten raw in salads, cooked in a number of ways or used in pickles. A good source of vitamin C. Closely related to broccoli.

Cavas are sparkling wines produced in Spain, mainly within the Penedes region of Catalonia, using the champagne method. Made using Macabeo, Parellada, Xarel-lo, Chardonnay and Subirat grapes, cava is available in different degrees of sweetness. The CO₂ present in the wines occurs as a result of secondary fermentation after bottling.

Caviar is salted roes (eggs) from various species of sturgeon, prepared by a special process involving washing, salting and ripening. Consumed as a table delicacy, with a highly esteemed flavour and texture. Black caviar from the beluga sturgeon is one of the most highly prized and sought after types of caviar. Marketed in small containers or in barrels. Grainy caviar (where roe are easily separated) and pressed caviar (where roe is pressed to remove excess liquid) are common forms of caviar. Alternative spelling is caviare.

Caviare is alternative spelling for caviar.

Caviar substitutes are roes (eggs) from fish other than sturgeon, which are prepared and packaged in a similar way to caviar. Principal fish species used are bream, carp, coalfish, cod, herring, mullet, pike and tuna. The designation is usually preceded by the name of the fish (e.g. cod caviar) and the name of the country of origin is often included.

Cayenne pepper is pungent powder made from the dried pods of chillies, including the seeds. Usually deep orange in colour. Used in small quantities as a spice, traditionally in Mexican and Italian cooking, but also in dishes from other regions.

CCC is alternative term for chlormequat.

cDNA is abbreviation for complementary DNA. Single stranded DNA formed from a messenger RNA (mRNA) template by reverse transcriptases. Radio-labelled cDNA can be used as a probe in genetic techniques.

Cebreiro cheese is Spanish soft fresh cheese made from cow milk. Acidic, slightly bitter flavour, similar to that of yoghurt.

Cedar nuts are name used for some types of pine nuts, particularly those obtained from the Siberian pine.

Cefazidime is Cephalosporin antibiotic active against most Gram negative enteric bacteria, particularly Pseudomonas aeruginosa. Used to treat mastitis in cattle and bacterial infections of the respiratory and gastrointestinal tracts in cattle and swine. Rapidly depletes in animal tissues following administration.

Ceftiofur is Cephalosporin antibiotic active against both Gram positive bacteria and Gram negative bacteria. Used to treat bacterial infections in cattle and swine. Rapidly depletes in animal tissues following administration. Use at the approved dosage and route is unlikely to result in residues exceeding the maximum residue limit in milk and edible tissues; no milk withdrawal periods are required and residues are not hazardous to industrial cheese and yoghurt starters.

Celeriac is common name for Apium graveolens var. rapaceum. A variety of celery grown for its globose, edible root rather than the stalk and leaves. The white fleshy root is usually consumed cooked and has a similar flavour to celery. Also known as turnip rooted celery.

Celery is common name for Apium graveolens var. dulce. A major leafy vegetable of the umbellifer family with many food uses. Celery petioles (leaf stalks) can be eaten raw or cooked and used to impart flavour and texture to dishes such as stews and soups. Their distinctive flavour is due to the presence: of terpenes and phthalides, which are also found in celeriac. Celery seeds and leaves are used as flavourings.

Celery seeds are small brown aromatic seeds of Apium graveolens, with a similar flavour to celery petioles. Both seeds and seed oils can be used to flavour stews and salads. Ground seeds can also be mixed with salt to form celery seasonings.
**Cell counts**  Numbers of cells present in a given sample quantity.

**Cell culture**  *In vitro* growth or maintenance of cells in or on a medium.

**Cell cycle**  An ordered series of events that occur in eukaryotic cells that lead to cell division and the production of two daughter cells. The cell cycle consists of four phases: G₁ phase, S phase and G₂ phase (collectively known as interphase), and M phase (**mitosis**). Loss of cell cycle regulation can lead to uncontrolled cell growth and **cancer** development.

**Cell lines**  Established collections of cells which can be cultured indefinitely and which usually have specific properties which can be exploited in scientific research studies.

**Cellobiases**  Alternative term for β-glucosidases.

**Celllobiohydrolases**  Alternative term for cellulose 1,4-β-cellobiosidases.

**Celllobiose**  Reducing sugar composed of two molecules of glucose linked via a β-1,4-glycosidic bond. Although free celllobiose is not found in nature, it is the monomer unit for **celluloses**, one of the most abundant substances in nature. Celllobiose maybe prepared from celluloses by hydrolysis with **cellulases**.

**Cellophane**  Thin, transparent material made from **celluloses**. Used as a wrapping for foods to protect against contamination and to preserve freshness.

**Cellulases**  EC 3.2.1.4. **Glycosidases** which catalyse the endohydrolysis of 1,4-β-d-glucosidic linkages in **celluloses**, lichenin and cereal β-d-glucans. Produced commercially from a number of **fungi** and bacteria. These enzymes have many applications in the food industry, e.g. processing of fruits and vegetables and their juices, brewing, winemaking, improving the shelf life of bakery products, enhancing the quality of soy protein hydrolysates and hydrolysis of celluloses prior to ethanolic fermentation.

**Cellulolytic enzymes**  Enzymes that act synergistically to hydrolyse **celluloses** or chemically modified cellulose polymers. These enzymes are traditionally classified into three groups, **cellulose 1,4-β-cellobiosidases, cellulases** and β-glucosidases. True cellulase systems, produced by a number of fungi, are able to hydrolyse crystalline cellulose completely, while low-value cellulase systems can only hydrolyse amorphous cellulose. Cellulolytic enzymes can hydrolyse cellulose waste materials prior to ethanolic fermentation and, in conjunction with pectic enzymes, represent an alternative to chemical peeling of fruits and vegetables.

**Cellulomonas**  Genus of aerobic or facultatively anaerobic **Gram positive bacteria** of the family Cellulomonadaceae. Occur in soil. Capable of hydrolysing **celluloses** by production of **cellulases**. Also produce multiple **xylan degrading enzymes** in the presence of xylan, carboxymethylcellulolose and starch, and to a much lesser extent, cellobiose. *Cellulomonas flavigena* produces a range of cellulases and xylanases.

**Cellulose acetate**  Tough polymer made by acetylation of **celluloses** and used as the basis of artificial fibres and plastics. Cellulose acetate membranes may be used for reverse osmosis, nanofiltration, ultrafiltration and electrophoresis. Composite gel fibre containing the polymer may also be used for the immobilization of enzymes to produce biosensors.

**Cellulose 1,4-β-cellobiosidases**  EC 3.2.1.91. **Glycosidases** which hydrolyse 1,4-β-d-glucosidic linkages in **celluloses** and cellotetraose, releasing **cellobiose** from the non-reducing ends of the chains. In general, these enzymes can hydrolyse amorphous celluloses by themselves but only hydrolyse crystalline celluloses in the presence of **cellulases**.

**Cellulose ether**  Derivatives in which some or all of the hydroxyl groups of **celluloses** are involved in ether linkages. Ethylcellulose, methylcellulose and carboxymethylcellulose are examples which are used as food additives.

**Cellulose films**  Transparent plastic **packaging films** made from **celluloses**. Include **cellulose acetate** films and **cellophane** (regenerated cellulose).

**Celluloses**  Class of β-D-((1→4) glucans which are indigestible **polysaccharides** comprising the majority of plant cell wall material. Occur in large quantities in foods, and comprise much of the dietary fibre in plant foods. Derivatives such as modified celluloses and microcrystalline celluloses are used as food additives.

**Cellulose sausage casings**  Sausage casings made of **celluloses**, which must be removed before sausages are eaten. Various sources of cellulose are used, including cotton linters, which are first dissolved and then regenerated to produce casings. Benefits of use include: ease of use; the variety of available sizes; uniformity of size; stretch and shrinkage properties which mimic those of natural casings; and greater strength and lower microbial levels than natural sausage casings. To add artificial colour to sausage surfaces, the inner surface of the casings may be coated with an edible, water soluble dye, which transfers to the sausage surface. Very strong casings can be produced by extruding cellulose onto a paper base material; these casings are used to prepare large sausages, such as bologna. Cellulose casings, removed before retail, are also used to prepare skinless sausages.
Cellulosomes High molecular weight multienzyme cellulosytic complexes produced by *Clostridium thermocellum* and other bacteria. They consist of a number of enzymes attached to a scaffolding protein, which contains a cellulose binding domain and several cohesin domains which interact with complementary dockerin domains of the catalytic subunits, integrating them into the complex.

**Cellvibrio** Genus of aerobic, rod-shaped Gram negative bacteria of the Pseudomonadaceae family. Found in soil. Produce *cellulolytic enzymes* and *xylan degrading enzymes* of interest to the food industry.

**Cell walls** Structures that are external to the cytoplasmic membranes of plant, fungal, algal and bacterial cells. Maintain cell shape and rigidity and may protect cells from mechanical damage, osmotic lysis and antibiotics.

**Central nervous system tissues** Tissues associated with that part of the nervous system in vertebrates which includes the brain, cranial nerves and spinal cord. Due to concerns about a possible link between variant Creutzfeldt-Jakob disease (CJD) in humans and bovine spongiform encephalopathy (BSE) in cattle, controls are in place in abattoirs and slaughterhouses to exclude BSE risk materials, such as central nervous system tissues, from the human food chain. The risk materials are considered a source of BSE prions, consumption of which could potentially result in the development of CJD. In addition, techniques have been developed to screen meat and meat products for the presence of central nervous system material.

**Centrifugal separators** Machines with rapidly rotating containers used to separate two liquids, solids from a liquid, or a liquid from a gas. In the food industry, these separators are used for clarification of beer and fermentation broths, during sugar processing to separate sugar crystals from syrups, and during food hygiene practices (e.g. cleaning in place).

**Centrifugation** Process in which liquids are separated from solids, or heterogeneous liquids are separated, on the basis of differences in density using machines (centrifuges) with rapidly rotating drums.

**Centrifuges** Machines with rapidly rotating drums used to separate liquids from solids or heterogeneous liquids on the basis of differences in density.

**Cephalins** Mixtures of glycerophospholipids which can be fractionated into phosphatidylethanolamine, phosphatidylserine and phosphatidylinositol.

**Cephalopods** Common name for an advanced group of molluscs (class Cephalopoda) characterized by absent or reduced internal shells and heads surrounded by tentacles. Includes *cuttlefish, octopus* and *squid*; many species are commercially important food species.

**Cephalosporins** Group of semisynthetic β-lactam antibiotics derived from the natural antibiotic cephalosporin C. Have a similar mode of action to penicillins, but tend to have a broader spectrum of action and wider safety margin. Examples commonly used in treatment of farm animals include cephradine, cephradine and cefuroxim.

**Cephalosporium** Genus of fungi of the order Hypocreales, some species of which are now classified in the genus *Acremonium*.

**Cephirothin** Cephalosporin antibiotic, commonly used in the form of benzathine or sodium salts for treatment of mastitis in cows; also used for treatment of endometritis in cattle, sheep, goats and swine. Rapidly metabolizes in animals following intramuscular administration.

**Ceramic membranes** Employed in ultrafiltration and microfiltration systems, ceramic membranes may be of the following types: flat, hollow fibre or open tubular. These membranes possess a high degree of resistance to chemical and abrasion degradation, and tolerate a wide range of pH and temperature ranges. A wide variety of applications includes those relating to biotechnology and pharmaceuticals, isolation and concentration of enzymes, standardization of the protein content of milk, extraction of proteins from whey, preparation of quarg and fresh cream cheese by ultrafiltration, clarification of fruit juices, microfiltration of alcoholic beverages, and concentration of whole eggs and egg whites.

**Ceramics** Articles made of clay that is permanently hardened by heat. Ceramic materials are non-metallic, inorganic compounds - primarily compounds of oxygen, but also compounds of carbon, nitrogen, boron or silicon. Problems have been found relating to migration of heavy metals, particularly cadmium and lead, from ceramic containers or containers with ceramic glazes into foods with which they are in contact.

**Ceramides** Generic term for a class of sphingolipids; N-acyl derivatives of a long chain base, e.g. sphingosine. Ceramides are present in a wide range of foods, and may be of importance for human health.

**Ceratocystis** Genus of fungi of the class Plectomycetes. Includes several plant pathogens, e.g. *Ceratocystis fimbriata* and *C. paradoxa* which cause black rot of sweet potatoes and pineapples, respectively.

**Cereal bars** Processed cereal grains which are formed into bars and often contain other ingredients such as dried fruits and nuts.
Cereal bran  Protective outer layer of the seeds of edible members of the grass family which is separated from the kernel during milling. Often added to foods as a source of dietary fibre.

Cereal by-products  Secondary products of cereal processing, e.g. bran and germ removed during milling of cereals to produce refined flour.

Cereal flours  Flour produced by milling of cereals.

Cereal products  Generic term for foods which have been formulated using cereals as their main ingredient.

Cereal proteins  Proteins found in cereal grains, which may be classed as biologically active enzymes or biologically inactive storage proteins. Storage proteins make up approximately 80% of total cereal proteins and are often used for varietal classification.

Cereals  Plants and seeds from monocotyledonous plants of the grass family. The edible, starchy seeds are suitable for food use and are processed to make a wide range of products.

Cereal wines  Non-distilled alcoholic beverages made by fermentation of saccharified mashes made from cereals. Examples of cereal wines include sake and other rice wines.

Cerebrosides  Glycolipids comprising ceramides linked to monosaccharides, usually glucose or galactose. In animals, these sphingolipids are found chiefly in the brain and other nervous tissues of animals. Also present in plants and fungi.

Cereulide  Emetic toxin produced by Bacillus cereus growing in foods. Structurally, a depsipeptide (cyclic polypeptide). Foods most commonly associated with B. cereus emetic poisoning are cooked rice, pasta, noodles and pastry. Symptoms of this disease include nausea, vomiting and malaise. Induces hepatoxicity in animal models at high doses.

Cerulenin  One of the antibiotics with antifungal activity. Obtained from Cephalosporium caerulens and acts by inhibiting the biosynthesis of sterols and fatty acids. Inhibits different types of fatty acid synthases.

Cervelat  Smoked, uncooked, mildly seasoned sausages made from chopped pork or a mixture of pork and beef. There are two kinds, namely: soft cervelat, a semi-dry sausage; and dry cervelat, which is dried slowly to a hard texture. Many countries make cervelat. Varieties manufactured include: Goteborg cervelat from Sweden; Gothaer cervelat from Germany; and Landjaeger cervelat from Switzerland. Cervelat may also be known as summer sausages.

Cestodes  Parasitic tapeworms of the class Cestoda. Includes species of the genera Diphyllobothrium, Echinococcus and Taenia.

Cetacea  Order of mammals including whales, dolphins and porpoises.

Cetavlon  Trade name for the cationic detergent disinfectant cetyltrimethylammonium bromide (cetrimide).

Cetylpyridinium chloride  Antimicrobial agent used in disinfectants for cleaning areas such as food processing equipment.

Cetyltrimethylammonium bromide  Cationic detergent disinfectant (cetrimide) with the trade name Cetavlon.

Cevapcici  Highly spiced meat products, traditionally produced in the former Yugoslavia. They are sometimes considered to be fresh sausages without casings. They are made from beef mince and/or pork mince mixed with fresh herbs; the mixture is formed into logs. Cevapcici are usually cooked by grilling and served with chutney or hot relish and toast.

Ceviche  Product prepared by marinating raw fish fillets or raw fish mince in lime juices or lemon juices with olive oils, spices, and sometimes onions, green peppers or tomatoes. Citric acid in the juices causes denaturation of the fish proteins, increasing fish firmness. Eaten usually as an appetizer particularly in Central and South America. Consumption has been associated with outbreaks of food poisoning or anisakiasis where infected fish or unhygienic food preparation practices have been used. Alternative spellings include seviche and cebiche.

Ceylon spinach  One of the major toxic glycoalkaloids found in potatoes.

Chaconine  One of the major toxic glycoalkaloids found in potatoes.

Chaetomium  Genus of ascomycetous fungi of the Chaetomiaceae family. Occur in soil, paper and textiles. Many species are strongly cellulolytic. Some species (e.g. Chaetomium globosum) are used in the industrial production of enzymes (e.g. cellulases, xylan degrading enzymes).

Chai  Spiced milky tea drink which originated in India but is becoming a popular beverage worldwide. Made from black tea to which is added milk, a mixture of spices such as cardamom, cinnamon, ginger, cloves and pepper, and a sweetener such as sugar. Also available are spice mixes for use when preparing chai, and chai mixes to which hot water is added for making the beverage.
Chakka Curd formed during preparation of the Indian dessert, shrikhand, made by straining dahi through a cloth to remove whey.

Chalcones Class of minor flavonoids, biochemically related to flavanones and dihydrochalcones. Native chalcone glycosides are easily transformed to flavanone glycosides, and are rarely extracted from foods in the chalcone form per se. Dietary sources of chalcone compounds include tomato skins, hops and liquorice.

Chalkiness Characteristic of rice kernels which is determined by the opacity of the endosperm, with opaque rather than translucent kernels often being characterized as chalky. Undesirable in most instances as it detracts from overall appearance and can reduce milling recovery since chalky grains tend to break more easily. Can also relate to the sensory properties of other foods.

Chalva Alternative term for halva.

Chamomile Herbs obtained from Anthemis nobilis (syn. Chamaemelum nobile). The plants are a source of essential oils used to flavour liqueurs, other beverages and confectionery. Flowers are used to make herb tea. Wild camomile (Matricaria recutita syn. M. chamomilla) has similar uses. Also known as camomile.

Champagne Sparkling wines made by the Methode Champenoise in-bottle secondary fermentation process, in a defined area of northeast France.

Champagnization The specific winemaking process used for manufacture of champagne, involving in-bottle secondary fermentation under defined conditions.

Champignons French word for edible fungi. Typically used to refer to cultivated button mushrooms (Agaricus bisporus).

Channel catfish A freshwater catfish species (Ictalurus punctatus) which occurs in rivers and streams in North America. Popular in the USA where it is farmed and marketed fresh, smoked and frozen.

Chantarelles Alternative term for Cantharellus.

Chapattis Flat, unleavened disc-shaped bread originating from northern India made with wheat flour, water and salt, and baked on a griddle.

Chaperones Proteins which assist in the correct processing, particularly non-covalent assembly, of other proteins. As well as their role in microbial pathogenicity, chaperones and their subclass chaperonins are of interest in biotechnology for the production of correctly folded recombinant proteins.

Chaptalization Addition of sugar to grape musts to increase alcohol content in the resulting wines.

Legal in some winemaking countries, prohibited in others.

Char Any of several trout-like fish species belonging to the genus Salvelinus within the family Salmonidae. Char species include S. alpinus (Arctic char) S. fontinalis (brook trout) and S. namaycush (lake trout). Flesh of most species is highly regarded. Usually marketed fresh or frozen.

Charcoal Amorphous, usually impure, form of carbon produced by heating wood or other organic material in the absence of air. Can be used in absorbents (activated carbon), as a cooking fuel which produces a distinctive flavour, e.g. in barbecued foods, or in fermentation technology.

Charcuterie products Varieties of cold cooked meats, especially pork products, which are cured, smoked or processed. They include ham, pates and sausages. Shops in which these products are produced or sold are known as charcuteries.

Charlock Early flowering annual weed (Brassica kaber or Sinapis arvensis) native to Europe and North America, seeds of which are used to make a poor quality mustard.

Charqui Intermediate moisture (water activity = 0.5-0.7), dried meat products, mainly produced in South America. In Brazil, most charqui is prepared from beef, but it is also made from mutton and llama meat. In Peru, it is also made from alpaca meat. Strips of meat are cut length-wise, salted and then pressed before air drying. In its finished form, charqui is in flat, slightly flaky, thin sheets. Traditional charqui is made without addition of nitrates or nitrates; nevertheless, microbial counts decrease during processing and storage. When good quality raw materials and appropriate handling conditions are used for charqui production, the final product has low microbial counts. Charqui-type products include jerky.

Chayote Squashes obtained from the tropical plant Sechium edule, also known as mirliton. Similar in shape to a large pear, usually furrowed, and containing a single seed. Chayote fruit are used in a variety of savoury and dessert dishes throughout South America and in Creole cooking. They are low in calories and sodium and a good source of trace elements. Tubers, shoots and leaves are also edible.

Cheddar cheese Semi-hard cow milk cheese originally made in England but now made all over the world. Natural colour ranges from white to pale yellow, but some cheeses have colorants added to form a more orange colour. Generally matured for 9-24 months, the flavour getting sharper with time.

Cheddaring Process used in manufacture of scalded cheese. Pressed curd is cut into pieces which are
covered and left for 6-10 hours at 15-20°C during which the curd becomes elastic and develops a yellow colour and characteristic flavour.

Cheese Dairy products made from the milk of cows, goats, ewes, buffaloes and other mammals. A combination of rennets or rennet substitutes and acidification by cheese starters is used to separate the milk into solid curd and liquid whey. The starters convert milk sugars into lactic acid, and play a role in defining cheese texture and flavour. An important part of the diet worldwide due to its calcium, proteins and phosphorus contents.

Cheese analogues Alternative term for cheese substitutes.

Cheeseburgers Beefburgers served in bread rolls with a slice of cheese.

Cheesecakes Rich desserts, typically made from curd cheese or cream cheese, additional ingredients including cream, eggs, sugar or flavourings. Sometimes require to be baked. Usually served cold on a biscuit or pastry base and may be topped with fruits.

Cheese curd Protein (casein) gel formed by coagulation of milk, e.g. during cheesemaking. Other milk proteins are retained in the liquid portion (whey).

Cheesemaking Process by which cheese is made from milk. Depending on the type of cheese being made, steps include preparation of the cheese milk, coagulation of milk with addition of cheese starters and rennets, draining of whey, pressing, shaping of curd, salting and ripening.

Cheesemaking milk Alternative term for cheese milk.

Cheese manufacture Alternative term for cheesemaking.

Cheese milk Milk used as the starting material in cheesemaking. Also called cheesemaking milk.

Cheese rind The outer surface of moulded, ripened cheese. Depending on the conditions used during ripening, a cheese rind may become thickened and develop a harder texture than that of the interior of the cheese. Can be coated with waxes or seasonings, inoculated with or treated to promote growth of specific microorganisms or, as in smear cheese, washed to inhibit microbial growth. Hard, thick cheese rinds, such as Parmigiano Reggiano cheese rind, is not usually eaten although may be used as seasonings, for example in soups. Softer rinds, such as the rind of Camembert cheese, can be consumed.

Cheese sauces Cheese flavoured white sauces used mainly for coating foods, e.g. macaroni, cauliflower or fish. Can be made at home, or purchased in ready to use format or as sauce mixes. Dishes that incorporate a cheese sauce are often known as mornay, e.g. eggs mornay or salmon mornay.

Cheese slices Presliced cheese of various types and thicknesses packaged for retail sale.

Cheese spreads Spreadable product made from cheese to which other milk products and possibly emulsifiers have been added.

Cheese starters Microbial cultures inoculated into milk to produce acidity by fermentation during manufacture of cheese. Commercial starter preparations are available in liquid form, or as freeze-dried or deep-frozen powders or granules. Composition of the culture is varied according to the type of cheese being made.

Cheese substitutes Artificial alternative to natural cheese.

Cheese varieties Specific types of cheese.

Cheese whey By-product of cheesemaking formed along with curd during coagulation of milk. Rich in milk proteins including α-lactalbumin and β-lactoglobulin. Whey is produced in large amounts, leading to disposal problems. As well as being utilized as a food ingredient, whey is used as a fermentation substrate and in animal feeds. Also known as lactose or serum.

Chelating agents Substances which form a stable chelate ring with free metal ions and can therefore be used in foods to help control the reaction of trace metals with other food components. They act as sequestants to prevent metal-catalysed oxidation, unwanted crystal formation and loss of nutritional quality in a variety of foods, and can also be used for the controlled release of metal ions for nutritional purposes or for controlled gelation in thickeners. Examples of chelating agents include EDTA (ethylenediaminetetraacetic acid) and glucono-δ-lactone.

Chemesthesis Complex sensation obtained from foods, regarded as a component of the sensory properties flavour and mouthfeel. Examples include the burn of capsaicin in chillies, the cooling sensation from menthol and the tingle associated with carbonated beverages.

Chemical oxygen demand Measure of the quantity of chemically oxidizable components present in water. Often abbreviated to COD. Generally reflects water quality, as COD values increase with increases in organic compounds and other pollutants. Measured during bioremediation of waste water prior to discharge into the environment to ensure minimal water pollution. Related to biological oxygen demand (BOD).
Chemiluminescence—Emission of light during a chemical reaction; may be used to measure that reaction.

Chemisorption—Adsorption of a gas by a solid in which the molecules of the adsorbed gas are held on the surface of the adsorbing solid by the formation of chemical bonds.

Chemistry—The science of the properties, structure and composition of elements and their compounds, including the transformations which they can undergo and the energy transfer during these reactions.

Chemometrics—The application of mathematics or statistical analysis to maximize the information that can be extracted from chemical data.

Chemostats—Apparatus for maintaining a microbial population in the exponential phase of growth by regulating the input of a rate-limiting nutrient, and removal of medium and cells. The concentration of biomass in the culture vessel remains constant and the culture is normally grown at a sub-maximal growth rate. Under steady-state conditions, the relationship between growth rate and concentration of growth-limiting substrate can often be predicted using the Monod equation, while specific growth rate is numerically equal to the dilution rate.

Chemotaxis—Movement of motile cells, including microorganisms, in response to chemical stimuli. Microorganisms move towards nutrients such as glucose and away from toxins. Some bacteria, such as Escherichia coli, possess several flagella that aid their motility. Chemotaxis is also an important virulence factor for pathogens.

Cherimoya—Common name for Annona cherimola, a member of the custard apples family. Native to South America, the edible fruits have a green, scaly surface and soft, yellowish white flesh containing a number of seeds. Fruits have a flavour similar to pineapples and are believed to be one of the finest tasting of the custard apples. They can be eaten raw or used in flavourings for beverages and foods such as ice cream.

Cherries—Reddish coloured stone fruits from trees of the Prunus genus. Can be classified into two main groups, sweet cherries (P. avium) and sour cherries (P. cerasus). Available fresh, dried, canned, frozen or brined (e.g. Maraschino cherries). Used as ingredients in many food products including cakes, pies, cherry brandy, cherry juices and confectionery.

Cherry brandy—Liqueurs made from cherries, which may be made with addition of crushed cherry stones to impart a characteristic bitter almonds flavour.

Cherry juices—Fruit juices extracted from cherries such as Prunus cerasus.

Cherry laurel—Common name for Prunus laurocerasus (syn. Laurocerasus officinalis). Similar in appearance (but unrelated to) bay. Leaves yield essential oils, which are used as flavourings in various types of foods, including desserts and confectionery, and beverages. Leaves contain hydrocyanic acid, which has to be removed from the oils prior to food use.

Cherry salmon—A Pacific salmon species (Oncorhynchus masou masou) from the northwest Pacific region; also known as masu salmon or Japanese char. Some forms remain in fresh water throughout their lives. A valued food fish in Japan, where its market price tends to be considerably higher than that of other salmon. Normally marketed fresh or frozen; also sold as a fermented sushi-like product.

Cherry tomatoes—Popular small-sized tomatoes characterized by an appealing bright colour and good flavour characteristics.

Chervil—Common name for Anthriscus cerefolium. A delicately flavoured herb which is used in a similar manner to parsley as a garnish or to flavour salads, sauces, and meat and fish dishes.

Chestnuts—Edible nuts from trees of the genus Castanea, particularly, C. sativa (Spanish or sweet chestnuts), C. mollissima (Chinese chestnuts) and C. crenata (Japanese chestnuts). Consumed as dessert nuts and also available in canned, pureed or ground forms. Used as an ingredient in confectionery and as an accompaniment to savoury dishes. May also refer to water chestnuts (Trapa natans) and Chinese water chestnuts (Eleocharis dulcis).

Chevon—Alternative term for goat meat; the term is commonly used in India.

Chewiness—Texture term relating to the extent to which a product needs chewing, or a measure of the effort needed to chew, i.e. its toughness, rubberiness or leatheriness in the mouth.

Chewing gums—Sweetened products made from chicle (gum-like exudate consisting of coagulated milky juice from the bark of the evergreen sapodilla tree, Achras zapota) or similar resilient substances (e.g. plasticized rubber or polymers), sugar or similar sweeteners. May also be made using a gum base, softeners and flavourings. Some chewing gums are specially formulated to promote dental health. Also known as chicle gums or gum balls.

Chewy candy—Candy that exhibits the texture property of chewiness. The temperature to which dissolved sugar is heated determines final candy texture. Sugar cooked to a temperature of approximately 115°C
results in a softer product. Examples include caramels and nougat.

Chhana  Indian style soft cottage cheese analogue prepared by heating milk (usually cow milk) to nearly boiling, adding acid coagulants while the milk is hot and removing whey by filtration. Used as a base for various Indian sweets, such as rasogolla and sandesh. Also known as channa.

Chicha  Corn based alcoholic beverages, which may be made by a combined alcoholic fermentation/lactic fermentation process, originating in Central and South America.

Chicken bones  Bones from chicken carcasses. During cooking, they darken in colour, and this change is increased by freezing and thawing prior to cooking. Chicken bones are commonly used to prepare chicken soups or are processed into animal feeds. Hot-water extracts prepared from chicken bones are used in many types of products, especially in flavourings. Exposure of chicken meat containing bone to a dose of ionizing radiation results in the formation of long-lived free radicals which give rise to characteristic electron spin resonance (ESR) signals. The presence of these signals provides clear evidence that chicken meat has been irradiated. Mechanical boning of chicken meat remains a problem to the meat industry, as bone fragments often remain in chicken fillets, escaping manual or X-ray machine detection.

Chicken drumsticks  Lower portions of the legs of chickens; they consist of the tibiotarsus and fibula bones with the surrounding chicken meat, cartilage and skin. Colour of meat from chicken drumsticks is darker than that of breast meat, primarily because chicken leg meat contains higher concentrations of myoglobin and haemoglobin than breast meat.

Chicken gizzard pickles  Pickles made from chicken gizzards. Usually prepared from sliced, cooked chicken gizzards, salt and water, and often mustard oil- or vinegar-based. Other ingredients may include garlic, ginger, cumin, red chilli, aniseed, caraway, turmeric, black pepper, cinnamon or cloves.

Chicken livers  Livers from chickens, part of edible offal. They are commonly cooked by sauteing, frying or grilling, or are used to prepare pates or mousses.

Chicken meat  Meat from chickens. Different proportions of red and white myofibrils produce light and dark meat in different parts of chicken carcasses. Chicken leg meat is darker than chicken breast meat. Composition of feeds influences flavour and colour of chicken meat. Compared with chicken meat produced in intensive systems, free-range chicken meat tends to have more flavour; however, it is tougher and, in developed countries, more expensive. Chicken meat can be roasted, grilled, poached or casseroled. Chicken are sold whole, or portioned into joints, including chicken breasts, wings, drumsticks and thighs.

Chicken mince  Meat mince prepared from chicken meat. It may be prepared specifically from light or dark chicken meat. Mince prepared from light coloured chicken meat has a lower content of saturated fats than mince prepared from dark chicken meat. Also known as ground chicken.

Chicken nuggets  Breaded, coarsely comminuted chicken products, usually reconstituted from deboned chicken meat. Formulations often include spent hen meat and offal. Quality of the product (often prime, choice or economy grades) differs with the proportion of lean meat to offal. Economy-type products tend to include higher proportions of offal and show higher cooking losses than the other types.

Chicken patties  Meat patties prepared from chicken mince.

Chicken products  Processed foods such as chicken nuggets, patties and sausages that are made from chicken meat.

Chickens  Birds of the genus Gallus belonging to the order Galliformes. These common domestic fowl are kept virtually worldwide for the production of chicken meat and eggs. Most commercial chicken farms use intensive systems; however, consumer concerns relating to animal welfare have led to an increase in the use of less intensive systems and free-range systems. Different gender and age groups of chickens are known as cocks (adult entire males), capons (adult castrated males), hens (adult females), cockerels and pullets (usually sexually mature young males and females, respectively) and chicks (sexually immature birds with down rather than feathers). Chickens are susceptible to avian flu and infection generally results in extensive culling which can lead to marked economic losses. Contact with infected birds can result in human illness, but the virus is not thought to survive thorough cooking.

Chicken sausages  Sausages prepared from chicken meat, often spent hen meat. Commonly they are made from mechanically recovered meat or chicken meat trimmings. They also tend to include chicken skin and the less preferred components of chicken offal, such as gizzards and hearts. Other ingredients may include water, salt, nitrates, pork fat, blood and phosphates.

Chicken skin  Skin from chickens. Antimicrobial treatment of chicken skin is commonly used to decrease bacterial contamination (and cross contamina-
Chihuahua cheese  

Chicory  

Common name for the tree *Cichorium intybus*. Utilized in a number of ways, some cultivars being grown for the root, a powder or extract from which is used as an additive in coffee, making a more bitter beverage. Other cultivars are grown for the leaves, which are used in salads or cooked as a vegetable. Some cultivars, such as *witloof*, are used to produce blanched leafy growths called *chicons*, which are eaten raw or cooked. Similar nutritionally to *lettuces and endives*.

Chihuahua cheese  

Mild-flavoured beans of *Cicer arietinum*. An important pulse in many regions including the Middle East, Mediterranean and Latin America. Chick peas can be divided into two major types: Desi, which are relatively small and dark in colour and the larger *Kabuli* which are of Mediterranean and Middle Eastern origin. Contain high amounts of good-quality protein and are also a good source of *folates* and other *B vitamins*. They are used in many foods including *salads, pasta and dips*, and are the basis of *humous* and *falafel*. Also known as *garbanzo beans* and *Bengal gram*.

Chicle gums  

Alternative term for chewing gums.

Chicory  

Common name for *Cichorium intybus*. Utilized in a number of ways, some cultivars being grown for the root, a powder or extract from which is used as an additive in *coffee*, making a more bitter beverage. Other cultivars are grown for the leaves, which are used in *salads* or cooked as a vegetable. Some cultivars, such as *witloof*, are used to produce blanched leafy growths called *chicons*, which are eaten raw or cooked. Similar nutritionally to *lettuces and endives*.

Chinese cabbages  

Cabbages of the species *Brassica pekinensis* or *B. chinensis*. The crinkly, thickly veined leaves are thin and crisp, cream in colour with green tips, and have a mild flavour. Rich in *vitamin A*, *folic acid* and *potassium*. Eaten raw or cooked as a vegetable. Many alternative names, including *napa cabbage*, *celery cabbage*, *Peking cabbage*, *wong bok*, *bok choi*, *pak choi* and *Chinese white cabbage*.

Chinese chives  

Common name for *Allium tuberosum*. Young leaves and flower stalks, with their *garlic*-like flavour, are used in *seasonings*. Also known as *garlic chives* and oriental *garlic*.

Chinese dates  

Alternative term for *jujubes*.

Chinese gooseberries  

Alternative term for *kiwi fruit*.

Chinese pears  

Fruits produced by *Pyrus chinensis*, *P. ussuriensis*, *P. bretschneideri* or, more generally, *P. pyrifolia*. Originally cultivated in China. *P. pyrifolia* is the oriental pear, also referred to as *Asian pears*.
Chinook salmon

Semi-cured sausages that are a speciality of Chistorra are usually cooked lightly before eating with potatoes. In the Basque region, they are smoked, slightly sweet and highly seasoned. Varieties include the lop chong. Chinese sausages are often added to stir-fry dishes.

Chinese water chestnuts

The most important processing quality parameters for chips are colour, flavour and texture.

Chips

Small pieces of food prepared by chopping or cutting, which are then usually fried. Include potato chips (French fries), corn chips and tortilla chips. The term is frequently used to refer specifically to potato chips in the UK and to potato crisps in the USA and continental Europe.

Chistorra

Semi-cured sausages that are a speciality of the Basque region of Spain. They are long, thin, flavourful pork sausages produced in links. Ingredients include garlic. Chistorra are lightly cured and dried for only a few days. In the Basque region, they are usually cooked lightly before eating with eggs or with local bread; however, they are also popular as flavourings for cooked dishes such as bean, lentil or rice casseroles.

Chitin

Homopolysaccharide, consisting of \( \beta(1 \rightarrow 4) \)-linked D-\( N \)-acetylglucosamine. Occurs in shells of crustacea and cell walls of fungi, and may be recovered from crustacea shell wastes. One of a number of effective thickeners and stabilizers. May also be used in functional foods, water purification, waste treatment and packaging applications.

Chitinases

Randomly hydrolyse \( N \)-acetyl-\( \beta \)-D-glucosaminide 1,4-\( \beta \)-linkages in chitin and chitodextrins. Produced by plants, fungi, yeasts and bacteria, these enzymes exhibit antifungal activity and can be used for processing shellfish wastes. Also responsible for haze formation in wines and are major allergens of fruits such as avocados, bananas, chestnuts and kiwifruit, causing latex-fruit syndrome.

Chitin deacetylases

Hydrolases which catalyse the hydrolysis of chitin into chitosan and acetate, via splitting of the \( N \)-acetamido groups of \( N \)-acytetyl-\( D \)-glucosamine residues. Chitosan forms have potential uses in functional foods and food preservatives.

Chitosan

Polysaccharide derived from chitin by partial deacetylation with a strong base. Often obtained from shellfish wastes. Used with other fining agents for clarification of beer and wines. Improves flocculation and thus minimizes haze. Also used in functional foods, filtration (e.g. for wine purification) and packaging. Exhibits antimicrobial activity and can extend shelf life.

Chitosanases

Glycosidases which hydrolyse \( \beta \)-1,4-linkages between \( N \)-acytetyl-D-glucosamine and \( D \)-glucosamine residues in partly acetylated chitosan. Act only on polymers with 30-60% acetylation. These enzymes can degrade the cell walls of microorganisms that contain glucosamine polymers and can be used for production of chitooligosaccharides, which have a number of potential uses in the food industry.

Chitterlings

Term applied to the small intestines, usually from swine, when prepared for use as food. May be used as an ingredient of sausages or pies, or may be eaten raw. Consumption of raw chitterlings has been associated with food poisoning where preparation conditions have not been hygienic. Also called chitlings.

Chives

Common name for Allium schoenoprasum. Fresh leaves have a mild onion-like flavour and are chopped and used as a garnish in soups and salads. Also available as a dried herb. Chinese chives are A. tuberosum.

Chlamydomonas

Genus of unicellular green algae of the family Chlamydomonadaceae. Occur in freshwater habitats and on damp soils. Used as a model for cell and molecular biology research studies.
Chloramines 

Antimicrobial compounds that decompose slowly to release chlorine. May be used in the treatment of water supplies.

Chloramine T An N-chloro sulfonamide used as an antiseptic, disinfectant and biocide. Used as an antimicrobial agent for control of parasites and disinfection of drinking water. Employed in the food industry for disinfection of equipment before processing.

Chloramphenicol Highly active antibiotic used both in treatment and prophylactically in a range of animals, including poultry, calves, swine and goats. Also used in salmon and trout for the treatment of furunculosis. Classified by WHO as moderately hazardous (WHO Ib). Potentially genotoxic; use is restricted in many countries and sterilizing agents. Chlorine gas is toxic.

Chlorine dioxide Gaseous chlorine compound which is used in oxidizing agents-type disinfectants, used for sterilization of foods and water. Chlorine dioxide is toxic.

Chlorine Sulfuric acid (HCl), which is used in food processing. May be used as an oxidizing agent for disinfection of equipment before processing. Chlorine gas is toxic.

Chlorofluorocarbons Abbreviated to CFC. Any class of synthetic compound of carbon, hydrogen, chlorine and fluorine used as refrigerants and aerosol propellants. Commercial CFC are nonflammable, noncorrosive, nontoxic and odourless, but are known to be harmful to the ozone layer. The most common commercial CFC, marketed as Freons, are trichlorofluoromethane (CFC-11) and dichlorodifluoromethane (CFC-12).

Chloriform Colourless, heavy, volatile, toxic liquid. Used as a solvent, fumigant and insecticide. Also known as trichloromethane.

Chlorogenic acid Synonym for caffeoylquinic acid. Phenol present in many foods of plant origin. Plays an important role in enzymic browning of fruits and vegetables. Has antioxidative activity, pesticides such as HCH, heptachlor, aldrin, endrin, dieldrin, PCB, DDE and DDT. Suspected of being carcinogenic, and characterized by accumulation in the food chain and very slow biodegradation. May contaminate fish and shellfish when discharged into the sea along with industrial effluents.

Chlorination Insertion of a chlorine atom into a compound, or treatment of an item with chlorine gas (Cl₂). For example, chlorine gas can be used in sterilization of water.

Chlorine Member of the halogens group, chemical symbol Cl. Chlorine and its compounds have strong microbiocidal activity and are used in the food industry as disinfectants and sterilizing agents. Chlorine gas is toxic.

Chlorine dioxide Gaseous chlorine compound which is used in oxidizing agents-type disinfectants, used for sterilization of foods and water. Chlorine dioxide is toxic.

Chlorite Sial of chlorous acid, used as a solvent, fumigant and insecticide. Also known as chloraxanil.
and may contribute to possible health-promoting or protective actions of dietary phenolic compounds.

**Chloromycetin** Alternative term for the antibiotic chloramphenicol.

**Chlorophenol** Organic halogen compound used in pesticides and wood preservatives. Formed in water and waste water as a result of chlorination. Chlorophenol contamination may cause taints in foods, beverages or water.

**Chlorophos** Alternative term for the insecticide tri-chlorfon.

**Chlorophyllases** EC 3.1.1.14. Esterases which catalyse the degradation of chlorophylls to phytol and chlorophyllide. Involved in desirable colour changes during ripening of fruits but also in post-harvest quality deterioration of broccoli and other green vegetables. Of use commercially for enzymic decoloration of chlorophyll-containing products, e.g. vegetable oils, as an alternative to chemical bleaching.

**Chlorophylls** Green photosynthetic pigments of the porphyrins class which occur in leaves and other plant tissues. May be used as food colorants, but stability is poor.

**Chloropicrin** Soil fumigant which may occur as residues in foods. Also one of the disinfection by-products which may be formed during chlorination of drinking water.

**Chloropropanols** Organochlorine compounds regarded as food contaminants, formed as a result of food processing and/or storage. In particular, the carcinogens 1,3-dichloro-2-propanol (1,3-DCP) and its precursor 3-monochloropropane-1,2-diol (3-MCPD) have been detected in foods, including soy sauces and products containing acid-hydrolysed vegetable proteins.

**Chlorothalonil** Non-systemic protectant foliar fungicide used for control of fungal diseases in a wide range of crops. Classified by WHO as unlikely to present acute hazard in normal use. Also known as daconil and tetrachloroisophthalonitrile.

**Chloropropham** Selective systemic carbamate herbicide and plant growth regulator. Used for pre-emergence control of many annual grasses and some broad-leaved weeds in a wide range of vegetable crops; also used in antipsprouting agents for potatoes. Classified by WHO as unlikely to present acute hazard in normal use. Also known as CIPC.

**Chlorpyrifos** Non-systemic organophosphorus insecticide and acaricide used for control of biting and chewing insects in a wide range of fruits, vegetables and cereals; also used for stored cereals and in animal rearing facilities. Classified by WHO as moderately hazardous (WHO II). Also known as dursban.

**Chlorpyrifos-methyl** Non-systemic organophosphorus insecticide and acaricide used for control of biting and chewing insects in a wide range of fruits, vegetables and cereals; also used for stored cereals. Classified by WHO as unlikely to present acute hazard in normal use.

**Chlortetracycline** Broad-spectrum tetracycline antibiotic used for treatment and control of a wide variety of bacterial infections in farm animals. Readily disperses throughout tissues; rapidly depletes following withdrawal in most cases.

**Chocolate** A confectionery product made from hulled, fermented and roasted cocoa beans (nibs), blended with sugar, fats (cocoa butter or cocoa butter substitutes) and lecithins. Milk solids may be added to produce milk chocolate. Fat is an important component since its particular melting profile contributes to the mouthfeel of the product. Chocolate contains theobromine, an alkaloid with effects similar to those of caffeine.

**Chocolate bars** Chocolate products that may or may not contain added ingredients or fillings, such as nuts, toffee, biscuits and dried fruits, formed into bars.

**Chocolate beverages** Hot or cold beverages in which chocolate is a main ingredient.

**Chocolate chips** Small pieces of chocolate used as ingredients in confectionery and bakery products.

**Chocolate coatings** Chocolate preparations used to coat various products such as sugar confectionery, bakery products, fruit or ice cream. Formed by pre-crystallization of chocolate, coating of the food and cooling. Pre-crystallization and cooling affect the gloss, degree of solidification and coat thickness of the coatings produced.

**Chocolate confectionery** Collective term for chocolate and chocolate products.

**Chocolate couverture** Chocolate which contains maximal levels of cocoa butter, used as coatings for high quality chocolate products.

**Chocolate crumb** Intermediate material produced during manufacture of milk chocolate, composed of dried milk, sugar and cocoa mass.

**Chocolate desserts** Desserts containing chocolate as a main ingredient, e.g. chocolate flavoured milk puddings and chocolate mousses.

**Chocolate dragees** Confectionery products composed of hard centres coated with chocolate.

**Chocolate fillings** Chocolate products used as fillings for various products, including sugar con-
Chocolate liquor

chocolate products and snack foods. May also refer to fillings (e.g. creme fillings) used for chocolates.

Chocolate liquor Fermented and roasted cocoa beans, which are ground finely to form a paste used in the manufacture of chocolate and cocoa powders. Grinding releases fats (cocoa butter) from the cells of the cocoa beans which helps the chocolate to flow. Also called chocolate mass, cocoa mass and cocoa liquor.

Chocolate mass Alternative term for chocolate liquor, produced by grinding dehusked cocoa beans, or nibs, to a paste from which chocolate and chocolate products are made. Also called cocoa mass and cocoa liquor.

Chocolate milk Chocolate flavoured milk-based beverage.

Chocolate powders Manufactured from cocoa powders which are agglomerated to form larger particle sizes. Used in the manufacture of chocolate beverages.

Chocolate products Products such as chocolate bars, drinking chocolate and chocolate desserts that are made from chocolate or have chocolate as a major constituent.

Chocolates Sweets made or coated with chocolate.

Chocolate truffles Small, round chocolates with a soft and creamy centre, which may be flavoured, often with fruit flavourings or liqueurs.

Chokeberries Pea-sized fruits produced in red and black varieties by plants of the genus Aronia. Black chokeberries, produced by A. melanocarpa, are violet-black in colour with a strong sour flavour. They are rich in vitamins and minerals and have a high content of flavonoids. Fruits are eaten fresh or preserved by canning or by drying whole or as a pulp. Juices may be extracted to make jellies. Also used commercially as a source of natural colorants.

Cholecalciferol Synonym for vitamin D₃, one of the group of sterols which constitute vitamin D. Fat-soluble vitamin necessary for formation of the skeleton and for mineral homeostasis. Produced on exposure to UV light from the sun from the provitamin 7-dehydrocholesterol, which is found in human skin. Alternative recommended name is calcitriol.

Cholera Acute infectious human disease characterized by profuse diarrhoea leading to extreme dehydration that can result in shock, renal failure and death. Caused by cholera toxin produced by Vibrio cholerae. Spread by the faecal-oral route, usually via faeces-contaminated water and food.

Cholera toxin Toxin produced by Vibrio cholerae that is responsible for cholera.

Cholesterol One of the sterols, and the major sterol found in vertebrate mammals. Present in all plasma membranes, but found especially in blood, liver, nerve tissue, brain tissue and animal fats. A precursor of many steroids, including the bile acids and steroid hormones. Not an essential dietary requirement; consumption of high levels have been associated with atherosclerosis and coronary heart diseases. Several health foods are claimed to reduce serum cholesterol levels; production of cholesterol-reduced products, especially dairy products and eggs, is increasing.

Cholesterol oxidases EC 1.1.3.6. Catalyse the oxidation of cholesterol to cholest-4-en-3-one and H₂O₂. These oxidases may be used in biosensors for the determination of cholesterol levels in foods.

Cholesterol oxidation products Oxidized cholesterol derivatives, also known as oxysterols, which have been linked to a range of adverse health effects including cytotoxicity, atherogenicity and carcinogenicity. Cholesterol oxidation products have been identified in a range of foods, including eggs, meat, dairy products and sea foods. Their formation can be influenced by food processing and storage conditions.

Cholesterol oxides Type of cholesterol oxidation products.

Choline An amino alcohol and biogenic amine precursor with activity similar to that of vitamin B group members. Occurs widely in living organisms as a constituent of certain types of phospholipids (lecithins and sphingomyelin) and in the neurotransmitter acetylcholine. Choline is synthesized in the body, is a ubiquitous component of cell membranes and therefore occurs in all foods. Rich sources include egg yolks, meat, livers and cereals.

Cholinesterases Accepted name for EC 3.1.1.8 and an alternative name for EC 3.1.1.7 (accepted name: acetylcholinesterases). The former enzymes act on a variety of choline esters. Both esterases have been used in biosensors for detection of insecticides and drugs residues in water and foods.

Choloylglycine hydrolases

Cholesterol oxidases EC 3.5.1.24. Hydrolases which catalyse the hydrolysis of trihydroxycholanoylglycine and dihydroxy derivative into trihydroxycholanate and glycine. Also act on choloylglycine. Activity is common in meat, cereals, eggs and dairy products, especially meat. Both cholanoylglycine and cholanoylglycine are claimed to reduce serum cholesterol levels; production of cholesterol-reduced products, especially dairy products and eggs, is increasing.

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Chondroitin One of the glycosaminoglycans and, as chondroitin sulfate, a constituent of connective tissues, predominantly cartilage and bone. May be obtained from fish processing wastes or animal carcasses. Used in functional foods and food supplements intended for improving joint health.

Chondrus Genus of seaweeds containing the edible species Chondrus crispus (Irish moss), which has cartilaginous, dark purplish-red fronds. This species provides a source of carrageenans (sulfated polysaccharides) which are used as food emulsifiers.

Chopi Common name for the Asian plant, Zanthoxylum piperitum. Peel from the dried fruits of this plant is used as a spice and the leaves are also used in flavourings for foods. The dried fruits have an aromatic lemon-like aroma, while the leaves have a flavour with tones of mint and lime. Extracts of peel and leaves have antimicrobial activity. Also known by a variety of other names, including Sichuan pepper and Chinese pepper.

Chopping Cutting of foods into bite-sized (or smaller) pieces with repeated, sharp blows with knives or cleavers, usually on chopping boards. A food processor may also be used to chop foods.

Chopping boards Boards made from wood, plastics or glass on which food is placed for cutting with knives or cleavers (chopping). For safety reasons, it is best to use one board for vegetables and another (preferably wood) for raw meat. Hot water and detergents should always be used in conjunction with scrubbing to wash a chopping board after each use. Plastics and glass boards may be cleaned in dishwashers.

Chorizo Highly spiced, fermented pork sausages, made from coarsely comminuted meat, which is flavoured with garlic, paprika and other spices. Three major types are produced, namely fresh, semi-dried and dried. Air dried chorizo is sliced and eaten raw. Other types of chorizo are cooked by grilling or frying, or are added to other meat in spicy casseroles, soups and stews. Smoked versions of chorizo are also produced. Chorizo are used widely in Spanish and Mexican cookery. Spanish chorizo are made from smoked pork and are sold ready-to-eat, whilst Mexican chorizo are made from fresh pork and require cooking before eating.

Christstollen Rich bread/cake originally from Germany that contains dried fruits and nuts and is traditionally eaten at Christmas. Alternative term for stollen.

Chromatography Techniques in which components of a gaseous or liquid mixture are separated on the basis of differences in the rate at which they migrate through a liquid or solid stationary phase under the influence of a gas or liquid mobile phase. Once separated, individual components can be measured or identified by various methods. Types of chromatographic techniques include gas chromatography, thin layer chromatography, affinity chromatography and ion exchange chromatography, classified according to characteristics of the method.

Chromium Mineral, chemical symbol Cr, which is widespread in foods. An essential nutrient at low concentrations, but toxic in excess.

Chromobacterium Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Neisseriaceae. Occur in soil and water. Generally non-pathogenic; however, some species can infect mammals, including humans. For example, Chromobacterium violaceum is a pathogen found in water. C. viscosum also produces lipases of potential commercial interest.

Chromoplasts Plastids found in plant cells which contain pigments such as carotenoids and xanthophylls. Present especially in flowers and ripe fruits.

Chromosomes Self-replicating structures consisting of or containing DNA that carries genetic information essential to the cell. Bacterial chromosomes are usually circular and present as a single type within a cell, although many copies may be present in each cell. Eukaryotic chromosomes are complexed with proteins (chromatin) and located in the nucleus. They are present as pairs and each cell may contain a single type or many different types, depending on the organism.

Chrysanthemum Genus of flowering plants, the flowers and leaves from some species of which are consumed as vegetables. Commonly used species include the garland chrysanthemum (Chrysanthemum coronarium).

Chrysene Member of the carcinogenic polycyclic aromatic hydrocarbons (PAH) group which can occur as a contaminant in foods.

Chryseobacterium Genus of aerobic Gram negative bacteria of the Flavobacteriaceae family. Many species from this genus were formerly classified as Flavobacterium. Found widely in foods, such as milk, meat and fish. Many species produce enzymes of industrial interest, such as metalloenzymes, protein glutaminases and keratinases.

Chrysin Member of the flavones. Synonyms include 5,7-dihydroxy-2-phenyl-4H-1-benzopyran-4-one and 5,7-dihydroxyflavone. One of the bioactive compounds present in plants, honeys and propolis. Shown to inhibit synthesis of oestrogens in vitro and is classed as one of the phytoestrogens. As with
other plant polyphenols, exhibits antioxidative activity.

**Chrysosporium** Genus of keratinophilic filamentous fungi of the order Onygenales. Common in soil, plant material and birds. Can cause occasional spoilage problems in the food industry.

**Chub** Freshwater fish species (*Leuciscus cephalus*) of minor commercial importance belonging to the family Cyprinidae (minnows and carps). Found in rivers and lakes, and sometimes brackish water, in Europe and Asia Minor. Popular as a game fish. Eaten fresh or smoked.

**Chub mackerel** Marine fish species (*Scomber japonicus*) from the mackerel family; widely distributed in the Indian and Pacific Oceans. Commercially cultured in Japan. Flesh is fatty with a strong flavour. Marketed fresh, frozen, smoked, salted and occasionally canned. Also known as Pacific mackerel and Spanish mackerel.

**Chufa nuts** Stem tubers of *Cyperus esculentus*, cultivated in West Africa. Eaten raw or roasted, or used to make non-alcoholic beverages. Also known as tiger-nuts.

**Chukars** Partridges which are similar to the red-legged partridge, but belonging to the genus *Alectoris*. There are two species. Chukars are hunted as game birds, but are also farmed successfully. Battery-farmed chukars slaughtered at 14-20 weeks of age have ready-to-cook yields (from live weight) of approximately 75%. A large proportion of the boneless cooked meat yield is breast meat.

**Chum salmon** Pacific salmon species (*Oncorhynchus keta*) found in coastal waters and rivers along the Pacific coasts of North America and Japan. Flesh has highly regarded flavour and texture; occurs in pink or white forms. Mainly canned but also sold fresh, dried-salted, smoked, and frozen. Roes are utilized in caviar substitutes.

**Chungkook-jang** Traditional Japanese and Korean fermented product made from soybeans. Also known as chunggugjang.

**Churning** Process used in buttermaking. Agitation or churning of cream breaks down the milk fat globule membranes, allowing individual milk fat globules to coalesce into grains which eventually separate from the buttermilk.

**Chutneys** Fruit or vegetable pickles, containing ingredients including spices and sugar. Originally an Indian delicacy.

**Chymosin** EC 3.4.23.4. Broad specificity similar to that of pepsin A. Also known as rennin. Component of rennets, it initiates the clotting of milk by cleavage of the Phe105-Met106 bond in the κ-chain of casein. Found in the fourth stomach of calves although microbially-produced recombinant enzymes are now widely available. Used extensively in cheesemaking.

**Chymotrypsin** EC 3.4.21.1. One of the proteinases which is produced as an inactive precursor. This serine endopeptidase cleaves peptide bonds immediately after a Tyr, Trp, Phe or Leu residue.

**Chymotrypsin inhibitors** Molecules, generally proteins, which inhibit the activity of chymotrypsin (EC 3.4.21.1, a serine proteinase). These inhibitors occur naturally in a range of plant foods, particularly seeds, where they play a role in plant defence against pests and pathogens. However, they can also act as antinutritional factors in plant foods, reducing the digestibility and nutritional values of these foods for humans. Cooking and other processing treatments can reduce levels of chymotrypsin inhibitors in plant foods. Efforts are also being made to breed plants with reduced levels of these compounds.

**Cider** Alcoholic beverages made by fermentation of apple musts. In most parts of the world, the term refers to fermented apple juices, but in the USA and parts of Canada, this alcoholic beverage is termed hard cider, and the term cider refers to unfermented apple juices. To produce cider, apples are washed and mashed, pressed, and fermented in oak vats using natural or added yeasts. Taste varies from sweet to dry. Appearance ranges from very dark, cloudy and sludgy, through to crisp, clean and golden yellow. Popular drink in the UK, especially the south-west, but also popular in Brittany and Normandy in France, in Ireland and northern Spain.

**Cider apples** Cultivars of apples grown for use in cider production.

**Cider vinegar** Fruit-flavoured vinegar made by refermenting cider or apple wines. Used widely as a table vinegar, especially in the USA and apple growing regions of Europe.

**Cider yeasts** Yeasts used for fermentation of apple musts to produce cider.

**Ciguatera** Food poisoning caused by consumption of tropical marine fish containing a neurotoxin (ciguatoxin) produced by certain dinoflagellates. Symptoms include abdominal pain, nausea and vomiting and multiple, varied neurological disorders. Ciguatera poisoning is the most common nonbacterial, fishborne poisoning in the USA (mainly Hawaii and Florida) and is a significant health concern in tropical areas worldwide. Species of fish most frequently implicated in ciguatera outbreaks include grouper, amberjack, red snappers, eels, sea bass, barracuda and Spanish mackerel.
Ciguatoxin Neurotoxin produced by dinoflagellates associated with coral reefs, which can accumulate in fish and cause ciguatera poisoning in consumers. *Gambierdiscus toxicus* is the dinoflagellate most notably responsible for production of ciguatoxin, although other species have been identified recently. At least five types of ciguatoxin have been identified and are noted to accumulate in larger and older fish higher up the food chain.

Cimaterol β-Adrenergic agonist used to enhance growth rates and improve feed efficiency and lean meat content of animals. Use as a growth-promoting agent in farm animals is not permitted in many countries.

Cineole Member of the terpenes class of flavour compounds, which occurs in many spices and essential oils.

Cinnamaldehyde Member of the phenolic aldehydes class of flavour compounds, characteristic of cinnamon but also occurring in other foods. Has antimicrobial properties.

Cinnamic acid Member of the phenolic acids class of flavour compounds which occurs in a wide range of foods. Cinnamic acid esters are also important flavour compounds. Cinnamic acid and its esters have antimicrobial activity.

Cinnamon Widely-used aromatic spice obtained from the dried inner bark of trees belonging to several species of *Cinnamomum*. True cinnamon (also known as Ceylon cinnamon) is *C. zeylanicum*, while much of the cinnamon sold in North America is actually cassia (*C. cassia*). Cinnamon is used in stick (quill) or ground form for flavouring both sweet and savoury foods, including confectionery, meat dishes and cola beverages.

Cinnamon oils Essential oils obtained from either cinnamon bark or cinnamon leaves. Cinnamon leaf oil has a high eugenol content and is used as an alternative to clove oils in seasoning blends. Cinnamon bark oil is characterized by a high cinnamaldehyde content and is used as the source of cinnamon essences for cooking.

CIPC Alternative term for the herbicide chlorpropham.

Ciprofloxacin Fluoroquinolone antibiotic used for treatment and control of gastrointestinal and respiratory infections in farm animals.

Circular dichroism Phenomenon (usually abbreviated to CD) that is observed when optically active matter absorbs left and right hand circular polarized light differently. CD is a function of wavelength and is measured using a CD spectropolarimeter. CD spectra vary according to secondary structure and can be analysed to give information about the secondary structure of biological macromolecules such as peptides, proteins and nucleic acids.

Citral Member of the terpene aldehydes class of flavour compounds. Occurs in a wide range of plant foods, especially coriander, pepper, lemon peel and ginger.

Citrate salts of citric acid which occur naturally in many foods, and may be used as acidulants in foods and beverages.

Citrates Synthases Includes EC 2.3.3.1 (citrate (S)-synthases; formerly EC 4.1.3.7) and EC 2.3.3.3 (citrate (R)-synthases; formerly EC 4.1.3.28). These two transferases exhibit opposite stereospecificities and are involved in the formation of citric acid from acrylic-CoA and oxaloacetic acid. Occur in all living organisms, and are involved in energy metabolism. Implicated in meat quality and in acidity of fruits.

Citric acid Commercially important, versatile organic acid, widely used, along with its salts (citrates), in the food and beverage industries. Highly soluble in water and used in acidulants, antioxidants, flavourings, antimicrobial compounds and chelating agents. Usually obtained commercially by fermentation of sugar or fruit processing wastes by *Aspergillus niger* or *Yarrowia lipolytica*. Isomer of isocitric acid.

Citric fermentation The process by which certain organisms produce citric acid. *Aspergillus niger* is the organism mostly used in industrial processes. Substrates include molasses and starch hydrolysates.

Citrinin Yellow-pigmented mycotoxin produced by *Penicillium citrinum* and some *Aspergillus* spp. Used as an antibacterial agent against Gram positive bacteria.

Citrobacter Genus of rod-shaped coliform Gram negative bacteria of the family *Enterobacteriaceae*. Occur as part of the normal flora in the intestines of humans and other vertebrates, and are not considered to be enteric pathogens. Also occur in water, sewage and soil. Species may be found in dairy products, raw shellfish, raw poultry meat and fresh, raw vegetables.

Citronella Tropical Asian grass (*Cymbopogon nardus*). Lemon-scented leaves are used in flavourings in cooking and as a tea. Source of essential oils that are used in commercial flavourings as well as in perfumery and insect repellents.

Citronella essential oils Yellow aromatic oils obtained from lemon-scented tropical grasses of the *Cymbopogon* genus (particularly *C. nardus*). Used in the food industry and as an aromatic/deodorizer in per-
fumes, cosmetics, soaps and insect repellents. Contains geraniol, citronellol and citronellal.

Citronellal Member of the terpene aldehydes group of flavour compounds, which occurs in essential oils of citrus fruits and a wide range of spices.

Citronellol Member of the terpene alcohols group of flavour compounds. Occurs in a wide range of plant foods, including fruits, essential oils, ginger and wines.

Citrons Long citrus fruits produced by Citrus medica, with thick peel and acid flesh. Used in production of candied peel, preparation of which involves fermenting immature fruits in brines and then soaking in a strong sugar solution. The candied peel is used in confectionery products.

Citrus beverages Beverages based on citrus juices and/or whole homogenates of citrus fruits.

Citrus essential oils Essential oils obtained from citrus fruits, e.g. bergamot oils. Typically produced by pressing the oil from citrus peel, although leaves, fruit or juice may also be used as the source. Applications include use as flavourings for soft drinks, ice cream, chewing gums and puddings. Limonene and other terpenes are major components. However, these are frequently removed prior to use of the oils, due to their susceptibility to off-flavour production as a result of oxidation. Also known as citrus oils.

Citrus fruits Fleshy and juicy fruits produced on trees of the genus Citrus. Include oranges, lemons, grapefruit, limes, tangerines, satsumas, mandarins and many hybrid varieties. All are rich in vitamin C.

Citrus juice concentrates Citrus juices which have been concentrated. May be diluted to produce normal strength citrus juices or used in manufacture of other beverages or foods.

Citrus juices Fruit juices extracted from citrus fruits; important types include orange juices, lemon juices, lime juices and grapefruit juices.

Citrus oils Alternative term for citrus essential oils.

Citrus pectins Pectins extracted from citrus fruits. Citrus peel is one of the main commercial sources of pectins.

Citrus peel Outer skin of citrus fruits, consisting of the outer coloured flavedo (also called the epicarp or zest) and the white inner pith (also called the albedo or mesocarp). The flavedo is the source of citrus essential oils, while the albedo is used as a source of pectins. Peel is also rich in fibre and phytochemicals. Often candied and used in baking, or used in making flavourings.

Citrus red Dye used to improve the colour of orange peel.

CJD Abbreviation for Creutzfeldt-Jakob disease.

Cl Chemical symbol for chlorine.

CLA Abbreviation for conjugated linoleic acid.

Cladosporium Genus of fungi of the class Hyphomycetes. Occur on fruits and vegetables. Cladosporium herbarum may cause spoilage of chilled meat. Other species may be responsible for spoilage of butter, margarines, stone fruits, eggs and grapes.

Clams General name given to a wide range of bivalve molluscs; typically marine bivalves with equally sized valves that burrow in mud or sand. Many clams are valued as seafoods and are eaten in a variety of ways, including baked, fried, stewed, stuffed, raw on the half shell, and in chowders and soups.

Clarification Process in which sediment and impurities are separated out of a liquid to make it clearer. Rendered fats can be clarified by adding hot water and boiling. The mixture is then strained and chilled. The resulting top layer of fat should be almost entirely clear of residue. Other products to which clarification is applied include fruit juices, wines and beer.

Clarifiers Equipment used for the process of clarification, in which sediment and impurities are separated out of a liquid to make it clearer.

Clarity Optical properties relating to the extent to which an item is clear and transparent.

Clary sage essential oils Essential oils extracted from clary sage (Salvia sclarea) by steam distillation. The essential oils are light golden yellow in colour and have an earthy, herbaceous aroma with a subtle fruity note. The constituents of these oils include linalyl acetate, linalool, myrcene, phellandrene and pinenes. The oils are important components of flavourings for Muscat wines.

Clastogenicity Capability of an agent to cause disruption or breakages in chromosomes.

Clavaria Genus of edible wild club fungi of the class Hymenomycetes.

Claviceps Genus of fungi of the order Clavicipitales. Typically parasitic to grasses. Causes plant diseases such as ergot, a disease of rye.

Clays Sticky impermeable earth that can be moulded when mixed with water and baked to make containers. Clay is plastic when moist and becomes permanently hard and retains its shape when baked or fired.
Cleaning

Of widespread importance in industry, clays consist of a group of hydrous aluminosilicate minerals. Individual mineral grains are microscopic in size and shaped like flakes. This makes their aggregate surface area much greater than their thickness and allows them to take up large amounts of water by adhesion, giving them plasticity and causing some varieties to swell. Clays are effective filter aids and are used during adsorption bleaching of oils.

Cleaning To make a surface free from dirt, pollutants or harmful substances.

Cleaning agents Agents, such as disinfectants, used in the cleaning process.

Cleaning in place A process in which processing equipment is cleaned using an in-place cleaning system that is usually computer controlled. Cleaning in place (CIP) systems are useful for equipment that is not easily accessible to the operator, and when opening the equipment would be harmful to the operators or the environment, and detrimental to product quality.

Clean in place Alternative term for cleaning in place.

Clean room technology Technology that incorporates use of a sterile, dust-free environment. Objectives of a clean room are to isolate a controlled area from the outside, and to control movement of materials and personnel. Parameters requiring control in a clean room are temperature, relative humidity, water activity, pressure, noise and lighting. Sources and parameters of potential contamination include air quality, type and geometry of air intake systems, personnel, machinery and equipment, waste produced and packaging materials.

Clementines Citrus fruit regarded as a cultivar of tangerines or a hybrid of tangerines and sweet oranges. Rich in vitamin C.

Clenbuterol One of the β-agonist drugs which is used in some countries as a growth promoter in slaughter animals. There is concern that residues in meat may present a health hazard.

Clipping A method for closing bags, sacks or tubes. Clipping machines are also used for applying clips to close the ends of sausages.

Cloned animal foods Meat and milk derived from the offspring of cloned animals, not from the cloned animals themselves. Experimental evidence suggests that the composition of foods from the progeny of cloned cattle, swine and goats is not significantly different from that of foods from their conventionally bred genetic counterparts, and that such foods are safe for human consumption. Insufficient information currently exists to reach the same conclusion about foods from cloned sheep and other animals. Advantages of cloned animal foods include their consistent quality (e.g. meat tenderness), but their widespread acceptance in the marketplace may depend on consumer attitudes.

Cloned animals Animals (including cattle, sheep, goats, swine) obtained via cloning technology for food production and other purposes, usually by somatic cell nuclear transfer, in which the nucleus is removed from an oocyte, forming an ooplast, and is replaced with a nucleus from a donor animal with desirable traits. The fused donor nucleus and ooplast are implanted into the uterus of a surrogate animal, leading to generation of a genetic copy of the donor animal. Cloned animals are not genetically modified; their DNA is identical to that of existing animals. Advantages associated with rearing of cloned animals include improved disease resistance, optimal body type for food production, improved fertility and adaptability to particular types of consumer preference.

Cloning technology Use of various genetic techniques for producing copies of single genes or segments of DNA by insertion in cloning vectors (e.g. plasmids or viruses). These vectors can then be introduced into recipient cells and propagated. The term also involves production of genetically identical cells (clones) from a single ancestor. In plants, the term refers to natural or artificial vegetative propagation.

Cloning vectors Autonomously replicating DNA molecules (e.g. plasmids, viral genomes and yeast artificial chromosomes) into which foreign DNA fragments can be inserted. They can then be inserted into host cells, propagated and, in the case of expression vectors, used for production of homologous or heterologous proteins.

Clostridium Genus of Gram positive, anaerobic rod-shaped bacteria. Occur in soil and in the intestinal tracts of humans and other animals. Some species are pathogens, e.g. Clostridium botulinum, the causal agent of botulism, and C. perfringens.

Closures Devices or packaging components used for closing or sealing of containers. Include caps, corks, crown corks, lids, stoppers and tamper evident closures.

Clotting The process of coagulation to produce a thick mass of cohesive material, e.g. formation of curd upon coagulation of milk.

Cloud Turbidity or haze within a product, usually applied to beverages.

Cloudberries Fruits produced by Rubus chamaemorus. Orange-yellow with an appearance similar to raspberries and a flavour like apples. Usually eaten stewed or as jams.
Cloudiness Extent to which an item is turbid, i.e. hazy in appearance. Usually applied to liquids such as beverages.

Clouding agents Substances used to impart the appearance of turbidity to foods and beverages. Soy proteins and citrus fruit processing wastes are frequently used as clouding agents in citrus beverages.

Clove oils Essential oils extracted from the flowers or buds of Eugenia caryophyllata by steam distillation. Possess a warm, spicy and fruity aroma, and exhibit antimicrobial activity. The constituents of these oils include eugenol, eugenyl acetate and caryophyllene.

Cloves Pungent, aromatic spices obtained from the dried, unopened flower buds of the tropical evergreen tree Syzygium aromaticum (syn. Eugenia caryophyllata, E. caryophyllus). Used whole or ground in a range of foods and beverages, including cakes, biscuits, sauces, curries and mulled wines.

Clove oils Semisynthetic penicillin antibiotic used principally to treat staphylococcal infections. Also known as cloxacillin.

Clovis Alternative term for carpet shells.

Cloxacillin Alternative term for carpet shells.

Cloves Pungent, aromatic spices obtained from the dried, unopened flower buds of the tropical evergreen tree Syzygium aromaticum (syn. Eugenia caryophyllata, E. caryophyllus). Used whole or ground in a range of foods and beverages, including cakes, biscuits, sauces, curries and mulled wines.

Cluster beans Seeds of Cyamopsis tetragonoloba. Immature pods are eaten as vegetables. Galactomannans are extracted from the seeds to make guar gums, which are used as stabilizers and thickeners in foods. Also known as guar beans.

CMC Abbreviation for carboxymethylcellulose.

CO₂ Chemical formula for carbon dioxide.

Coagulants Substances or agents that cause separation or precipitation of solids from a solution, a process known as coagulation or clotting. Examples include rennets, calcium sulfate and acid whey, which are commonly used to produce cheese, tofu and chhana, respectively.

Coagulation Precipitation of solids from a solution, usually upon addition of specific agents, producing material of a solid or semi solid state. Coagulation is a process particularly applicable to cheesemaking. Also known as clotting.

Coagulum Formed by precipitation of casein by the action of acids or rennets, as in cheese curd.

Coalfish Marine fish species (Pollachius virens) from the cod family (Gadidae) found in the northern and western Atlantic and Barents Sea. This species is often used in production of fish cakes, but is also marketed fresh, dried/salted, smoked, canned and frozen. Also known as pollock and saithe.

Coal tar dyes Artificial colorants originally obtained from coal tar hydrocarbons. The term is now used to refer to any artificial organic dyes or pigments, regardless of source. Also known as aniline dyes.

Coating Covering food with a layer of coating material. For example, chicken pieces may be dipped or rolled in seasoned breadcrumbs or flour prior to cooking. The food can be dipped into beaten eggs, milk or beer before being coated with the dry mixture, to aid adhesion of the coatings to the food. Coating food in this manner usually precedes frying or baking. Products such as mayonnaise or sauces can also be used to coat food.

Coatings Materials which form thin continuous layers or coverings over the surface of foods. Used to enclose and/or protect the food, and may be eaten along with the food or removed before consumption. Include batters, breadcrumbs, breadings, carnauba wax, chocolate coatings, shellac and wax coatings.

Cobalamin Term that covers several chemically related compounds, members of the vitamin B group, that are essential for cell division in tissues where this process is rapid, e.g. in formation of red blood cells. Deficiency leads to pernicious anaemia when immature red blood cells are released into the bloodstream, and there is degeneration of the spinal cord. This type of anaemia is the same as seen in folates deficiency.

Cobalt Mineral, chemical symbol Co, which is widespread in foods. An essential nutrient, but toxic in excess.

Cobnuts Alternative term for hazelnuts.

Coca-cola A proprietary brand of cola beverages.

Coci Spherical, or near spherical, bacterial cells.

Coccidiostats Drugs used for control of pathogenic protozoa (from class Coccidia) responsible for coccidiosis and other parasitic diseases. Normally used prophylactically in feeds for poultry, swine, cattle and sheep. Examples include dimetridazole, nicarbazin and salinomycin.

Cochineal Water-soluble natural red colorant obtained from the dried bodies of South American insects (Coccus cacti). The red colour is due to carminic acid, whose aluminium lake is known as carmine.

Cockles General name used for several species of marine bivalve molluscs, characterized by a shell having convex radial ribs. Commonly eaten species include Cerastoderma edulis (common cockle), Car-
**Cockroaches** Common name for orthopteran insects of the family Blattidae, which possess flat wide bodies, and long slender segmented antennae. Widespread pests in human dwellings and food factories. May be pests of stored foods and act as vectors for pathogens.

**Cocktails** Alcoholic beverages generally based on a mixture of spirits with flavourings or other ingredients.

**Cocoa** Small tropical American tree (Theobroma cacao) that are rich in theobromine. After fermentation and roasting, cocoa beans are used to make cocoa, chocolate and their products. Sometimes refers to highly concentrated cocoa powders made by grinding and removing most of the fats (cocoa butter), or a milk-based beverage made with such powders. Also known as cacao.

**Cocoa beans** Seeds or fruits of the cocoa tree (Theobroma cacao) that rich in theobromine. After fermentation and roasting, cocoa beans are used to make cocoa, cocoa powders, chocolate and their products. Also known as cacao beans.

**Cocoa beverages** Beverages based on cocoa (Theobroma cacao) solids.

**Cocoa butter** Edible vegetable fat obtained by pressing or solvent extraction of ground, roasted dehulled cocoa beans (Theobroma cacao). Composed of symmetrical disaturated oleic glycerol esters resulting in brittleness at room temperature and a sharp melting point at 31-35°C. Used primarily in the food industry for manufacturing chocolate.

**Cocoa butter equivalents** Vegetable fats with similar triacylglycerols composition and physicochemical properties to cocoa butter. Used for partial or complete replacement of cocoa butter.

**Cocoa butter extenders** Vegetable fats that may be mixed with cocoa butter to a limited degree without significantly affecting its physicochemical properties.

**Cocoa butter replacers** Alternative term for cocoa butter substitutes.

**Cocoa butter substitutes** Fractionated fats based on various oils (palm, palm kernel, coconut or hydrogenated soybean) designed to replace cocoa butter in confectionery applications. Also known as cocoa butter replacers.

**Cocoa liquor** A suspension of cocoa particles in cocoa butter that has produced by milling cocoa beans that have undergone dehulling (cocoa nibs).

The grinding process generates heat which melts the fats, causing them to become liquid. Cocoa liquor is a key component of chocolate that is also known as chocolate liquor, chocolate mass and cocoa mass.

**Cocoa mass** Produced by grinding of cocoa nibs (cocoa beans from which the shell or husk has been removed) to release the cocoa butter from the cells. Used in the manufacture of chocolate and chocolate products. Also called cocoa liquor, chocolate liquor and chocolate mass.

**Cocoa nibs** Cocoa beans that are separated from their husks and broken into small pieces. Used in the manufacture of chocolate.

**Cocoa powders** Products obtained by extracting a predetermined amount of cocoa butter from chocolate liquor using hydraulic presses, and grinding the resulting press cake. Cocoa powders produced are classified according to fat contents.

**Cocoa products** Products such as cocoa beverages and cocoa powders that are made from cocoa or contain cocoa as a major constituent.

**Cocona** Fruits produced by Solanum topiro or S. sessiliflorum. Orange to maroon in colour, with white to pale yellow flesh. Rich in iron; good source of vitamin A, vitamin C and niacin. Used in salads, cooked with fish or in meat stews, sweetened in sauces and pies, pickled, candied or in jams and jellies. Often processed as a nectars or juices. Leaves are also cooked and eaten as a vegetable.

**Coconut butter** Alternative term for coconut oils when in its semi-solid state.

**Coconut cream** Product similar to coconut milk, but richer. Relatively high fat content, with level varying among commercial brands. For the canned product, coconut milk is filtered, mixed with emulsifiers and stabilizers, and emulsified to give a creamy consistency, before pasteurization and canning. Used in the same way as cream in many recipes and also in beverages.

**Coconut milk** Liquid prepared by squeezing freshly grated coconut endosperm through sieves. Relatively high in fat, level varying among commercial brands. Used in products such as curries and confectionery.

**Coconut oil** Semi-solid white fats or pale yellow to colourless oils extracted from copra, the dried pulp of coconuts, Cocos nucifera. Rich in lauric acid and myristic acid and used extensively in the food industry. Also known as copra oils.

**Coconuts** Common name for Cocos nucifera. Fruits of the coconut palm consisting of an outer skin, a fibrous region and a hard shell enclosing the commer-
Coconut toddy  Alcoholic beverages made by fermentation of the sap of coconut palms (*Cocos nucifera*).

Coconut water  The liquid enclosed within the kernels of *coconuts* (*Cocos nucifera*), which may be used in beverages.

Cocos  Genus of palms. In some, including the coconut palm (*Cocos nucifera*) and *C. yatay*, fruits, buds and inflorescences are eaten or used in making foods and beverages.

Cocoyams  Starchy corms of *Xanthosoma sagittifolium* (‘new’ cocoyams, also called tannia or yautia) or *Colocasia esculenta* (‘old’ cocoyams, alternative term for *taro*) that form part of the staple diet in African countries. Eaten roasted, boiled or baked; the flour prepared from the corm is used as a food ingredient and for making fufu.

Cod  Name given to several marine fish species from the family Gadidae. The principal cod species is *Gadus morhua* (Atlantic cod) which is widely distributed in the North Atlantic and Barents Sea and in commercial terms is the most important food fish in northern Europe. Flesh is lean, firm and white. Other cod species include *G. macrocephalus* (Pacific cod), *G. ogac* (Greenland cod) and *Boreogadus saida* (Arctic cod). Marketed fresh, frozen, smoked. Often processed as a battered product for frying, grilling or baking.

Codex Alimentarius  An international food code with the main purposes of protecting consumer health, ensuring fair trade practices in the food trade and promoting coordination of all food standards work undertaken by international governmental and non-governmental organizations. Includes standards, codes of practice, guidelines and recommendations covering general topics (such as labelling, hygiene, additives, residues and risks assessment) and detailed requirements relating to a specific food or group of foods, while other texts deal with the operation and management of production processes or the operation of government regulatory systems for food safety and consumer protection. The Codex Alimentarius Commission, established in 1963 by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) as the body responsible for compiling the publications that constitute the Codex Alimentarius, usually meets every two years. Membership of the Commission is open to all Member Nations and Associate Members of FAO and WHO.

Cod liver oils  Pale yellow oils derived from the livers of Atlantic cod (*Gadus morhua*) and other species of the family Gadidae. Have a typical fish-like flavour which is intensified on exposure to light. Rich in vitamin A and vitamin D. Contain saturated, monoenoic and polyunsaturated fatty acids, such as eicosapentaenoic acid and docosahexaenoic acid.

Cod livers  Livers from members of the cod family (Gadidae) which are an important source of fish oils. Cod livers are also used in the production of cod liver pastes, which contain spices and other flavourings and are marketed canned and in the form of sausages.

Coeliac disease  Life-long intolerance to wheat gluten, characterized by inflammation of the proximal small intestine. The disease is often manifested as persistent diarrhoea, malabsorption and malnutrition. Aetiological mechanisms include genetic predisposition, dietary exposure to wheat and immunological factors; prevalence of the disease is high in geographical areas where wheat is a dietary staple. Management of the condition involves consumption of a gluten free diet, which has been facilitated by the development of gluten free foods, especially gluten free bread.

Coenzyme Q  Member of the quinones family. Various kinds of coenzyme Q are distinguished by their number of isoprenoid side chains. The most common form in human mitochondria is Q10 which functions as an electron-carrying coenzyme in the mitochondrial electron transport system and as an antioxidant in mitochondria and lipid membranes. Marketed widely as a nutritional supplement. Also known as ubiquinone.

Coenzymes  Low molecular weight non-protein organic molecules, whether freely dissociable or firmly bound, necessary for the activity of certain enzymes.

Coertuek  Common name for *Echinophora tenuifolia* subsp. *sibthorpiana* which is used as a spice and source of essential oils in Turkey.

Coextrusion  The process of producing continuous multilayer products in sheet, film, tubing, filament, or other forms, and for production of filled foods. Separate polymer or ingredient streams are fed from different extruders to a die feed block, where they are combined in the die, emerging in combined form as a continuous multilayer extrudate.

Cofermentation  Fermentation of two or more substrates by a single microorganism or fermentation of a single substrate by two or more microorganisms.
Coffee beverages prepared from ground roasted coffee beans (Coffea arabica and C. canephora).

Coffee bags  Ground roasted coffee packaged in portion-size bags for easy infusion to produce coffee beverages.

Coffee bars  Restaurants serving coffee and light refreshments.

Coffee beans  Seeds of the coffee bush (Coffea arabi- bica or canephora) which are used to prepare coffee beverages. As grown, coffee beans are enclosed in soft fruits; these are fermented, and the seeds (coffee beans) are separated from the soft tissue. Raw coffee beans are roasted and ground before use in preparation of beverages.

Coffee beverages  Beverages prepared by infusion of ground roasted coffee beans in hot water by a variety of processes. Optionally consumed with addition of other substances, commonly milk, cream or sugar. Types of coffee beverages include espresso coffee, cappuccino coffee and cafe latte.

Coffee cream  In Germany, cream with a minimum fat content of 10% marketed also with fat contents of 12 and 15%. Also called drinking cream. Whitening power in coffee is increased by homogenization; further processing is performed to increase stability of higher fat products in hot coffee.

Coffee essences  Concentrated coffee extracts.

Coffee extracts  Liquid extracts from coffee beans, containing active ingredients and flavour compounds; coffee extracts may be used for preparation of coffee beverages.

Coffee granules  Dried coffee extracts presented in the form of granules.

Coffee grounds  Roasted coffee beans which have been ground ready for use in preparation of coffee beverages.

Coffee oils  Volatile, water soluble substances formed during roasting of coffee beans so that the sugars and carbohydrates within the bean become caramelized. Contribute to the flavour and aroma of coffee.

Coffee powders  Dry coffee extracts in the form of powders.

Coffee products  Products such as coffee powders, coffee extracts and coffee beverages that are made from coffee or contain coffee as a major constituent.

Coffee substitutes  Materials for preparation of beverages with sensory properties resembling those of coffee. Commonly based on roasted plant materials, e.g. grains or chicory roots.

Coffee whiteners  Whiteners used in coffee and tea beverages as an inexpensive alternative to milk. Typically made from vegetable fats, casein, carbohydrates, emulsifiers and stabilizers. Available in liquid or powdered (shelf stable) forms.

Cogeneration  The simultaneous production of electricity and thermal energy (such as heat or steam), often for industrial or commercial uses. These products may be generated as by-products of industrial processing, e.g. the production of electricity from sugar cane in a sugar factory.

Cognac  A high quality brandy manufactured in a defined district in the Charente and Charente Maritime regions of France.

Cognitive development  The process by which the brain develops its ability to think, learn, reason and remember. This process starts from infancy and continues through childhood, adolescence and adulthood.

Nutrition  can play a role in cognitive development, e.g. breast feeding can have a positive effect.

Cognitive performance  Behavioural effects relating to acquisition and use of knowledge (perception, attention, memory, speech and language, and reasoning). Some foods can affect cognitive performance.

Coho salmon  Pacific salmon (Oncorhynchus kisutch) found in rivers and coastal waters along western and eastern Pacific coasts. High fat, firm-textured flesh is somewhat lighter in colour than that of other Pacific salmon. Marketed fresh, dried/salted, smoked, canned, cured and frozen.

Cohumulone  a-Acids fraction present in hops and hop products and contributing to the bittering action of hops in beer.

Cola beverages  Soft drinks flavoured with extracts of cola nuts.

Cola nuts  Nuts produced by Cola nitida and C. acuminata. Used in manufacture of soft drinks such as cola beverages, or chewed as a stimulant. High caffeine content. Also known as kola nuts.

Colby cheese  Semi-soft washed-curd cheese from the USA, made from cow milk. Ripens in 4 months. It has a sweet and mild flavour and must be eaten soon after purchase to prevent drying out and loss of flavour.

Cold boning  Cutting of meat (muscle) from animal carcasses that have been refrigerated at 1-2°C for 48 h post mortem.

Cold shock proteins  Protein fractions which are synthesized in various bacteria in response to cold shock, and which contribute to cold tolerance and psychrophilic properties of these bacteria.

Cold shortening  Contraction of muscle fibres in raw meat at low temperatures. Related to toughness in the meat once cooked.

Cold storage  Storage of foods at refrigeration temperature in order to extend shelf life.
**Cold stores** Refrigerated rooms or cabinets used for storage of foods at low temperatures, to extend shelf life.

**Coleslaw** Salad of shredded vegetables, principally cabbages, dressed with mayonnaise or an alternative creamy dressing.

**Colicins** Bacteriocins produced by members of the family Enterobacteriaceae (e.g. strains of *Escherichia coli* and *Shigella sonnei*) which are often lethal to other susceptible bacterial strains within this family.

**Coliforms** Anaerobic, lactose-fermenting, rod-shaped Gram negative bacteria, typically found in the gastrointestinal tracts of humans and animals (e.g. species of the genera *Citrobacter*, *Enterobacter*, *Escherichia* and *Klebsiella*). May loosely refer to any Gram negative, rod-shaped, enteric bacteria. Used as indicators of faecal contamination of water.

**Coliphages** Bacteriophages that infect *Escherichia coli*.

**Collitis** Inflammatory disease of unknown cause which affects some or all of the colon. Takes various forms, e.g. ulcerative colitis, mucus colitis or ischaemic colitis, which differ in symptoms and effects, and tends to vary in intensity over time. Sensitivity to diet depends on the individual, but in general foods and beverages which act as bowel irritants should be avoided. These include tea, coffee, alcoholic beverages, vinegar, spicy foods, fried foods, sugars and salty foods.

**Collagen** Insoluble animal proteins, with high contents of the amino acids glycine, hydroxyproline and proline. Collagen is the main fibrous component of skin, tendons, connective tissues and bones. Networks of collagen are also present in tissues and organs including the muscles. Thermal denaturation of collagen occurs between 60 and 90°C. When collagen is boiled it is converted into soluble gelatin. Collagen is important in relation to meat texture. Collagen crosslinks link together molecules and fibrils of collagen, increasing its tensile strength; thus, the greater the number of crosslinks the tougher the meat. In cooked meat, the presence of collagen crosslinks contributes to shrinkage and tension development, with a subsequent increase in meat toughness. Collagen is used to form edible, biodegradable films and coatings for the packaging of foods.

**Collagenases** A group of proteinases which digest collagen. Includes microbial collagenases (EC 3.4.24.3), which can act as exotoxins in pathogens such as *Clostridium* spp. Also includes interstitial collagenases (EC 3.4.24.7); these metalloendopeptidases are useful for tenderization of meat, while proteolytic digestion products of collagen are useful as seasonings and ingredients. Have detrimental effects on the texture of fish during storage, although fish and shellfish processing wastes are a useful source of collagenases for commercial applications.

**Collagen sausage casings** Edible and inedible sausage casings, which are regenerated from collagen extracted from animal hides and skins. Edible collagen casings have very uniform physical characteristics and are much stronger than natural casings; they are mainly used to prepare fresh pork sausages and frankfurters. Inedible collagen casings must be removed before sausages are eaten; their advantages include strength, uniformity and shrinkage characteristics.

**Collards** Leaves of a smooth-leaved variety of kale. Used as a vegetable. Good source of vitamin A, vitamin C, calcium and iron.

**Colletotrichum** Genus of mitosporic fungi of the family Phyllachoraceae. Some species are important plant pathogens. For example, *Colletotrichum gloeosporioides* causes anthracnose of tropical fruits (e.g. mangoes and papayas), and *C. musae* causes anthracnose and crown rot of bananas.

**Colloidal stability** A measure of the longevity of colloids; the ability to maintain the suspension of one material in another.

**Colloids** Mixtures containing small particles of one material suspended in another, often of a different phase. Colloidal particles are generally 1 to 100 nm in size and so are larger than the individual solution molecules, but smaller than particles found in precipitates, which can be removed by filtration. Examples of colloids include aerosols, foams, emulsions and gels. A colloid containing solid particles suspended in a liquid is more accurately called a sol.

**Collybia** Edible fungi, some species of which are members of the genus *Flammulina* or *Lentinus*.

**Colonization** Formation of population groups (colonies) of the same types of microorganisms by adherence to cells, surfaces or nutrient media. In foodborne diseases, often the first stage of pathogenesis.

**Colonization factors** Virulence factors produced by microorganisms that assist in colonization of cells, surfaces or nutrient media. Include adhesins, fimbriae and pili.

**Colony counting** Enumeration of cell colonies in a given sample cultured on a solid medium.

**Colony counts** Numbers of cell colonies in a given sample cultured on a solid medium.

**Colorants** Substances that impart colour, such as dyes or pigments. Added to foods to improve visual
appearance, replace colour lost during processing and ensure colour consistency. Broadly classified into natural colorants and artificial colorants, depending on whether they are substances extracted from natural sources or manufactured for use as a food additive.

Colorectal cancer Malignant diseases of the large intestine. Dietary factors suggested to be associated with reduced risk for this cancer include increased intakes of dietary fibre, fruits and vegetables and reduced intakes of meat and iron.

Colorimeters Instruments that measure the contents of components in a sample solution by comparison of colour with that of standard solutions.

Colorimetry Analytical technique based on comparison of the colour of a solution with that of a standard solution.

Colostrum Mammary secretion produced during the first 4-5 days post partum. Differs from mature milk mainly in the high content of immunoglobulins, which provide passive immunization of the suckling infant or animal. Other differences in composition include increased contents of milk fats, short chain fatty acids, lactoferrin, minerals, most vitamins, some hormones and some organic acids in colostrum, and reduced contents of medium-chain fatty acids, lactose, orotic acid, and some vitamins and hormones.

Colour Optical properties relating to the subjective appearance of the wavelength or wavelengths present in a beam of light perceived by the eye. Although it is actually continuous, the visible spectrum is usually split into seven major colours - red, orange, yellow, green, blue, indigo and violet - in order of decreasing wavelength. Colour of foods not only helps to deter- mine quality, but is also an index of ripeness or spoilage. Various types of spectrophotometers or colorimeters can be used for colour measurement.

Column chromatography Chromatography technique in which a column or tube is used to hold the stationary phase.

Colupulone β-Acids fraction present in hops and hop products.

Colza oils Alternative term for rapeseed oils.

Comamonas Genus of rod-shaped, motile Gram negative bacteria of the family Comamonadaceae. Some species accumulate poly-β-hydroxybutyrate and some produce biotechnologically useful enzymes such as esterases and quinohaemoprotein alcohol dehydrogenases.

Combustion In general terms, process in which a substance reacts with oxygen or other oxidant giving off heat and light. As an analytical technique, a method for determination of nitrogen and crude protein in a sample by burning in oxygen and measurement of the nitrogen gas produced.

Comet assay Method for detection of DNA damage in eukaryotic cells which involves gel electrophoresis and is used as a measurement of genotoxicity. It involves: embedding cells in agarose gels on microscope slides; lysis of cells to remove cellular proteins; unwinding of DNA content at neutral or alkaline pH values; electrophoresis; and visualization of DNA via staining with a DNA-binding dye, usually an emitter of fluorescence. The pattern seen resembles a comet with a greater mass of intact nuclear DNA being trailed by a streak of DNA fragments. The size of the streak correlates positively with the amount of DNA damage.

Comfrey Common name for the herb Symphytum officinale, a member of the borage family. Leaves and stems can be eaten, usually boiled or fried, and leaves and roots can be dried and used to make herb tea. The plant is also used in flavourings and health foods. Contains pyrrolizidine alkaloids, which can be toxic.

Comminution Reduction of a food to minute particles or fragments. A number of techniques are available including crushing, shredding, grinding and mincing.

Common Agricultural Policy The internal agricultural support system of the European Union, intended to provide stable agricultural markets and incomes for European farmers and food for European consumers through a system of domestic support, market access protection and export subsidies. Abbreviated to CAP.

Common beans Seeds produced by Phaseolus vulgaris. Vary in size, shape and colour. Eaten fresh, canned or frozen, and available dried. Also used as ingredients in many dishes. Due to the presence of antinutritional factors, dried seeds must be soaked and cooked well before consumption. Beans produced by this species have been given a variety of names, including French beans, kidney beans, haricot beans, snap beans, string beans, cannellino beans and pinto beans.

Common millet Cereals belonging to the genera Panicum and Setaria.

Complexometry Technique in which a substance is measured by the extent to which a complex is formed with an agent. Used to indicate the end point of a titration by formation of a coloured complex.

Composite flours Products made by blending wheat flour with flour of other origins. Often used to make
Compressibility

Conarachin

One of the main concentrated rectified musts, grape musts, which have been purified (e.g. by ion exchange) and concentrated. May be used as a source of added sugar in winemaking, to increase alcohol concentration in the wines or to increase sweetness of wines.

Compressibility

One of the rheological properties, and a measure of the degree to which matter can be squashed or crushed by an externally-applied force. Indicates the hardness, firmness or sponginess of a material.

Compressimeters

Apparatus used for determining compressibility.

Compression

Flattening of an item by pressure.

Computerized data processing

Analysis and organization of data by the repeated use of one or more computer programs.

Concomitants

Fruit products made by stewing fruits with sugar or in syrups; eaten hot or cold.

Concentration

The process by which the strength of a solution or substance is increased. Achieved by a variety of means, including evaporation, filtration and dialysis.

Conching

The final step in chocolate manufacture, in which machines with rotating blades slowly blend heated chocolate liquor, ridding it of residual moisture and volatile acids. Conching continues for 12 to 72 hours (depending on the type and quality of chocolate), while small amounts of cocoa butter and sometimes lecithins are added to give chocolate its smooth texture.

Condensation

The conversion of a vapour or gas to a liquid. In physics, condensation is the process of reduction of matter into a denser form, as in the liquefaction of vapour or steam. Condensation is the result of the reduction of temperature by removal of latent heat of evaporation, the liquid product being known as condensate. Condensation is an important part of the process of distillation. In chemistry, condensation is a reaction involving the union of atoms in the same or different molecules. The process often leads to elimination of a simple molecule such as water or alcohol to form a new and more complex compound, often of greater molecular weight.

Condensed milk

Milk thickened by evaporation of a considerable amount of its water content. Usually sold in cans and may be sweetened or unsweetened. Unsweetened milk is similar to evaporated milk, i.e. sterilized by heat, sold in a range of fat contents and may be reconstituted by addition of water in amounts stated on the packaging. Sweetened condensed milk contains sugar in amounts high enough to act as a preservative, and is used in baking and to make sweet products such as confectionery, puddings and pies.

Condiments

Distinctly flavoured products used to season foods. Refers in particular to items that are added to foods at the table immediately prior to consumption (e.g. sauces, relishes and mustard), rather than items added during cooking. Can include salt, pepper and other spices.

Conductimetry

Technique in which the concentration of a substance in solution is measured by conductance of that solution when an alternating current is applied. Changes in conductance can be used to indicate the end point of a titration. Alternative spelling is conductometry.

Conductivity

Alternative term for electrical conductivity or thermal conductivity. The former is a measure of the ability of a material to carry an electric current. The latter is a thermophysical property relating to the rate of conduction of heat through a material.
Confectionery Generic term for sweetened food products. Sugar confectionery refers to products such as sweets, candy and chocolates, while bakers confectionery refers to bakery products such as cakes and pastries.

Confectionery bars Sugar confectionery products formed into bars. Examples include chocolate bars.

Confectionery cream Water-in-oil or oil-in-water emulsions used mainly as fillings for bakery products.

Confectionery fillings Products such as fondants or cremen which may contain nuts, flavourings or other ingredients and are used to fill sugar confectionery or bakery products.

Confectionery pastes Products containing ingredients such as glucose syrups, sugar, fats, colourants and flavourings that are used in the production of extruded sugar confectionery.

Confectionery products A generic term for items produced by the confectionery industry. Includes both sugar confectionery and bakers confectionery.

Confections Sweet food products, particularly sugar confectionery.

Conger eels Marine eels within the family Congridae, which includes several species targeted for consumption. Important species include Conger conger (from the Eastern Atlantic Ocean around Europe), C. oceanicus (from the Western Atlantic) and C. verrauxi (caught around the coasts of Australia and New Zealand). Conger eels are often consumed smoked or semi-preserved in jelly.

Conglycinin One of the main soy proteins, present as β-conglycinin, which is composed of α, α’ and β subunits. The 7S β-conglycinin and 11S glycinin together account for approximately 70% of the storage proteins in soybeans.

β-Conglycinin One of the main soy proteins, composed of three subunits (α, α’ and β). A 7S globulin which, along with glycinin, makes up approximately 70% of the storage proteins in soybeans.

Conjugases Alternative term for γ-glutamyl hydrolases.

Conjugated fatty acids Positional and geometric isomers of polyunsaturated fatty acids, containing at least 1 pair of double bonds separated by a single bond. Include conjugated linoleic acid (CLA) isomers found in meat and dairy products. Other conjugated fatty acids occur in plants, including various isomers of octadecatrienoic acid in vegetable oils from pomegranates, marigolds and Catalpa ovata seeds.

Conjugated linoleic acid Group of linoleic acid isomers with conjugated double bonds, particularly the isomer cis-9,trans-11-octadecadienoic acid. Occurs naturally in ruminant fats, especially milk fats. Thought to have beneficial effects on health, including anticarcinogenicity, antiatherogenic activity, immunological effects, and improvement of lipids metabolism and body composition. Commonly abbreviated to CLA.

Connect Elastic protein found in muscle foods (meat and fish), in which it is important for texture and tenderness. Similar to titin.

Connective tissues Tissues that connect, bind, support or separate organs or tissues. Connective tissues include cartilage, ligaments, tendons, adipose tissues, the non-muscular structures of blood vessels and the matrix of bones. In fish, collagen connective tissues separate the myotomes (muscle segments). In animals, connective tissues consisting of both collagen and elastin bind muscle fibres into bundles and support the blood vessels. Toughness of meat is correlated with connective tissue content. On cooking, the collagen component of connective tissues is converted into gelatin, thereby making meat more tender; however, the elastin component is unchanged on heating. Frying or roasting have little effect on meat tenderness, but tough meat is made more tender by stewing.

Conophor nuts Common name for seeds produced by Tetracarpidium conophorum. They have a bitter taste when raw, but are palatable when boiled and are a popular snack in Nigeria. Also used as a source of oils.

Consistency Texture term relating to the degree to which a product, usually a thick liquid, is viscous or dense. The simplest method to determine consistency is to measure the time it takes for the food to run through a small hole of a known diameter. Another popular technique involves measurement of the time it takes for more viscous foods to flow down an inclined plane using Bostwick consistometers. These devices might be used with tomato ketchups, honeys or sugar syrups.

Consistometers Instruments used to measure the uniformity and consistency of a manufactured material, such as a food product. The Bostwick consistometer is widely used to evaluate consistency of food suspensions. The Bostwick measurement is the length of flow recorded in a specified time.

Consommes Clear soups made by clarifying broths, usually fish or meat based. May be served hot or cold. Sometimes used as bases for sauces. The term double consomme refers to one which has been
Consumer acceptability

Extent to which a commercial product is considered satisfactory by consumers. In the case of foods and beverages, overall acceptability is judged on the basis of a number of factors, including sensory properties, physical properties such as colour, appearance and texture. Evaluation of consumer acceptability is important in development and marketing of new products.

Consumer complaints

Expression of dissatisfaction made by consumers regarding a commercial product or service. With respect to foods and beverages, the term covers complaints made at a local level, e.g. regarding the acceptability of a meal served in a restaurant, through to those reported to official agencies, e.g. regarding contamination of products with foreign objects or food poisoning incidents.

Consumer education

Provision of a variety of forms of training to consumers so as to increase their knowledge of a product or service.

Consumer information

Information, such as guidelines and details of use, given to consumers so as to increase their awareness of products and services.

Consumer panels

Groups of consumers employed during sensory analysis tests who are not specifically trained but can provide a good insight into consumer preference.

Consumer preference

Extent to which consumers like one commercial product more than others. In the case of foods and beverages, preference is governed by a range of factors, including sensory properties, appearance, physical properties, texture, health concerns, price and type of packaging. Evaluation of consumer preference variables is important in development and marketing of new products.

Consumer research

Any form of marketing research undertaken using the final consumers of a product or service from which to gather data. For example, consumer preference data are obtained and information is gathered on the way in which consumers in a free market choose to divide their total expenditure in purchasing goods and services.

Consumer response

Behaviour that consumers exhibit when provided with information in areas such as product purchase, new product development and product labelling. Covers concepts such as consumer attitudes, consumer awareness, consumer choice, consumer complaints, consumer expectations and consumer preference.

Consumer surveys

Marketing research tools used to gather data on consumer response to a particular product or service.

Controlled atmosphere storage

Storage of fruits and vegetables in sealed warehouses where temperature and humidity are closely controlled, and the composition of gases in the atmosphere is altered to minimize spoilage. Usually, the concentration of oxygen is reduced, the concentration of carbon dioxide (CO₂) is increased, and ethylene, a gas naturally produced by plants that accelerates ripening, is removed from the atmosphere. This controlled environment helps slow the enzymic reactions that eventually lead to decomposition and decay, and may increase the time that produce can be stored by several months. Ripening rooms, in which ethylene gas is added to the atmosphere, also help produce higher quality fruits and vegetables. This technology enables produce to be picked...
before it is ripe, for easier handling, and then ripened quickly and uniformly under controlled conditions.

**Control systems** Systems in which inputs and outputs are progressively altered in a well-planned way to cause a process or mechanism to conform to some specified behaviour under a set of given constraints. Computer-based control systems for large industrial plants can involve control of hundreds or thousands of individual variables. Recent developments in control engineering include self-tuning and adaptive control systems, in which controller settings are modified automatically in response to changing process and/or disturbance conditions, and the application of neural networks and artificial intelligence techniques, which mimic the actions of skilled human operators.

**Convenience foods** Processed foods that can be quickly and easily prepared by the consumer. Examples include ready to eat meals, cooked sliced meat, sauces for pasta and pizzas and microwaveable foods.

**Conveying** Process by which items are transported or carried to a particular place.

**Conveyors** A continuous moving band used for transporting objects from one place to another. Conveyors include simple chutes, unpowered roller conveyors, and a range of powered systems in which materials are carried along by belt, bucket, screw, trolley, or other arrangement. Pneumatic conveyors are tubes in which goods - usually in a finely divided form - are moved along by blowers.

**Convicine** Member of the pyrimidine glucoside class of antinutritional factors occurring in faba beans, broad beans and other legumes. Causes the haemolytic disease favism in susceptible individuals.

**Cook chill foods** Foods, particularly ready meals, produced by cook chill processing and kept at low temperatures (<5°C) from manufacture to point of sale. The minimal processing involved results in high-quality convenience foods with a short shelf life. Generally packaged in plastics trays, as either ready to eat foods or easily reheatable products.

**Cook chill processing** A method of catering that involves cooking of foods in batches to a just done status followed by immediate, fast chilling (using blast chilling or water bath chilling techniques) to just above freezing point. Products are then stored for reheating at a later time. The cook chill process offers a cost effective means of providing quality food while reducing overhead costs.

**Cookers** Appliances for cooking foods, domestic cookers typically consisting of an oven, hob and grill.

**Cookies** US term for biscuits. Compared with other types of biscuit, cookies tend to be larger, with a softer, chewier texture. In some parts of the UK, the term refers to sweet buns that are filled with cream or topped with icings.

**Cooking** Process of preparation of foods by mixing, combining and heating the ingredients. Heat-activated cooking methods take five basic forms. Food may be immersed in liquids such as water, stocks, or wines (boiling, poaching, stewing); immersed in fats or oils (frying); exposed to vapour (steaming and, to some extent, braising); exposed to dry heat (roasting, baking, broiling); and subjected to contact with hot fats (sauteing).

**Cooking fats** Fatty substances such as butter, margarines and vegetable shortenings which are solid at room temperature and are used to moisten, enrich, tenderize and flavour foods during cooking.

**Cooking loss** Quality characteristic relating to the extent to which nutrients and water are lost from foods during cooking.

**Cooking oils** Fatty substances such as sunflower oils, olive oils and groundnut oils which are liquid at room temperature and have usually been refined, bleached and deodorized. May be used for deep frying, or in baking, frying and grilling of foods.

**Cooking properties** Ability of a food product to have acceptable properties upon cooking, particularly relating to texture, flavour and colour.

**Coolers** Devices or containers for making or keeping items cool.

**Cooling** Process by which the temperature of items is lowered, usually after some form of cooking.

**Cooperatives** Business organizations that are owned and run jointly by their members, with profits or benefits shared among them. For example, farmers have formed cooperatives for many purposes, including marketing of produce, purchasing of production and home supplies, and provision of credit. Farm marketing associations are the most important type of agricultural cooperative. Farm purchasing cooperatives rank second in importance.

**Coppas** Italian raw, fermented pork sausages. Traditionally prepared from entire swine neck muscles, which are deboned and sliced before curing and ripening in casings. However, some coppa may include ingredients such as air-dried neck of pork, swine skin and cartilage. At least three groups of microorganisms (lactic acid bacteria, Micrococcaceae and yeasts) are active in the ripening of coppa. Coppas are usually served in slices.

**Copper** Mineral, chemical symbol Cu, which is an essential nutrient, but toxic in excess. Copper and its alloys (brass, bronze) may be used in construction of
food processing equipment. Copper ions are prooxidative, and may cause taints in wines.

**Copra** Dried white flesh of coconuts (*Cocos nucifera*) from which coconut oils are extracted.

**Copra oils** Alternative term for coconut oils.

**Coprinus** Edible fungi, commonly consumed species including *Coprinus comatus* and *C. cinereus*. Also known as ink cap mushrooms, some species being used in manufacture of ink.

**Cordials** Term which refers to two types of product: concentrated and sweetened fruit-based beverages; and sweet liqueurs.

**Cordyceps** Genus of ascomycete fungi containing approximately 300 species. Used as foods and herbal medicines in Asian countries. Some species (e.g. *Cordyceps militaris*) are used in the production of fermented foods.

**Corers** Utensils used to remove the tough central part of various fruits and vegetables, particularly apples. Corers are usually made of stainless steel and come in different shapes for different uses. An all-purpose corer has a medium-length shaft with a circular cutting ring at the end. An apple corer shaped like a spoked wheel with handles not only core the apple, but cuts it into wedges as well. A corer for pineapples is a tall, arch-handled utensil with two serrated, concentric cutting rings at the base. After the top and bottom of the pineapples are sliced off, the corer is inserted from the top and twisted downward. The tool not only removes the core, but also the outer shell, so producing pineapple rings.

**Coriander** Common name for *Coriandrum sativum*, an umbelliferous plant cultivated for its aromatic seeds and foliage. Seeds are a major component of curry powders and are also used as a pickling spice and in flavourings for meat products and other food products. Seed essential oils are also widely used for flavouring purposes, as are the fresh leaves, which are added to foods to impart a delicate, citrus- and parsley-like flavour. Also known as cilantro.

**Coring** Process by which the tough central part of various fruits and vegetables is removed, often using corers.

**Coriolus** Genus of fungi of the class Hymenomycetes. Species may be used in production of laccases (e.g. *Coriolus versicolor* and *C. hirsutus*), or in the decoloration of brown food pigments. *C. versicolor* may also be used in the bioremediation of food factories effluents and food factories wastes.

**Corks** Closures for bottles, particularly wine bottles, or jars. Made from cork, as it is a material which can be compressed to a smaller size and resists absorption of liquids. A sensory defect, known as corking, may occur in wines due to growth of microorganisms on corks. There is also the risk of release of substances such as trichloroanisole, tannins and peroxides from the corks into the food or beverage contained in the bottle or jar. Synthetic closures made from plastics have been developed as an alternative to natural cork closures for wine bottles. Crown corks are closures made from metal.

**Cork spots** Plant disorder affecting apples and pears. Characterized by large brown spots in the fruit flesh and fruit deformation, with a pitted appearance. Caused by low levels of calcium in affected fruits due to any of a number of factors.

**Cork taint** Aroma and flavour defect of wines caused by contamination with 2,4,6-trichloroanisole, which may be present in the corks used to close the bottles.

**Corn** Grains, also known as maize, from any of numerous varieties of a tall, annual cereal plant (*Zea mays*), which are borne on large ears. Low in tryptophan. Niacin is present in bound form, making development of the deficiency disease pellagra a possibility in those eating corn as a staple. Corn is processed into a great many products, including corn oils, corn starch, corn syrups, flour and corn masa. It is also used in making some kinds of beer, whisky and gin. Some types of corn have a hard endosperm and kernels that burst on heating; these are used to make popcorn.

**Corn bran** Outer protective coating of corn kernels; removed during milling.

**Corn bread** Bread in which the main cereal component is corn flour. May also contain wheat flour or, for gluten free bread, rice flour. Arepas are flat corn bread products popular in South America. Generally spelt cornbread in the USA, where various sweet or savoury flavourings may be added, and shape, texture and thickness of the products are varied according to taste.

**Corn chips** Crisp snack foods made from corn meal batters, shaped into flat triangles and fried.

**Corn cobs** Flowering organs of *Zea mays*, composed of inner and outer leaf-like organs (glumes) which fold around the corn kernels, a woody ring of lignified conducting tissue, and an inner pith. Often used as a source of furfural. Waste corn cobs are used as substrates for production of various fermentation products including enzymes, ethanol and sugar.

**Corn dogs** Sausages, especially frankfurters, coated in a heavy corn flour batter and cooked by frying or baking. Usually served on a stick.
Corned beef  In the UK, corned beef describes beef that is brined, chopped, pressed and sold in tins. In North America, corned beef describes beef brisket that is cured in seasoned brine and boiled; it is usually served cold.

Cornelian cherries  Fruits of the wild dogwood (*Cornus mas*). Eaten fresh or made into preserves and marmalades. Also used to make alcoholic and non-alcoholic beverages.

Corn fibre oils  By-products of the corn processing industry which are rich in cholesterol-lowering phytosterols and of potential use in the manufacture of nutraceutical foods. Produced during wet milling of corn.

Cornflakes  Breakfast cereals made from corn, often enriched with vitamins.

Corn flour  Flour often ground from a variety of corn with large, soft grains and friable endosperm, from which the germ and outer hull are first removed. Also known as maize meal. Distinct from cornflour, which is used as an alternative term for corn starch.

Cornflour  Alternative term for corn starch.

Cornish pasties  Meat pies traditionally made in Cornwall, United Kingdom. Each pasty consists of a folded pastry case filled with seasoned meat and vegetables, especially potatoes.

Corn masa  Dried corn flour or dough made from this. Produced by cooking and steeping corn grains in unsalted lime followed by rinsing, grinding and drying. Used in manufacture of tortillas and related products.

Corn oils  Pale yellow oils derived from wet grinding the kernels of corn (*Zea mays*). Typically bland in flavour and widely used as a cooking oil and salad oil and in the manufacture of margarines. Palmitic acid, oleic acid and linoleic acid are the major fatty acids. Oxidative stability is high, despite the highly unsaturated nature. Also known as maize oils.

Corn starch  Starch isolated from corn. Common substrate for manufacture of syrups.

Corn steep liquor  One of the by-products of processing corn to manufacture corn starch. The brown, syrupy liquid is rich in lactic acid and phytic acid as well as containing a range of amino acids, proteins, peptides, carbohydrates, vitamins and minerals. It is used as a fermentation substrate in production of substances such as enzymes, polysaccharides and antibiotics by microorganisms.

Corn syrups  Nutritive sweeteners manufactured by partial hydrolysis of corn starch. Corn syrups are a mixture of glucose, maltose and maltodextrins produced by acid hydrolysis of corn starch at >100°C, followed by enzymic hydrolysis if required. Degree of hydrolysis required depends on the final application of the syrup; commonly, 40-60% of glycosidic bonds are hydrolysed, i.e. the corn syrups have a dextrose equivalent of between 40 and 60, although corn syrups of 24-80 dextrose equivalents are also produced. Corn syrups are approximately half as sweet as sucrose, although sweetness increases with increased hydrolysis. In addition to their use as sweeteners, corn syrups are used as thickeners, humectants, carbon sources for microbial fermentation and to provide body to soft drinks and beer.

Coronary heart diseases  Diseases of the heart due to narrowing of the coronary arteries resulting in myocardial ischaemia and/or myocardial infarction. Narrowing or occlusion of the arteries can be a consequence of atherosclerosis or thrombosis. Risk factors for coronary heart diseases have been identified, and include dietary, genetic and lifestyle factors.

Corrinoids  Group of compounds containing four reduced pyrrole rings joined into a macrocyclic ring (the corrin nucleus). Includes vitamin B12. Many corrinoids have a cobalt atom in the centre of the macrocyclic ring. The B12 vitamins are found in animal foods but not plant foods. Corrinoids are also produced by bacteria.

Cortisol  Steroid which occurs in animal tissues. May be used as an indicator of stress in slaughter animals, and of meat quality.

Corynebacteriaceae  Family of nonmotile, rod-shaped, primarily aerobic Gram positive bacteria of the suborder Corynebacterineae and order Actinomycetales. Contains the genus *Corynebacterium*.

Corynebacterium  Genus of aerobic or facultatively anaerobic, rod-shaped Gram positive bacteria of the family Corynebacteriaceae. Occur widely in nature, particularly in soil and vegetable matter, and on human skin. Can also be present on the surface of meat. Some species are involved in the spoilage of vegetable products and meat products. *Corynebacterium glutamicum* is important industrially, and is used in the commercial production of glutamates, glutamic acid and lysine for the food industry.

Costmary  Common name for *Balsamita major* (syn. *Chrysanthemum balsamita*), a perennial herb related to tansy. The fragrant mint-flavoured leaves are used for seasoning various foods, including salads, cakes, meat dishes and herb tea. Formerly used to flavour ale.

Costus  Alternative term for kuth (*Saussurea lappa*).

Cottage cheese  Soft acid curd white cheese made from whole, semi skimmed or skimmed cow milk without rennets, which is drained, but not pressed, so
some whey remains. Possesses a slightly lumpy consistency and has a mild flavour. Low in fat and carbohydrates, and high in protein.

**Cotton candy** Fluffy mass of spun sugar that is formed from thin threads. Often served around a stick. Also called candy floss in the UK.

**Cottonseed meal** Residue that remains when oils have been extracted from cottonseeds. Sometimes used as a specialty ingredient in manufacture of cookies and frequently in livestock feeds.

**Cottonseed oils** Pale yellow oils derived from cottonseeds (Gossypium spp.). Used as a salad oil and cooking oil and, on hydrogenation, in the manufacture of margarines. Rich in palmitic acid, oleic acid and linoleic acid; gossypol is a minor constituent.

**Cottonseed proteins** Proteins derived from cottonseeds (Gossypium spp.). Classified as storage and non-storage proteins, both of which show desirable functional properties that make them suitable for use as food supplements.

**Cottonseeds** Seeds of the cotton plant (Gossypium spp.) which are commercially important for their oils. Also a source of cottonseed meal and cottonseed proteins.

**Cough drops** Medicated and sweetened lozenges that are taken orally to relieve a cough or sore throat.

**Coulometry** Technique in which the amount of an analyte in solution is measured by converting it from one oxidation state to another, the end point of the reaction being measured with an indicator also present in the solution. A constant current source is used to deliver a measured amount of charge. An intermediate reagent, generated electrochemically from a precursor is often used to cause chemical oxidation. Analyte concentration is calculated from the amount of charge required to cause complete conversion.

**Coumarins** Group of aromatic compounds and lactones that are derived from coumarin (2H-1-benzopyran-2-one) by substitution. Include esculetin (6,7-dihydroxycoumarin), and furocoumarins (furan-substituted coumarin). Present as flavour compounds in many plant foods and spices, and may also display biological activity and/or toxicity.

**Coumarin** Constituent of the cotton candy. Cottonseed oils are rich in coumarins.

**Coulometry** Technique in which the amount of an analyte in solution is measured by converting it from one oxidation state to another, the end point of the reaction being measured with an indicator also present in the solution. A constant current source is used to deliver a measured amount of charge. An intermediate reagent, generated electrochemically from a precursor is often used to cause chemical oxidation. Analyte concentration is calculated from the amount of charge required to cause complete conversion.

**Coumarin** Constituent of the cotton candy. Cottonseed oils are rich in coumarins.

**Countercurrent chromatography** Form of liquid partition chromatography in which no solid support is required and two immiscible solvent phases are used. Partition takes place in an open column in which one phase (the stationary phase) is retained and the other (the mobile phase) passes through continuously. The stationary phase is retained in the column as a result of column configuration and gravitational or centrifugal force fields. The technique is used in the food industry for preparative separation of food constituents, such as polyphenols from tea, and anthocyanins from fruits and vegetables, and for analysis of food components and contaminants.

**Couplers** Devices for connecting or combining items.

**Courgettes** Small, dark green cucumber-shaped vegetables cut from the plant when young. Also known as zucchini in the USA and Canada.

**Couscous** Granular product originating from North Africa, made with either semolina from durum wheat or millet flour. Also refers to a North African dish made with this product, which is steamed and traditionally served with a stew of lamb, chicken, meat, chick peas and vegetables.

**Cowberries** Red, acid berries produced by Vaccinium vitis-idaea; similar to, but smaller than, American cranberries. Contain high levels of benzoic acid. Used in jams and jellies. Also known as mountain cranberries, lingberries or lingonberries.

**Cow cheese** Cheese made from cow milk.

**Cow milk** Milk produced by dairy cattle.

**Cow milk cheese** Cheese made from cow milk.

**Cowpea meal** Flour produced from cowpeas. Used as an ingredient in foods.

**Cowpeas** Seeds of Vigna unguiculata, a legume from which young pods and leaves are also consumed. Vary in colour, white ones having pigment at the eye only, leading to their alternative names, blackeyed beans or blackeye peas. Rich in protein and carbohydrate.

**Cows** Adult female bovine animals belonging to the genus Bos. In farming, the term cows is used to describe female cattle which have borne more than one calf.

**Coxiella** Genus of anaerobic, rod-shaped Gram negative bacteria of the Coxiellaceae family.
**Coxsackieviruses**

*Coxiella burnetii*, the causal agent of Q fever in humans, may be transmitted from infected animals to humans via their **milk**. Sheep, cattle and goats may act as reservoirs for the disease.

**Coxsackieviruses Enteroviruses** of the Picornaviridae family, including 2 groups - Coxsackie A and B viruses. May be transmitted via the faecal-oral route, particularly through contaminated **water**.

**Coypu** Large semi-aquatic South American rodents (*Myocastor coypus*), also known as nutria. Coypu are hunted and farmed for their fur and **meat**. Coypu meat is similar in protein content to **poultry meat** and **game meat**, it has favourable composition of **fatty acids** and amino acids, and low contents of fats and cholesterol.

**Crab legs** Legs from species of large marine **crabs**, which are consumed as sea food delicacies. Commercially important species for crab legs include red king crabs (*Paralithodes camchatica*), blue king crabs, (*P. platypus*) golden king crabs, (*Lithodes aequispinus*), dungeness crab (*Cancer magister*) and edible crab (*C. pagurus*).

**Crab meat** Edible flesh from the body and legs of crabs; in the sea food industry, the term crab meat designates canned white meat from crabs. Usually white in appearance, although leg meat often has red coloration. The most important crab species for meat production are edible crabs (*Cancer pagurus*), dungeness crabs (*C. magister*), blue crabs (*Callinectes sapidus*) and king crab species, such as the red king crab (*Paralithodes camchatica*).

**Crabs** Crustaceans from the order Decapoda, having 5 pairs of legs with the first pair usually modified as pincers. Approximately 4500 crab species occur worldwide, most inhabiting marine or estuarine waters. Many crab species are commercially valuable **sea foods**. Marketed in a variety of forms, including fresh cooked whole crab, cooked leg meat, canned meat and pastes.

**Crackers** Thin, crisp **wafers** or **biscuits** (e.g. water biscuits, cream crackers, wholemeal crackers) made from unsweetened **dough** made with **wheat flour**, fat and **sodium bicarbonate**.

**Cracking** Breaking of an item with little or no separation of the component parts. Can be used to refer to damage to a commodity, e.g. freeze cracking of foods, or a processing step, e.g. cracking of **eggs** to remove them from their **shells**.

**Crambe seeds** Seeds from plants belonging to certain species of the genus *Crambe* which belong to the mustard family. **Oils** extracted from the seeds are rich in **erucic acid** and are similar to **rapeseed oils**.

**Cranberries** Red, acid **berries** produced by *Vaccinium oxycoccus* (large, or American cranberries produced by *V. macrocarpon*). Acidity is due to high levels of a number of acids, including **citric acid**, **quinic acid**, **benzoic acid** and **malic acid**. Because of the acidity, consumption of cranberries can be beneficial in cases of urinary tract infections and some types of kidney stones. Cranberries are used in a range of products, including **sauces**, jellies, **relishes** and beverages.

**Cranberry juices** **Fruit juices** prepared from cranberries (*Vaccinium oxycoccus* or *V. macrocarpon*). Thought to have a protective action against urinary tract infections.

**Crates** Re-usable, slatted, wooden or plastics containers used for transportation of goods, including various foods. Crates subdivided into units are used for holding individual items, such as **bottles**. The term is also used to describe containers for the transportation of live animals, particularly poultry.

**Cravings** Behavioural term relating to a strong desire or longing for a specific item. The most commonly craved food is thought to be **chocolate**.

**Crawfish** General name used for marine **lobsters** species within the genera *Palinurus* and *Panulirus* (also called **spiny lobsters**) and *Jasus* (also called **rock lobsters**). Marketed in a variety of ways, including fresh whole, shelled meat, canned and in pastes. Ground crawfish is often used in **soups**.

**Crayfish** General name used for various freshwater lobster-like **crustacea** found in lakes, rivers and swamps around the world. Several species are valued as foods, particularly *Camburus* spp. and *Astacus* spp. from North America and Europe. Usually marketed live and boiled prior to consumption.

**Cream** Fatty product prepared from **whole milk** by centrifugation. Marketed in a range of types differing in fat content. In the UK, **half cream** contains approximately 12% fat, **single cream** and extra thick single cream 18%, **whipping cream** 34%, **double cream** and extra thick double cream 48%, and **clotted cream** 55%. In the USA, light cream contains 20-25% fat and heavy cream 40% fat.

**Cream cheese** **Soft cheese** made from **cow milk**. An acid curd cheese, but unlike **Cottage cheese**, made using **cheese starters**. Generally mild and velvety, but whey powder can be added to produce a more grainy texture. Eaten as a cheese and also used in making **cheesecakes** and in **baking**.

**Creameries** Premises in which **dairy products** are manufactured. Also called **dairies** or **dairy factories**.

**Creamers** **Cheese makers** or **cheese producers**.
Cream horns  Baked hollow puff pastry products, which are horn-shaped and filled with whipped cream and sometimes jams.

Creaminess  Consistency term relating to the extent to which a product is creamy, i.e. smooth, glossy and uniform. As one of the sensory properties, creaminess has viscous, flavour and taste aspects.

Creaming  Natural formation of a layer of milk fat on the top of milk left to stand for some time. This happens because of the lower specific gravity of milk fat and is dependent on the size of the milk fat globules. Clustering of the milk fat globules is also affected by globulins in the milk fat globule membranes. Creaming can be controlled by homogenization of milk and heating to cause denaturation of the globulins.

Cream liqueurs  Liqueurs in which cream is combined with alcohol to produce a thick and shelf stable blend. Cream is homogenized to break down the milk fat globules to a size suitable to encase the alcohol molecules, preventing the cream from being curdled and the product from separating. The milk fat globules are made as small as possible to give a smooth taste and long shelf life. Cream liqueurs are generally packed in dark glass bottles to protect from UV radiation and are best kept refrigerated after the bottle has been opened.

Cream milk  Milk from which no fat has been removed. Also called full cream milk or whole milk.

Cream puffs  Baked puff pastry products, which are hollow, and filled with whipped cream.

Creatine  One of the nitrogen compounds which play an important role in muscle metabolism. Occurs in muscle foods such as meat, fish and shellfish. Concentrations of creatine and its anhydride metabolite creatinine may be used as indicators of the condition and quality of meat and meat products.

Creatinine  Anhydride metabolite of creatine. Found in a range of foods.

Creep  One of the rheological properties, describing a deformation with time of materials under continual stress. An important parameter in a wide range of foods, including fruits and vegetables, bakery products, dairy products and extruded starch-based foods, as well as in gels and films, and packaging materials.

Cremes  Creams or custards used in fillings and desserts. For example, creme caramel, creme brûlée and confectionery cremes.

Cremoso Argentino cheese  Argentinian soft cheese made from pasteurized milk. Has a particularly high moisture content. Its elastic texture and delicate flavour make it especially suitable for topping pizzas and vegetable dishes.

Crepes  Thin pancakes originating from France made from batters containing flour, eggs, salt, milk and water. May be served with sweet or savoury fillings. Crepes suzette, traditional desserts, are made by warming crepes in orange-butter sauces, pouring over orange liqueurs and flaming before serving.

Crescenza cheese  Italian cheese made from cow milk. Texture and flavour can vary from smooth with fresh, clean acidity to rubbery and mushy with a sour taste. Best ripened for no longer than 10 days and eaten soon after.

Cresols  Methylenol flavour compounds found in a range of foods, especially smoked foods. Cresol residues from lacquers applied to cans may occur as contaminants in canned foods. Cresols and cresol derivatives may cause taints in foods and beverages.

Cress  Pungent leaves of seedlings from numerous plants of the family Cruciferae. Used as a salad vegetable, spice and in soups. Garden cress, or pepper-cress, is Lepidium sativum.

Creutzfeldt-Jakob disease  Abbreviated to CJD. One of the prion diseases, this one affecting humans. After a long incubation period (not yet defined), it is characterized by progressive degeneration of the central nervous system. Symptoms include mood swings, aggression, slurred speech, hallucinations, problems in swallowing and ataxia. The initial form of Creutzfeldt-Jakob disease was only observed in subjects >40 years of age. In 1996, however, variant Creutzfeldt-Jakob disease (vCJD), affecting subjects as young as 12 years of age, was formally identified in the UK. The first known vCJD death, identified retrospectively, occurred in the UK in 1995. vCJD is believed to be transmitted to humans in foods (beef, beef products and offal) derived from cattle infected with BSE. In 1997, experiments in mice provided convincing evidence for the link between BSE and vCJD. The full extent of vCJD will not be discernible for many years to come because of the long incubation period of the disease; however, many thousands of BSE infected cattle are thought to have entered the UK food chain during the late 1980s, before the first BSE control measures were introduced.

Crispbreads  Thin cracker-like products having a considerably lower water content than bread. Made from rye flour or wheat flour and water. Commonly eaten as an alternative to bread by those on a wt. loss diet.

Crispness  Term relating to perception of product texture in the mouth; the extent to which a product is brittle when bitten.
Crisps  Popular savoury bagged snack foods comprising very thinly sliced vegetables or extruded cereals that have been fried and flavoured, e.g. potato crisps. Also known as chips in some countries.

Critical control points  Points, steps or procedures at which quality control can be applied and a food safety hazard prevented, eliminated, or reduced to acceptable levels. The selection of critical control points (CCP) is aided by the use of a CCP Decision Tree, which is designed to help determine what should be used in a Hazard Analysis Critical Control Point (HACCP) plan to control hazards.

Croakers  General name used for marine fish species within the family Sciaenidae, which occur worldwide; also widely referred to as drum. Principal food fish within the family include Atlantic croaker (Micropogon undulatus), black croaker (Cheilotrema saturnum) and yellow croaker (Umbrina roncador).

Crocin  Yellow water-soluble carotenoid pigment which is found in the fruits of gardenia (Gardenia jasminoides Ellis) and in the stigmas of saffron. Purified crocin (purity $>99.6\%$) has antioxidative activity comparable to that of BHA at some concentrations. Used in colorants for foods, e.g. smoked haddock and cod, and has potential for use in antioxidants.

Crocodiles  The common name given to about 12 species of the genus Crocodylus in the family Crocodylidae. Crocodiles are hunted or farmed to produce crocodile meat and skins. Crocodile (C. niloticus) farming is a rapidly growing industry.

Crohn's disease  Inflammatory bowel disease or set of diseases of the gastrointestinal tract the cause of which is unclear. Proposed causes include genetic, microbial and environmental factors. Due to the similarity of Johnne's disease in cows and other animals to Crohn's disease in humans, an association with the causative agent of Johnne's disease, Mycobacterium avium subsp. paratuberculosis, has been suggested. Possible routes of transmission of M. avium subsp. paratuberculosis from animals to humans include through infected dairy products and meat.

Croissants  Rich, crescent-shaped rolls made by laminating butter into a fermented dough; often served at breakfast with butter and jams. Also eaten stuffed with sweet or savoury fillings.

Crops  Plants, including cereals, vegetables and fruits, which are cultivated commercially for the produce that they yield.

Crops rotation  Practice of growing a sequence of different crops on a given piece of land to maintain the fertility of the soil.

Croquant  Chopped, roasted almonds which are cooked in caramelized sugar. Also known as kroquant.

Cross-contamination  Transfer of contaminants between foods or surfaces. This form of contamination can include transfer of pathogens from uncooked meat to cooked or ready-to-eat foods, either directly or indirectly (e.g., via chopping boards).

Cross-linking  A form of chemical modification. Used in foods to alter the functional properties of compounds such as proteins, starch, gelatin and gluten. Transglutaminases (protein-glutamine γ-glutamyltransferases) can be used to modify food proteins by cross-linking, whilst glutaraldehyde is commonly used as a cross-linking reagent for immobilization of enzymes on membranes.

Cross-reactivity  The ability of antibodies to react with or bind unrelated antigens. Caused by the antigens involved sharing similar, although not necessarily identical, antigenic determinants (epitopes). Of importance in the management of food allergies.

Croutons  Cubed or shaped pieces of seasoned toasted or fried bread used for garnishing soups or salads. May be flavoured, e.g. with herbs or garlic.

Crowberries  Small black fruits produced by Empetrum nigrum. Best eaten cooked, as this enhances the flavour. Often eaten mixed with other berries. Used in pies, soups and jellies, and to make wines.

Crown corks  Metal closures for bottles. Comprise preformed caps and a sealing pad. These are placed over the mouth of the container to be sealed, and the edges are crimped to secure them to the containers. Commonly used for sealing bottles containing soft drinks or beer.

Cruacid carp  A freshwater fish species (Carassius carassius) from the carp family (Cyprinidae) widely distributed in lakes and rivers in Europe and northern and central Asia. Rarely regarded as a high value food fish, but is an important source of protein in some re-
Crushings  To deform, squash or pulverize an item by compressing forcefully. When applied to foods, this is also known as a process where goods fall apart into small fragments, or the process by which foods are broken up (usually with the fingers) into small pieces.

Crustacea  A subphylum of invertebrates containing approximately 30,000 species. Most are aquatic; of these, the majority are marine, but some are found in freshwater. Members of Crustacea include lobsters, crabs, crayfish, shrimps, copepods, barnacles and several other groups of organisms.

Cryogenic  Branch of physics concerned with the production and effects of very low temperatures. Cryogenic temperatures are achieved either by the rapid evaporation of volatile liquids or by the expansion of gases.

Cryopreservation  Preservation of foods using very low temperatures.

Cryoprotectants  Compounds used in cryopreservation or regular freezing to protect frozen foods from damage caused by ice formation. Include sucrose, which prevents muscle protein from denaturation during frozen storage of surimi, and sorbitol, starch and starch hydrolysates, which can be used to restrict undesirable changes in the functional properties of meat proteins. Glycerol is also commonly used as a cryoprotectant.

Cryoscopes  Instruments used for measuring the boiling point and freezing point of liquids.

Cryscopy  Technique for determining the molecular weight of a substance by measuring the amount by which the freezing point of a solvent drops upon addition of a known quantity of that substance.

Cryovac  Trade name for a range of systems and equipment for packaging of foods, including vacuum packaging and modified atmosphere packaging.

Cryphonectria parasitica  Species of fungi of the family Cryphonectriaceae. Part of the Cryphonectria-Endothia complex. Commonly called the chestnut blight fungus. Microbial rennets derived from this species are used in cheesemaking.

Crypthecodinium cohnii  Species of marine algae of the family Crypthecodiniaceae. Used in biotechnology for the industrial production of docosahexaenoic acid.

Cryptococcus  Genus of yeast fungi of the class Hymenomycetes. Occur on plants and in soil. Cryptococcus neoformans is often associated with meat and meat products where it may cause spoilage. C. albidus may be responsible for the spoilage of certain fruits.

Cryptosporidiosis  Enteric disease caused by infection with Cryptosporidium parvum. Commonly transmitted through ingestion of food or water contaminated with animal faeces. Characterized by severe diarrhoea, abdominal cramps, fever and headache. May be asymptomatic.

Cryptosporidium  Genus of protozoan parasites of the family Cryptosporidiidae. Occur in the intestinal tracts of vertebrates. Some species are pathogenic to humans and other animals. Cryptosporidium parvum is the causative agent of cryptosporidiosis in humans.

Crytoxanthin  Garnet-red carotenoid pigment with vitamin A activity which occurs naturally in egg yolks, butter, blood serum and in many plants. Slightly soluble in ethanol and methanol, and soluble in chloroform and benzene. It has many nutritional and medical uses.

Crystallinity  Physical properties relating to the degree of structural order in a solid resulting from the formation of solid crystals with repeating patterns. Sugars and fats readily form crystals under favourable conditions such as appropriate temperature and
Crystallization

Formation of crystals, particularly used to purify a material or extract it from solution. Extensively used in sugar processes, and also in the processing of butter and margarines, chocolate and ice cream. Also used to prepare proteins, including enzymes, for structural analysis by X-ray diffraction spectroscopy.

Crystallography

Measurement of the shape and structure of crystals. Modern methods utilize diffraction patterns generated when a sample is targeted by a beam (e.g. electromagnetic radiation). X-ray crystallography is commonly used to determine the molecular structure of proteins.

Crystals

Solid materials formed by crystallization, in which the atoms are arranged in a single regular arrangement called a lattice. Sugars and fats readily form crystals under favourable conditions such as temperature and concentration. Starch can also crystallize, and in bread this retrogradation process is associated with staling. The presence of crystals in foods strongly influences their texture.

Cs

Chemical symbol for caesium.

Cu

Chemical symbol for copper.

Cuartirolo argentino cheese

Alternative term for Argentinean Quartirolo cheese.

Cucumber pickles

Cucumbers pickled in brines. Alternative term for pickled cucumbers.

Cucumbers

Fruits produced by *Cucumis sativus*. Contain approximately 95% water and 2% sugar, with some carotenes in the skin. Usually eaten raw in salads, but also used to make cucumber pickles and added to yoghurt to make raita, commonly eaten with curries. Seed kernels may be eaten as a snack food. Small ridge cucumbers are sometimes referred to as gherkins.

Cucumber seeds

Kernels derived from *Cucumis sativus* which are rich in proteins and oils and may used as a source of these compounds.

Cucumisins

EC 3.4.21.25. Serine proteinases occurring in the sarcocarp of muskmelons (*Cucumis melo*). Highly homologous with microbial subtilisins. Catalyse hydrolysis of proteins with broad specificity. Have potential for use in the food industry, including as milk clotting enzymes in cheesemaking.

Cucurbitaceae

Family of food plants including cucumbers, gherkins, gourds, marrows, melons, pumpkins and squashes. Both the fruits and other parts of the plants may be consumed. Fruits contain mostly water, with good levels of vitamin C and sometimes carotenes.

Cucurbitacins

Oxygenated tetracyclic triterpenoids produced by plants of the family Cucurbitaceae, such as gourds and cucumbers. Among the most bitter compounds known to man. Include cucurbitacin A, B and C and momordicoside A. Found in all plant parts except the seeds. Accumulation is generally not very high in fruits, but varies from season to season and according to location. Although perceived as bitter by humans, cucurbitacins are attractive to some insects and are used in baits.

Cultivar

Commercial or cultivated varieties of given species of plants or fungi. Abbreviated to cv.

Cultivation

From agriculture, a general term encompassing the processes associated with growing of crops prior to harvesting.

Culture

Microbiological techniques for the growth of microorganisms or other types of cells in various nutrient media.

Cultured buttermilk

Commercial product made as a substitute for buttermilk produced during churning as a by-product of buttermaking. Made by adding lactic acid bacteria to skim milk. The lactic acid produced during fermentation gives the product a tangy flavour similar to that of churned buttermilk, but composition of the two products differs. Used as a beverage and as an ingredient in baking.

Cultured cream

Alternative term for fermented cream.

Cultured dairy products

Alternative term for fermented dairy products.

Cultured foods

Alternative term for fermented foods.

Cultured milk beverages

Alternative term for fermented milk.

Cultured milk products

Alternative term for fermented dairy products.

Cultured milks

Alternative term for fermented milk.

Culture media

Alternative term for media.

Cumin

Common name for *Cuminum cyminum*, an umbelliferous herb grown for its aromatic, spicy seeds. These are used whole or ground as a flavouring ingredient in curry powders, and a range of other products including chilli, pickles, sausages, bakery products and liqueurs. Unrelated to black cumin.

Cuminaldehyde

Aldehyde which is predominant amongst the carbonyl compounds in cumin (Cuminum cyminum L.) seed essential oils, representing the major flavour compound in cumin. Colourless liquid, insoluble in water but soluble in ethanol. Has antimicrobial activity, particularly against...
fungi and yeasts. Also a potent inhibitor of mushroom tyrosinases.

*Cunninghamella* Genus of filamentous fungi of the family Cunninghamellaceae. Occur as saprotrophs on decaying vegetable matter, soil and dung, or as parasites or pathogens of plants or animals. Species have also been recovered from animal foods, cheese and brazil nuts. *Cunninghamella echinulata* is used in the industrial production of γ-linolenic acid.

*Cuphea* Genus of plants belonging to the family Lythraceae which is being developed as an oilseed crop. Seeds of many species, e.g. *Cuphea lanceolata* and *C. viscosissima*, contain oils rich in medium chain saturated fatty acids. Such species are a potential source of these fatty acids, which have beneficial health and nutrition effects in humans and can affect fat quality when fed to animals.

*Cupuacu* Fruits produced by the cupuacu tree (*Theobroma grandiflorum*), which grows in the Amazonian rainforest. The exotic tasting pulp is used in making a range of products including fruit juices, ice cream, jams and candy. The seeds, which constitute approximately 20% of the fruit, contain a fat resembling cocoa butter and develop a chocolate-like aroma if roasted. They have been used to make a chocolate alternative which is free of caffeine.

*Curculin* High potency, 114 amino acid, sweet-tasting homodimeric protein isolated from fruit of the Malaysian plant *Curcuriligo latifolia*. On a weight basis, curculin is 430-2070 times sweeter than sucrose. Exhibits its flavour modifying activity which causes organic and inorganic acids to taste sweet after ingesting the protein. Susceptible to heat, and at 50°C starts to degrade and lose its sweet-tasting and taste modifying properties. Studies have investigated production of a recombinant form of the protein using bacteria.

*Curcuma* Genus of plants, rhizomes of which are used as spices and sources of essential oils and colorants. Commercially important species include *Curcuma longa* (turmeric), *C. aromatica* (wild turmeric) and *C. zedoaria* (zedoary). The name is also applied to a natural colorant used to colour foods and textiles and as an indicator in analytical techniques. This colorant is sometimes called turmeric, curry or Indian saffron, and is commonly used in curries.

*Curcumin* Phenolic pigment which exists as a yellow-orange powder or needles and is derived from rhizomes of plants of the genus *Curcuma*, e.g. turmeric (*Curcuma longa* L). Insoluble in water but soluble in ethanol. Curcumin is a powerful antioxidant, and shows antitumour activity in animal studies and anticarcinogenicity in vitro. Used as a food dye, a biological stain and an analytical reagent. Also known as turmeric yellow.

*Curcuminoids* A group of polyphenols including curcumin and 2 of its related demethoxy compounds, demethoxycurcumin and bisdemethoxycurcumin, found in turmeric rhizomes, and cassamunin A and cassamunin B, found in tropical ginger (*Zingiber cassumunar*). Brilliant orange/yellow pigments, used as colorants in a variety of foods, particularly pickles and curries. Demonstrate antitumour activity, antioxidative activity, hypolipaemic activity and neuroprotective effects.

*Curd* Protein (casein) gel formed by coagulation of milk, e.g. during cheesemaking. Other milk proteins are retained in the liquid portion (whey).

*Curd cheese* A semi-soft cheese with a creamy texture and mild flavour. A white cheese used especially in cooking.

*Curdlan* Extracellular microbial polysaccharide composed entirely of 1→3-β-D-glucosidic linkages which is produced by *Agrobacterium* spp. (formerly *Alcaligenes faecalis* subsp. *myxogenes*). Used as a food additive, particularly in formulation aids, processing aids, fat substitutes, stabilizers, thickeners and texturizers. Can undergo both thermo-reversible and thermo-irreversible gelation.

*Cured meat* Meat preserved with the aid of salt and colour fixing ingredients, e.g. sodium nitrate and/or some sodium nitrite. Other curing agents may be added to accelerate curing (reducing agents), to modify flavour (e.g. sweeteners), to modify texture, to retard development of oxidative rancidity, and to increase water binding capacity and decrease shrinkage during subsequent processing. The curing process may involve: rubbing dry curing ingredients into the meat; immersion of meat in curing brines; or injection of the meat with solutions of curing ingredients. In the past, curing was used primarily to preserve meat, but with increases in the use of refrigeration and freezing, the major purpose of curing has changed. Meat curing ingredients are now mainly used to impart unique colour, flavour, palatability and texture properties to cured meat products. During the curing process, nitrates are converted into nitrites. Nitrosomyoglobin, formed from myoglobin and nitric oxide during curing, is responsible for the red colour of cured meat. Health concerns relating to use of nitrates and NaCl in cured meat have led to reductions in use of both ingredients.

*Curing* Preservation of foods such as meat, cheese and fish by salting, drying, pickling or smoking. Smoking can be carried out by the cold smoking method (in which the food is smoked at 20-30°C) or by the hot smoking method (which partially or totally cooks the food at 40-90°C). Pickled foods are
Curry powders are blends of powdered spices used for preparing curries. Various spices can be used in order to impart a particular flavour and/or pungency. Popular spice ingredients include cumin, coriander, ginger, cloves, cardamom, fenugreek, chilli and turmeric.

Curcuma Genus of fungi of the Pleosporaceae family. Occur in soil and on plants. Some species (e.g. Curvularia lunata) may cause spoilage of stored grains (e.g. sorghum, corn, rice and wheat).

Custard apples Fruits of any of several plants of the genus *Annona*. Round to heart-shaped with a white to yellow edible pulp. Flesh is eaten as a dessert or used as an ingredient in products such as fruit salads, sherbet, ice cream, yoghurt and milkshakes. Rich in vitamin C. The name has been applied to a number of species, including *Cherimoya* (*A. cherimola*), *sugar apples* or sweet sop (*A. squamosa*), *soursop* (*A. muricata*) and the hybrid atemoya.

Cyanobacteria Cyanobacteria are photosynthetic bacteria containing chlorophylls and other pigments. Include unicellular and colonial species. Capable of fixing both carbon dioxide and nitrogen. Important
Cyanocobalamin

Cyanocobalamin Synonym for vitamin B₁₂. Member of the vitamin B group, found in foods of animal origin such as livers, fish and eggs. Vitamin B₁₂ is the coenzyme for methionine synthase (EC 2.1.1.13), an enzyme important for the metabolism of folic acid, and methylmalonyl coenzyme A mutase (EC 5.4.99.2).

Absorption of this vitamin requires the presence of an intrinsic factor. Failure of absorption, rather than dietary deficiency, is the major cause of pernicious anaemia.

Cyanocobalamin is an important model organism in biotechnology. Some cyanobacteria produce bioactive compounds and some are sold as foods. For example, Spirulina has long been valued as a food source as it is high in protein and can be cultivated easily. Certain cyanobacteria produce cyanotoxins, making them dangerous to animals and humans. Cyanobacterial toxins can accumulate in sea foods and sources of water used for production of drinking water. Formerly known as blue green algae.

Cyanogenic glycosides Cyanogens which are capable of liberating large amounts of toxic cyanides, which can be metabolized to goitrogens (thiocyanates). Include linamarin, linustatin and neolinustatin. Occur naturally in many plants, including cereals, pulses, fruits, root crops, nuts and oilseeds, usually in parts that are not eaten or at such low concentrations that they do not present a health risk to consumers. However, in cassava, they occur in high levels both in the edible roots and leaves. Readily detoxified by appropriate processing of plant materials.

Cyanogens Colourless flammable highly toxic gases with pungent odours. Produced synthetically by oxidizing hydrogen cyanide, but some (e.g. cyanogenic glycosides) occur naturally in plants. Starting materials in the manufacture of complex thiocyanates, which are used as insecticides.

Cycad seeds Seeds produced by gymnosperms of the genus Cycas, especially C. circinalis, the false sago palm. Contain a toxic principle, cycasin, which causes a neurological disorder when untreated seeds are consumed.

Cyclamates Salts of cyclamic acid, prepared by sulfonation of cyclohexylamine. Also known as sulfamates. Used as non-nutritive artificial sweeteners in foods, usually in the form of calcium cyclamate or sodium cyclamate. Cyclamates are 30-50 times as sweet as sucrose and display good solubility and thermal stability characteristics for a variety of food applications, such as low calorie foods. Used synergistically with other artificial sweeteners. Use of cyclamates was banned in the USA, UK and Canada due to concerns about possible carcinogenicity. However, later studies have failed to confirm this and use is still permitted in many countries.

Cyclamic acid One of the organic acids, used as artificial sweeteners in foods, usually in the form of metal salts (cyclamates). Also known as cyclhexanesulfamic acid.

Cyclic fatty acids Fatty acids which include a ring structure within or at the end of the fatty acyl chain. The ring structure usually comprises between 3 and 7 carbon atoms. Present in oilseeds and microorganisms, but uncommon in animal fats. Can be formed in oils as a result of thermal processing, e.g. frying or physical refining.

Cyclodialdrin glucoanotransferases Alternative term for cyclomaltdextrin glucoanotransferases.

Cyclamides Dextrins containing at least six glucose units in the form of a ring. Can associate with a range of substances and are therefore used as complexing agents, particularly in the β-cyclodextrin form. Used in the food industry as emulsifiers, stabilizers and masking agents for off odour and off flavour.

Cyclhexanesulfamic acid Alternative term for cyclamic acid.

Cycloheximide Protein synthesis inhibitor obtained from Streptomyces griseus. Has been used in antibiotics, fungicides and plant growth regulators. Generally now only employed in research applications due to its significant toxicity, including teratogenicity.

Cyclohexylamine Toxic amine which exists as a liquid with a strong fishy aroma. Major metabolite of the cyclamates which are used as sweeteners. Miscible with water and common organic solvents. Used in organic synthases and in the manufacture of plasticizers, dyes, emulsifying agents, dry-cleaning soaps, corrosion inhibitors and rubber chemicals.

Cyclomaltdextrinas EC 3.2.1.54. Glycosidases which hydrolyse cyclomaltdextrins to linear maltodextrins. Can also hydrolyse linear maltodextrins, and may hydrolyse starch, pullulan, amyloses and amylopectins. They may also exhibit transglycosylation activity.

Cyclomaltdextrin glucoanotransferases EC 2.4.1.19. These glycosyltransferases cyclize part of 1,4-α-D-glucan chains by formation of 1,4-α-D-glucosidic bonds. Cyclomaltdextrins of 6, 7 or 8 glucose molecules, known as α-, β- and γ-cyclodextrin,
respectively, are formed reversibly by the action of the enzyme on starch and dextrins. The enzymes will also disproportionate linear maltodextrins without cyclizing. Applications include use as dough conditioners and in the production of artificial sweeteners.

**Cyclones** Processing equipment used for separation of solids from air. Consists of a conical chamber into which the air and solid, such as a food powder, is added tangentially at high speed producing a whirl or cyclone. Particulate matter is forced to the sides of the chamber, decelerates and drops down to the conical end of the chamber from which it is removed. The air stream remains in the central region of the cyclone. Used for separation of powders, e.g. milk powders, from air after spray drying.

**Cyclooxygenases** Alternative name for prostaglandin-endoperoxide synthases (EC 1.14.99.1). These oxidoreductases catalyse formation of prostaglandins from arachidonic acid and display both dioxygenase and peroxidase activities. In mammals, cyclooxygenase-1 (COX-1) regulates basal levels of prostaglandins, while cyclooxygenase-2 (COX-2) is responsible for acute increases of prostaglandin production, e.g. during inflammation. Foods containing COX inhibitors can have anti-inflammatory activity.

**Cyclopiazonic acid** Mycotoxin produced by Penicillium spp. (e.g. Penicillium verrucosum and P. griseofulvum) and Aspergillus spp. (e.g. A. flavus and A. oryzae). Formed during fungal growth on food such as corn, peanuts and cheese. Toxic to certain animals (e.g. chickens), but no definite health risk for humans.

**Cycloserine** Broad spectrum antibiotic that is particularly active against Mycobacterium spp. Used to treat mycobacterial infections (such as tuberculosis) in animals.

**Cyclospora** Genus of parasitic coccidian protozoa of the family Eimeriidae. Cyclospora cayetanensis may be transmitted to humans through ingestion of water or food contaminated with oocysts.

**Cyclosporiasis** Disease caused by infection with Cyclospora spp. (especially C. cayetanensis in humans). It is characterized by watery diarrhoea, loss of appetite, substantial weight loss, bloating, flatulence, abdominal cramps, nausea, vomiting, muscle aches, low-grade fever and fatigue. Some infected persons are asymptomatic.

**Cycocel** Alternative term for the plant growth regulator chlormequat. Classified by WHO as slightly toxic (WHO III).

**Cyhexatin** Organotin acaricide used to control plant-feeding mites infesting almonds, walnuts, hops, ornamentals and some fruits, which have become resistant to many other acaricides. Classified by WHO as slightly hazardous (WHO III).

**Cymene** Volatile, combustible, aromatic hydrocarbon consisting of benzene rings carrying one methyl and one isopropyl group. Exists as a colourless, transparent liquid with an aromatic aroma. Three isomers are known, i.e. ortho-, meta- and para-cymene. para-Cymene occurs naturally in several essential oils, e.g. oregano (Origanum vulgare L.). Uses include synthetic resin manufacture, metal polishes, solvents and organic synthetics. para-Cymene can be used to produce pure carvacrol and para-cresol.

**Cypermethrin** Non-systemic pyrethroid insecticide used to control a wide range of insects in fruits, vegetables, cereals, rapeseeds and coffee; also used in animal rearing facilities. Classified by WHO as moderately hazardous (WHO II).

**Cyprodinil** Pyrimidine fungicide used to treat cereals, and also applied to the foliage of various other crops, such as almonds, grapes, stone fruits and pome fruits, to control plant diseases.

**Cystatins** Proteins which inhibit cysteine proteinases. These proteinases inhibitors are present in many plant seeds, including legumes and cereals, and are also found in animals tissues, including meat, eggs and fish. Have a potential role in the regulation of proteolysis during meat processing as they can inhibit calpains and cathepsins, and could also be used to maintain the quality of fresh fish and surimi.

**Cysteine** Crystalline sulfur-containing amino acid. In the human diet, cysteine is a conditionally essential amino acid; thus, it may be required in the diet unless abundant amounts of its precursors, methionine and serine, are available for cysteine synthesis at a nutritionally significant rate.

**Cysteine sulfoxides** A group of organic sulfur compounds found predominantly in Allium and Brassica spp., where they are important precursors for flavour compounds produced by lyases such as alliin lyases.

**Cysticercosis** Infestation with the larvae (cysticerci) of the tapeworm Taenia solium. May be caused by ingestion of tapeworm eggs in food and water. Normally, the cysticerci develop in the animal host (swine), and humans are infected with the adult form through eating undercooked infected meat.

**Cysticercus** Larval forms of Taenia spp. of tapeworm. Cysticercus cellulosae is the larval form of T. solium found in swine, while C. bovis is the larval form of T. saginata found in cattle.
Cystine  White crystalline amino acid; oxidized dimeric form of cysteine. In healthy individuals, it is produced from methionine or homocysteine and is not an essential amino acid.

Cystoseira  Genus of seaweeds found in low intertidal and subtidal shores of warm and temperate waters around the world. Some species are utilized as food or a source of phytochemicals.

Cytidine  Nucleoside composed of one molecule of cytosine and one molecule of D-ribose. Also known as cytosine riboside.

Cytochalasins  Mycotoxins produced by certain fungal species (e.g. Aspergillus, Helminthosporium and Phomopsis spp.). Formed during fungal growth on grains and grain products.

Cytokines  Humoral mediators produced by components of the immune system including the interferon and interleukin families and tumour necrosis factor-α (TNF-α). Cytokines are involved in regulation of immune response and inflammation and aberrant production is associated with certain allergies and inflammatory diseases. Modulation of cytokine status may been one mechanism by which functional foods, such as probiotic foods, may enhance immunity and health.

Cytokinins  Class of plant growth regulators which occur naturally in plants and are also applied exogenously to influence the quality of fruits and vegetables. Particularly active in stimulating growth and cell division. Also, in animal physiology, refers to a class of linear polypeptide hormones, including bradykinin and angiotensin. Also known as kinins.

Cytolethal distending toxin  Toxins produced by certain Gram negative bacteria, including the pathogens Escherichia coli, Campylobacter and Salmonella. Disrupts the cell cycle in eukaryotes. Comprise 3 subunits designated CdtA, CdtB and CdtC. Subunits CdtA and CdtC are involved in delivery of the toxins to the host cells, while CdtB is responsible for the genotoxicity of the toxins.

Cytophaga  Genus of anaerobic, gliding, rod-shaped Gram negative bacteria of the family Flexibacteraceae. Occur in soil, decomposing matter and aquatic habitats. Some species may cause spoilage of refrigerated foods, especially fish and shellfish.

Cytosine  Pyrimidine base, which is a constituent of DNA and RNA.

Cytotoxicity  Quality or degree of being cytotoxic (exerting a toxic effect on cells).

Cytotoxins  Toxins which exert a toxic effect on cells.
2,4-D  Selective systemic herbicide used for post-emergence control of annual and perennial broad-leaved weeds in cereals, orchards, some vegetable crops and sugar cane. Classified by WHO as moderately hazardous (WHO II). Also known as 2,4-dichlorophenoxyacetic acid.

Dab  Marine flatfish species (Limanda limanda) which occurs abundantly around the northeast Atlantic. Flesh has firm texture and a sweet flavour. Marketed fresh, dried/salted, smoked and frozen.

Daconil  Alternative term for the fungicide chlorothalonil.

Dahi  Fermented milk product popular in India. Dahi made from buffalo milk is generally preferred to that made from cow milk. A sweet variety of dahi, misti dahi, is prepared by adding cane sugar to milk during heating, giving a caramelized flavour and brown colour.

Daidzein  One of the two isoflavones of particular importance in soybeans, the other being genistein. Both compounds are structurally similar to oestrogenic steroids and possess both oestrogenic activity and anti-oestrogenic activity, the principal functions responsible for the health benefits associated with consumption of soybeans and soy products.

Dairies  Premises in which dairy products are manufactured. Also called creameries or dairy factories.

Dairies effluents  Waste water released from dairies.

Dairies wastes  Wastes remaining after processing of dairy products.

Dairy beverages  Drinks based on milk or other dairy products, e.g. whey.

Dairy desserts  Ready to eat desserts based on dairy products, such as cream, milk or yoghurt. Available as chilled, frozen and shelf-stable products. Include mousses, custards, fromage frais, milk puddings and ice cream products.

Dairy factories  Premises in which dairy products are manufactured. Also called creameries or dairies.

Dairy-lo  Trade name for fat substitutes composed of whey protein concentrates which have been subjected to controlled thermal denaturation, resulting in functional proteins with fat-like properties. Used mainly in reduced fat dairy products, frozen dairy desserts (such as ice cream), bakery products and salad dressings. Marketed by Cultor Food Science.

Dairy products  Products manufactured from milk. Include as major product groups, cheese, yoghurt, butter, cream, fermented milk, ice cream and whey products. Also called milk products.

Dairy science  Division of food science dealing with the characteristics, manufacture and quality of dairy products as well as the production, management and distribution of dairy animals such as cows, goats and sheep.

Dairy spreads  Spreads based on milk fats and containing other, sometimes non-dairy, ingredients to give a lower fat content than butter.

Dairy starters  Microbial cultures used in manufacture of fermented dairy products, including fermented cream, fermented milk and cheese.

Dalia  Types of porridges made from wheat grits.

β-Damascenone  One of a number of aroma compounds found in plant foods and beverages produced from them. A member of the ketones class of chemicals derived from carotenoids and has the molecular formula C13H18O. May be added to flavourings, but more commonly used in fragrances, being a characteristic aroma compound in rose oil. Imparts a floral, fruity or woody aroma.

Daminozide  Plant growth regulator (the active component in Alar) which has been widely used in the cultivation of apples. Concern arose in the 1980s over the safety of Alar when it was identified as a possible carcinogen. Daminozide is also known by a number of other names, including N-dimethylaminosuccinamic acid, kylar and SADH.

Damsons  Purple plum-like fruits produced by Prunus damascena. Eaten cooked or used to make jams or damson cheese, a solid preserve of damsons and sugar.

Danbo cheese  Danish semi-soft cheese made from cow milk. Has a smooth, dry, yellow rind and is
sometimes coated with red wax. Ripened for 6 weeks to 5 months.

**Dandelions** Common name for *Taraxacum officinale*. All parts of the plant are consumed. The root is used to make beverages that smell like coffee but have the flavour of chicory, the leaves are used in salads or as vegetables, and the flower heads are used in winemaking.

**Danish pastries** Sweet bakery products made from laminating yeasts-fermented dough with butter or margarines and filled with nuts, fruits or custards. Often glazed with thin sugar/water icing.

**Dark chocolate** Chocolate that contains at least 35% cocoa solids. In the US, both semisweet and bittersweet chocolates may be referred to as dark chocolate. An equivalent term is plain chocolate. Dark chocolate is a rich source of gallic acid and epicatechin.

**Dark cutting defect** A defect of beef, often associated with bull beef. Dark cutting meat, also known as black beef or dark cutter beef, has a darker colour, and poorer flavour and texture than normal beef; moreover, the high pH value of dark cutting meat encourages the growth of spoilage bacteria and reduces shelf life. Physiological stress and exhaustion pre-slaughter deplete muscle glycogen stores, ultimately increasing the pH of meat and leading to the development of dark cutting defect. In young bulls, incidence of dark cutting defect can be decreased by low stress handling and prevention of bull behaviour (mounting, mock fighting and butting) in abattoir pens prior to slaughter.

**Darkening** Discoloration of a substance by becoming dark or darker. Red colour is often used by consumers as an indicator of the freshness of meat. Darkening of the product, which occurs during storage due to pigment shifts, is perceived as being a negative event, even though this is not a true indicator of wholesomeness or nutritional value. Because of consumer concerns, packaging films are designed to protect meat colour, largely by controlling diffusion of oxygen. Darkening is also a problem during repeated use of frying oils.

**Dark firm dry defect** Commonly abbreviated to DFD defect, a condition associated with pork in which meat has a high pH value and darker than normal lean colour. The defect results from a decreased glycogen content in swine muscles prior to slaughter; it is often associated with pre-slaughter stress. In beef, the term dark cutting defect or dark cutter is used to refer to the same condition.

**Databanks** Large stores of data held on computers.

**DATEM** Anionic oil in water emulsifiers used as improvers in breadmaking. Acronym for diacetyl tartaric acid esters of mono- and diglycerides.

**Date marking** Marking of food or beverage containers with a date that may be the date of manufacture, the sell-by date and/or the use-by date (expiry date). The sell-by date is the date by which the manufacturer recommends that a perishable product should be sold. Use-by dates are chiefly used in the UK instead of sell-by dates, and indicate the recommended date by which a perishable product should be eaten or used, after which it is no longer deemed to be safe, desirable or effective. Date marking is often required by law, particularly on packs of foods which should be maintained at low temperature, e.g. cheese, pates and ready meals, and on foods in which spoilage organisms are likely to multiply or cross contaminate other foods, e.g. fresh meat and fish. Other foods, such as bread and cakes, which tend to deteriorate in quality rather than safety do not require date marking by law, but are often labelled voluntarily by the manufacturer or retailer.

**Dates** Fruits of the date palm (*Phoenix dactylifera*). Vary in colour, shape and size, and may be soft, dry or semi-dry. Contain high levels of sugar, amounts and individual types of sugars varying among cultivars, but small amounts of vitamins. Vitamin C content is relatively high in fresh fruits, but is reduced to trace amounts by drying. Served as dessert fruits and incorporated into many food products, especially cakes and biscuits. In addition, in Arab countries, dates are also used in preparation of syrups, vinegar and sugar substitutes.

**Date shells** Marine bivalves (*Lithophaga lithophaga*) occurring along shores of the Mediterranean Sea and eastern Atlantic, which bore into rocks using a secreted acid. Consumed as a table delicacy in some Mediterranean regions.

**Dating** Process of marking a product or its outer packaging with date information, such as date of manufacture or date by which the product should be consumed to ensure quality.

**Davana** Common name for *Artemisia pallens*, a plant used as the source of aromatic herbs and essential oils with a characteristic fruity odour. Used in flavourings for cakes, pastries and value-added beverages.

**Dawadawa** Fat- and protein-rich fermented foods from West and Central Africa, traditionally made from African locust beans. Seeds are cooked, fermented and formed into balls, which can be used to flavour soups and stews. The fermented products can be stored for long periods and are a good source of li-
noleic acid and vitamin B₂. Also known as iru in Nigeria.

Day lilies Plants of the genus *Hemerocallis* that belong to the family Hemerocallidaceae. Some species have edible flowers, which may be used fresh or after drying, and which exhibit sweetness and a mild vegetable-like flavour. The young green leaves and tubers of some species are also edible.

DDD Alternative name for TDE.

DDE Persistent non-systemic organochlorine insecticide occurring as a degradation product of DDT. Usage of the parent compound to control insects on crops has generally been displaced by less persistent insecticides.

DDT Persistent non-systemic organochlorine insecticide used to control a wide range of insects. Subject to the Stockholm Convention on Persistent Organic Pollutants and usage on crops has generally been displaced by less persistent insecticides. Classified by WHO as moderately hazardous (WHO II).

Deacetylation Form of chemical structure modification involving removal of acetyl groups (CH₃-CO-) from molecules. Used to convert chitin or chitosan into biologically active derivatives and to alter the rheological properties of additives, such as xanthan gums.

Deacidification Neutralization process whereby the acidity of a substance is reduced. Deacidification is often used in conjunction with the processing of apple juices, cider, vegetable oils, wines and grape musts. Deacidification of grape musts is crucial for the production of well-balanced wines, especially in colder regions of the world. Malolactic fermentation is widely used to reduce the acidity of grape juices. Young wines can also be deacidified with calcium carbonate and potassium hydrogen carbonate. Deacidification of vegetable oils (such as rice bran oils and corn oils) can be carried out using solvent extraction and membrane processing. Nanofiltration has been used for deacidifying and demineralizing cottage cheese whey, ready for use in ice cream and other frozen dairy desserts.

Deaeration Removal of air or oxygen from a solution, for example by bubbling with an inert gas. Also known as degassing.

Deamidation Form of chemical structure modification in which amide bonds undergo hydrolysis to remove amide groups from molecules such as proteins and amino acids. Enzymic or non-enzymic deamidation of cereal proteins is often performed to improve functional properties, such as solubility, foaming capacity and emulsifying capacity. Can also cause undesirable damage to amino acid side chains on certain food proteins during processing.

Deaminases Includes members of EC 3.5.4. These hydrolases act on carbon-nitrogen bonds other than peptide bonds, removing amino groups from compounds. Ammonia is produced in the process. Substrates include purines, pyrimidines, nucleotides, nucleosides, etc., and hence can affect food flavour.

*Debaryomyces* Genus of yeasts of the family Saccharomycetaeae and class Saccharomycetes. *Debaryomyces hansenii*, which tolerates high concentrations of salt and is cryotolerant, is the most common species of yeast found in all types of cheese. Also found on fish, in salted dairy products and in brines as it is able to grow in the presence of salt at low temperatures, and to metabolize lactic acid and citric acid. *D. hansenii* also provides proteolytic and lipolytic activities during cheese ripening. This species is one of the most frequent yeast species to be associated with chilled foods. Used as a starter in the manufacture of fermented sausages, and has been responsible for the spoilage of fruit juice concentrates and yoghurt. *D. hansenii* is able to convert xylose to xylitol.

Debittering Removal of bitter compounds from foods such as citrus fruits, chocolate, soybeans and cruciferous vegetables, and beverages such as wines, fruit juices, cider and beer, to make them more palatable. Debittering can be achieved biologically, using enzymes or immobilized bacteria. Lactone hydrolases are used commercially for debittering citrus juices by removing triterpenes. Correction of excessive naringin bitterness in citrus fruits can be achieved through use of adsorbents or cyclodextrins to form less bitter inclusion complexes. Deliberate aeration of the pulp during apple juice extraction for cidemaking promotes the removal of bitter and astringent flavonoids through their binding to the pomace. Fining with gelatin decreases contents further still by coprecipitation. Proline-specific aminopeptidases can be used for debittering food protein hydrolysates. Enzymic hydrolysis of oleuropein by β-glucosidase from *Lactobacillus plantarum* offers an alternative to chemical debittering treatments for table olives.

Deboning A process for cutting of meat from the bones, which can be done either manually or mechanically.

Debranching enzymes Alternative term for pullulanases and isoamylases.

Debranning Process of bran removal from cereals. May be achieved by milling or by soaking in a solution of an alkali such as sodium hydroxide. Used to
Decaffeination  Removal of caffeine from a substance such as coffee or tea. Caffeine is removed from coffee by soaking coffee beans in chemical solvents or water. The resulting decaffeinated product contains approximately 3 mg caffeine per 150 ml cup, compared with 75-150 mg for normal coffee.

\[ \text{γ-Decalactone} \] One of the aroma compounds, with molecular formula C\textsubscript{10}H\textsubscript{18}O\textsubscript{2}. Synonyms include decan-4-olide and 5-hexylidihydro-2(3H)-furanone. Has a fruity, peach-like aroma and is naturally present in various foods, including fruits and alcoholic beverages. Microbially synthesized γ-decalactone is used in food flavourings.

Decanal  One of the aldehyde flavour compounds, which occurs naturally in a wide range of foods and beverages and is used in flavourings for processed products.

Decanoic acid  Synonym for capric acid. Member of the medium chain-length saturated fatty acids with 10 carbon atoms. Found in a range of animal and vegetable fats and vegetable oils, and, in its free form, contributes to the flavour of foods and beverages.

Decanol  Alcohol with 10 carbon atoms. Along with some of the other higher alcohols, contributes to the flavour of foods and beverages, especially alcoholic beverages, and is also widely used as a solvent.

Decanters  Stopped glass containers into which wines or spirits are decanted.

Decarbonation  Removal of carbon dioxide from a sample. Required for sample preparation prior to beer analyses, such as determination of original gravity and alcohol content.

Decarboxylases  Lyases belonging to subclass EC 4.1.1 that remove carboxyl groups from a molecule, especially amino acids and proteins. When acting on single substrates, a molecule of CO\textsubscript{2} is eliminated leaving an unsaturated residue.

Decarboxylation  Chemical modification involving the removal of carboxyl groups from organic compounds, generating CO\textsubscript{2}. Can be due to the influence of enzymes (decarboxylases) or other catalysts, or can occur spontaneously. Several aroma compounds, including diacetyl, are formed by decarboxylation reactions.

Decenoic acid  One of the mono-unsaturated fatty acids, having the chemical formula C\textsubscript{10}H\textsubscript{16}O\textsubscript{2}. Various isomers exist, some of which are used as flavourings, including 4-decanoic acid and 9-decanoic acid (also known as caproleic acid). Also present as natural flavour compounds in foods, including dairy products. The derivative trans-10-hydroxy-2-decenoic acid occurs in royal jelly and is used as a marker for this product, while another, 10-oxo-trans-8-decenoic acid, is produced by mushrooms and exhibits antimicrobial activity.

Deep freezing  A method for preservation of foods by rapid freezing and storage at -18°C. Freezing preserves foods by preventing microorganisms from enhance milling performance of cereals as well as to provide by-products with potential as food ingredients. However, debranning may also affect the nutritional quality and functional properties of the cereal and subsequent products.
Deep frying  Degreening

Defecation  Removal of impurities, usually applied to foods in an amount of hot fats or oils sufficient to cover them completely during frying.

Defoaming agents  Substances, often silicon-based, used to minimize formation of foams during food processing. These foams would otherwise cause problems for both the processing operation and final product quality. Typical applications where foaming problems occur include freeze drying, sugar processes and manufacture of fruit and dietetic soft drinks. Similar to antifoaming agents.

Degassing  Alternative term for deaeration.

Degassing  Process of ripening or improvement of skin or peel colour, usually by application of ethylene to citrus fruits (such as satsuma mandarins and lemons), bananas, rapeseeds and mustard seeds. Decay tends to be more severe in degreened fruit because the degreening process itself promotes decay, and because packaging line fungicide treatments have to be delayed until after degreening. Uneven degreening of bananas is a ripening disorder characterized by either partial or delayed yellowing or by permanent greenness after treatment with exogenous ethylene. Green seed is a significant economic problem in rapeseeds because the rapeseed oils extracted from such seed contains chlorophyll-type pigments. Seed crushers can remove the green colour...
Degumming

The first stage in the purification of crude oils, which involves removal of phospholipids and colouring materials. Degumming is necessary to prevent separation and settling of gums (sticky, viscous oil-water emulsions stabilized by phospholipids) during transportation and storage of crude oils, to reduce oil losses in the subsequent phases of refining, and to avoid excessive darkening of the oils in the course of high-temperature deodorization. Degumming agents, such as phosphoric acid, may be used together with a flocculation agent such as alumina. During water degumming, phosphatides in seed oils are removed by centrifugal separation, after precipitation with water. Acid degumming involves removal of gums and impurities via centrifugal separation after precipitation with acid and water. By-products of the degumming process are known as lecithins.

Degumming agents

Processing aids used to remove phospholipids, trace metals and mucilaginous gums during the initial (degumming) stage of oils and fats refining. Examples include water, phosphoric acid and citric acid.

Dehairing

Removal of the hair from hides and fleece of animal carcasses, usually by scalding, singeing or chemical methods. Carcasses are dehaired as an intervention to reduce microbial load and improve visual cleanliness prior to dressing.

Dehulling

Removal of the hulls from fruits or seeds prior to consumption. Also called hulling or husking. This term also relates to removal of the cluster of leaves from the tops of strawberries prior to consumption.

Dehydrated foods

Alternative term for dried foods.

Dehydration

Alternative term for drying.

Dehydroacetic acid

Organic acid used in preservatives to inhibit microbial growth in foods and beverages.

Dehydroascorbic acid

Oxidized form of vitamin C, which together with ascorbic acid (the reduced form), makes up the total vitamin C activity in a substance. Present in many food materials, where it has been implicated in browning or discoloration reactions in certain matrices, such as citrus juices. In breadmaking, dehydroascorbic acid is formed from ascorbic acid (used in bakery additives) and acts as an oxidizing agent, promoting formation of disulfide bonds (important for dough strength).

Dehydrogenases

Oxidoreductases that oxidize substrates by transferring hydrogen atoms to an acceptor that is either NAD/NADP or a flavin enzyme.

Dekkera

Genus of yeasts of the family Saccharomycetaceae and class Saccharomycetes. Telomorph of Brettanomyces. Important spoilage microorganisms in several foods and beverages. Dekkera bruxellensis and D. anomala are responsible for the spoilage of beer and wines. However, at low levels, these yeasts can have a positive effect on the sensory properties of specific wines and beers. Typically isolated from barrel aged wines.

Delicatessen foods

Speciality ready to eat foods purchased from delicatessen shops or departments. Examples include delicatessen salads, imported cooked meat products and speciality cheese. Also known as deli foods in the USA.

Delicatessen salads

Ready to eat chilled salads (frequently mayonnaise-coated) obtained from delicatessen shops or departments. Examples include coleslaw, potato salads and herring salads.

Delphinidin

One of the anthocyanidins pigments, often present as a glycoside, and found in many fruits and vegetables. Displays antioxidative activity.

Deltamethrin

Non-systemic pyrethroid insecticide used to control insect pests on a wide range of fruits, vegetables and cereals; also used in stored cereals and as a dip or spray for cattle, sheep and swine. Classified by WHO as moderately hazardous (WHO II).

Demineralization

Removal of minerals from substances. Includes processing steps in food manufacture, such as for sugar syrups, drinking water, musts and whey, and for treatment of food factories effluents. Processes used to achieve demineralization include electrodialysis, reverse osmosis and nanofiltration. Also covers the undesirable removal of selected minerals from previously healthy tissues such as bone and tooth enamel, which may be caused by a variety of factors including nutritional imbalance and excess acidity, respectively.

Denaturation

Structural change, especially in proteins or nucleic acids, in response to extreme conditions of temperature, pH, pressure or salt concentration, which renders the molecule incapable of performing its original biological function. Used in food processing to inactivate detrimental enzymes, or to alter the gelation properties of proteins such as gelatin or whey proteins. However, can also be deleterious, leading to impairment of functional properties such as water holding capacity in proteinaceous foods, and to reduced product yields in enzyme catalysis.

Denitrification

Process of removing nitrogen or nitrogen compounds from a substance, or alterna-
Densitometry  Technique for measuring the optical density of a material by recording transmission of light.

Density  One of the physical properties of a substance, defined as the mass contained in a given volume. Routinely determined for a wide range of foods, including fruits and vegetables (sometimes related to ripeness and composition), fats and oils, foods produced by extrusion, and cereals. Density determinations can also be used as process control steps in food processing.

Dental caries  Disease in which cavities are formed in the teeth resulting ultimately in dental pain and tooth loss. Caries formation is associated with the action of oral Streptococcus mutans strains. Cavity formation is increased by the consumption of sugar-containing foods, as the sugar is metabolized by the bacteria to form acids, which destroy the tooth enamel and subsequently the dentine. Increasing oral saliva production, achieved by various means such as chewing chewing gums, can buffer bacterial acid production and reduce cavity formation. Sometimes known as cavities.

Dental health  Measure of the physical condition of an individual's teeth and gums, or factors influencing their condition. Cariogenic foods, including many with a high sugar content, promote development of dental caries (decay), whilst cariostatic or anticariogenic foods or ingredients reduce these processes. Fluoridation of drinking water is undertaken with the aim of improving dental health, and oligosaccharides with cariostatic properties are being developed for use as sweeteners.

Dentex  Genus of marine fish containing several species of sea bream.

Deodorization  Removal or concealment of an unpleasant smell in an item. Deodorization is usually the last step in edible oil refining, involving vacuum-steam distillation at elevated temperature, during which free fatty acids and odoriferous volatile compounds are removed in order to obtain a bland and colourless product. Deodorization can be conducted under continuous, semi-continuous or batch conditions.

Deoxycholate  Salt of deoxycholic acid (one of the secondary bile acids). Used in surfactants and selective media for cell culture, such as deoxycholate-citrate agar. Also known as deoxycholate.

Deoxymyoglobin  Form of myoglobin in which the ferric iron in the haem moiety is not bound to O2, but is commonly bound to water. Formed initially on cutting of meat and imparts a purple colour to the meat. Has relatively low oxidative stability and its oxidation to oxymyoglobin restores a red colour to the meat. Responsible for the purple colour often seen with meat subjected to vacuum packaging.

Deoxynivalenol  One of the Type B trichothecenes group of mycotoxins, produced by Fusarium spp. Also known as vomitoxin. Occurs in Fusarium-infected cereals, primarily those infected with F. graminearum and F. culmorum. Deoxynivalenol has been implicated in cases of mycotoxicoses in both humans and animals. However, large amounts of grain containing deoxynivalenol would have to be consumed to pose a risk to human health.

Deoxyribonucleases  Nucleases, also known as DNases, that cleave the phosphodiester bonds between nucleotide subunits in single- or double-stranded DNA. Include endodeoxyribonucleases (EC 3.1.21, 3.1.22 and 3.1.25) which cleave within DNA molecules and exodeoxyribonucleases which hydrolyse terminal nucleotides (EC 3.1.11, 3.1.15 and 3.1.16). Endodeoxyribonucleases include the restriction endonucleases.

Deoxyribonucleic acid  One of the nucleic acids. Commonly abbreviated to DNA.

Depolymerization  Form of modification in which biopolymers (e.g. proteins and polysaccharides) are broken down firstly into smaller fractions (peptides and oligosaccharides) and finally into individual monomers (amino acids and sugars). Occurs in pectins and celluloses during ripening. Depolymerization of polyacrylamides may lead to formation of acrylamide in foods during heating.

Depositors  Devices for laying down a body of accumulated matter. In the food industry, they may be used to place such substances as fillings, toppings, batters and mixes in position.

Depuration  To make or become free from impurities using controlled purification systems employing sterilized water. Systems can be flow-through or recirculating types, and water sterilization treatments involve the use of chlorine, UV light, ozone, membrane filters or iodophors. Depuration is usually applied to purification of shellfish, such as oysters and mussels. Post-harvest depuration in controlled waters can increase the safety of shellfish by reducing the number of pathogens present following harvesting from moderately polluted water.

Dermatitis  Inflammation of the skin. Atopic dermatitis may be associated with other atopic diseases such as asthma and type I allergies, including those in response to foods.

Desalination  Removal of salt, e.g. desalination of sea water.
Desalting  Removal of salt.

Desaturases  Includes EC 1.3.1.35 and members of subclass EC 1.14.99. These oxidoreductases have a number of uses in the food industry, e.g. fatty acid desaturases introduce double bonds into fatty acyl chains and are useful for production of polyunsaturated fatty acids. Genetic modification of desaturases in plants and microorganisms can be used to modify contents of fatty acids, and cholesterol desaturase can be used to reduce the cholesterol content of foods.

Desaturation  Process by which a substance is made less saturated. In the case of organic compounds, e.g. fatty acids, this involves removal of hydrogen atoms from adjacent carbon atoms, thereby forming double bonds and increasing the degree of unsaturation. Such reactions are catalysed by desaturases. In the food industry, introduction of double bonds into fatty acyl chains in this way is useful for production of polyunsaturated fatty acids, intake of which can have beneficial effects for risk of cardiovascular diseases development.

Desiccation  Removal of deposits of scale from an item, particularly removal of lime scale from heating elements in kettles and boilers. For removal of fish scales, the alternative term scaling maybe used.

Desiccated coconut  Product prepared from coconut endosperm by shredding and drying. Used in manufacture of sugar confectionery and bakery products.

Desiccation  Alternative term for drying.

Designer foods  Functional foods targeted towards a certain purpose such as the prevention of certain diseases, or provision of tailored health benefits.

Desmin  One of the animal proteins present in meat and fish muscle. It is an intermediate filament protein present in the cytoplasm of skeletal, cardiac and smooth muscle cells. In skeletal muscle, it is found near the Z-line of sarcomeres and is thought to be involved in maintaining alignment of the sarcomeres and in regulation of the distribution and function of mitochondria. Post mortem proteolysis of desmin by calpains has been demonstrated with effects on meat tenderness and water holding capacity.

Desmosterol  Member of the steroids group, found in a variety of animal and plant foods including goat milk, sea urchins and wild palm oils. It has also been detected in human milk.

Desmutagenicity  Specific type of antimutagenicity relating to the ability of a chemical to counteract the mutagenicity of another chemical. This attribute has been demonstrated for several foods or isolated food components, and contributes to their associated health benefits. Foods and components displaying this property include tea polyphenols, extracts of seaweeds, cheese and fermented milk. Some microorganisms used in food fermentations have also been shown to have desmutagenic activity, including Bifidobacterium spp. and some lactic acid bacteria.

Desorption  Physical or chemical sorption process by which a substance (gas, liquid or solid) that has been adsorbed or absorbed by a liquid or solid material is removed from the material. Desorption isotherms of foods during drying are commonly studied to quantify reductions in moisture content. An O2 adsorption-desorption process has been observed in dough during breadmaking. A thermal desorption step is used in analyte separation during GC analyses.

Desoxycholate  Synonym for deoxycholate.

Dessert mixes  Dried instant foods used to prepare desserts, typically by adding water or milk. Also called pudding mixes.

Desserts  Sweet foods usually served as the last course of a meal. The term encompasses many different types of food, including dairy- and fruit-based products, cooked or raw. Available frozen, chilled or shelf-stable, as well as in the form of dessert mixes. Popular desserts include cheesecakes, mousses, gateaux, fruit products and ice cream products.

Dessert wines  Sweet wines of varying alcohol content usually drunk in small amounts as an accompaniment to the dessert course of a meal. May also refer to fortified wines.

Desulfation  Removal of salts of sulfurous acid, usually sulfites, and SO2. Microbes can be used for desulfitation of waste water (effluent) from food factories. Wines for distillation can be desulfited using CaCO3. Musts that are preserved by heavy sulfitation, and used for adjustment of sweetness of wines, require desulfitation before use. In the Brimstone winemaking system, clarified grape juices are preserved with high levels of SO2 (1200-2000 mg/l) and then desulfited just before fermentation.

Desulfovibrio  Genus of sulfate reducing, obligately anaerobic, rod-shaped Gram negative bacteria of the family Desulfovibrionaceae. Occur in aquatic environments, including fresh and salt water sediments, and also in the gastrointestinal tracts of animals, and in faeces. Capable of reducing sulfur compounds to hydrogen sulfide.

Detergents  Surfactants, such as soaps, used for cleaning purposes.

Deterioration  Spoilage process involving a decline in food quality. Can occur during storage via the actions of microorganisms or chemical reactions. Can
also be caused by physical processes, such as heating or freezing.

**Detoxicants** Substances which inactivate, neutralize, or render harmless toxins or poisons.

**Detoxification** Process of removing poisons or toxins (e.g. from foods), or process of inactivating, neutralizing or rendering harmless toxins or poisons. Can be effected by the use of solvents, chemical reactions, enzyme systems or microbial action.

**Detoxification enzymes** Enzymes involved in transformation of ingested xenobiotics, including drugs, pesticides and some food components, to a form that can be excreted in urine. Classified as Phase I and Phase II enzymes. Phase I enzymes initiate metabolism of xenobiotics and include cytochrome P450 monoxygenases, while Phase II enzymes continue the process by modification of the products of Phase I enzyme reactions, and comprise many transferases, including glutathione transferases. Hepatic detoxification enzymes have been studied predominantly. The anticarcinogenicity of some plant foods, e.g. garlic, has been linked to their stimulation of Phase II enzymes.

**Dewatering** Process of removing excess water from a substance, e.g. after washing of a food. Used in processing of foods and in treatment of wastes. In the case of foods, water can be removed by various procedures including passing over vibrating screens, using specially designed rotary screens or centrifugation.

**Dewberries** Blackberry-like fruits produced by a number of Rubus spp., including R. caesius in Europe, and R. hispidus or R. canadensis in America. Similar in appearance to blackberries, but smaller, with a slight whitish bloom.

**Dextran** Branched glucans formed by certain lactic acid bacteria through the fermentation of sugars. Found in dental plaque and as a deterioration product in the sugar cane industry. Employed widely, such as in aqueous two phase systems and as a model polysaccharide molecule in carbohydrate research. Used therapeutically as a substitute for blood plasma and as a plasma expander under emergency conditions.

**Dextranases** EC 3.2.1.11. Catalyse the endohydrolysis of 1,6-α-D-glucosidic linkages in dextran, producing isomaltose, isomaltotriose and other isomaltodextrin oligosaccharides. Useful in the sugar industry for degrading any contaminating dextran that may be present, which can interfere with filtration and clarification of sugar juices.

**Dextranucrases** EC 2.4.1.5. Glycosyltransferases which catalyse the synthesis of dextran from sucrose. Can also synthesise oligosaccharides, e.g. leucrose (a sugar substitute) in the presence of appropriate sugar acceptors, e.g. maltose (a strong acceptor) and fructose (a weak acceptor). Used in the production of prebiotic oligosaccharides.

**Dextrinases** Previously used as an alternative term for α-dextrin endo-1,6-α-glucosidases, which are now reclassified as pullulanases (EC 3.2.1.41). Also occasionally used in conjunction with limit dextrinases (EC 3.2.1.142) or with dextrin dextranases (EC 2.4.1.2).

**α-Dextrin endo-1,6-α-glucosidases** Alternative term for pullulanases.

**Dextrins** General term used for a range of watersoluble polysaccharides formed by partial hydrolysis of starch, including maltodextrins and cyclodextrins. Used for various applications in the food industry, such as prevention of crystallization or as thickeners. Their sticky consistency also makes them suitable for use as edible adhesives. Cold-water soluble dextrins are used as carriers for flavourings in products such as dry mixes, soups and gravy.

**Dextrose** Name given to the dextrorotatory stereoisomer of glucose (D-glucose).

**Dextrose equivalent** The percentage of hydrolysis of glycosidic bonds in products, particularly maltodextrins, glucose syrups, corn syrups and other starch products, calculated as dextrose (D-glucose) on a dry weight basis; e.g. if 40-60% of the glycosidic bonds are hydrolysed, the corn syrup will have a dextrose equivalent of 40-60%. Pure glucose has a dextrose equivalent of 100, pure maltose approximately 50 and starch effectively zero. Often abbreviated to DE.

**DFD defect** Abbreviation for dark firm dry defect of pork.

**Dhal** Term used in two ways. In India, it is used to denote split pulses of a number of varieties, including grass peas and lentils. It also refers to a spicy dish based on lentils or other pulses that may be pureed and served with curries. Alternative spellings include dal, dahl and dhall.

**Dhokla** Popular fermented foods of India. Typically prepared by soaking meal from chick peas or other legumes in water with buttermilk or curds for several hours, seasoning with ginger and chillies, and steaming the batter. The steamed cake is cut into squares, garnished with grated coconut and coriander and served hot.

**Diabetes** Group of two diseases (diabetes mellitus and diabetes insipidus) of disparate pathology, both charac-
Diabetic diet A diet designed specifically for individuals with diabetes to help control their symptoms and disease progression. The amount of sugar or readily available carbohydrate is usually limited to avoid large increases in blood glucose levels.

Diabetic foods Dietetic foods manufactured specifically for individuals suffering from diabetes. Generally formulated to be low in absorbable carbohydrates, e.g. by replacing sucrose with fructose, sorbitol or other sweeteners that do not induce a large increase in blood glucose level.

Diacetoxyisocirpenol Trichothecene produced by Fusarium spp. Also known as anguidine.

Diacetyl Yellow, flammable liquid with a strong aroma and buttery flavour derived from fermentation of glucose. Soluble in water and alcohol. Used as an aroma carrier in foods and beverages.

Diacyl tartaric acid esters of mono- and diglycerides Emulsifiers known by the acronym DATEM.

Diacylglycerols Glycerides composed of a molecule of glycerol bonded to two fatty acids. Possess emulsifying capacity and are used as additives in foods, including shortenings. Also known as diglycerides.

Diafiltration Extension of the ultrafiltration process in which water is added back to the extract during the concentration process. During diafiltration, both diffusive and convective mass transfer take place simultaneously as a result of two driving forces: a concentration gradient and a transmembrane pressure gradient. This is useful in selectively removing low molecular weight materials from a mixture, and offers a useful alternative process to ion exchange or electrodialysis for removal of anions, cations, sugars, alcohol or antinutritional factors. Diafiltration is an accepted method for production of alcohol free, low calorie and low alcohol beer.

Diallyl disulfide Organic sulfur compound which is a major component of garlic and garlic oils and a major contributor to their aroma. In addition to its sensory properties, the compound also possesses health benefits including antitumour activity and protection against the risk of cardiovascular diseases.

Dialysis Separation of particles in a liquid on the basis of differences in their size and thus ability to pass through a membrane. Membranes are chosen that will allow small particles to pass through, but retain larger particles. The process can be used to remove unwanted particles and enrich or concentrate a solution.

Diamine oxidases Alternative term for amine oxidases.

Diarrhoea Disorder characterized by loose watery stools which are often evacuated at increased frequency. Diarrhoea may be an indicator of many diseases of the gastrointestinal tract, including foodborne diseases, food poisoning, gastroenteritis, food intolerance, colitis and colorectal cancer.

Diarrhoetic shellfish poisoning Food poisoning resulting from consumption of marine bivalves containing certain diarrhoetic shellfish toxins (such as okadaic acid) produced by dinoflagellates. Symptoms include nausea, intestinal pain, diarrhoea and memory loss.

Diarrhoetic shellfish toxins Toxins produced by certain marine dinoflagellates which are responsible for causing diarrhoetic shellfish poisoning. The most important of these toxins is dinophysistoxin-1, okadaic acid and derivatives of these compounds.

Diastases Alternative term for α-amylases.

Diastatic activity Total activity of starch degrading enzymes in grain malts. An important quality characteristic for malting and brewing.

Diatomaceous earths Powdery natural materials formed from the microscopic skeletons of diatoms, deposited in most cases during the Cenozoic era. Diatomaceous earth is fine in texture and grey or white in colour; when pure, diatomaceous earth is composed almost entirely of silicon dioxide or silica, but it is often found mixed with clay or organic matter. The material is used in fining agents and filtration materials in the food industry, among many other varied and wider fields of application.

Dioctoxanthin One of the carotenoids detected in several types of fish and shellfish and also in brown seaweeds.

Diazepam Sedative drug that exhibits antihypertensive and myorelaxant properties. Normally used as a feed intake and growth promoting agent. Use to reduce...
stress in animals during transport to slaughterhouses is not permitted. Undergoes extensive and complex metabolism in animals.

Diazinon  Non-systemic organophosphorus insecticide and acaricide used for control of sucking and chewing insects and mites on a wide range of fruits, vegetables, cereals, sugar cane, cocoa, coffee and tea; also used as a veterinary acaricide. Classified by WHO as moderately hazardous (WHO II).

Diazocyclopentadiene  One of the plant growth regulators. A competitive inhibitor of ethylene that can be used to control ethylene-induced developmental responses in fruits and vegetables.

Dicamba  Selective systemic herbicide used to control annual and perennial broad-leaved weeds and brush species in crops, particularly cereals. Often used in combination with other herbicides. Classified by WHO as slightly hazardous (WHO III). Also known as banvel.

Dichlofluanid  Fungicide used for control of scab, brown rot and other fungal diseases in pome fruits, stone fruits and various vegetables; also has a suppressive effect on spider and rust mites on fruits. Classified by WHO as unlikely to present acute hazard in normal use. Also known as euparen.

Dichloroacetic acid  One of the haloacetic acids and disinfection by-products found in drinking water treated with chlorine. Chemical formula C₂H₂Cl₂O₂. Also detected in some foods and beverages washed with chlorinated water. Toxicity, including hepatotoxicity, neurotoxicity and carcinogenicity, has been demonstrated in studies using animal models.

Dichlorobenzene  Organochlorine compound used widely, including as an insecticide and acaricide in apiculture, a moth repellent and a deodorant. Classified by WHO as slightly hazardous (WHO III).

2,4-Dichlorophenoxyacetic acid  Alternative name for 2,4-D.

Dichlorprop  Selective systemic herbicide used for post-emergence control of annual and perennial broad-leaved weeds in cereals. Also acts as a plant growth regulator. Classified by WHO as slightly hazardous (WHO III).

Dichlorvos  Organophosphorus insecticide and acaricide used for control of insect pests and mites in stored fruits, vegetables and cereals; also used as an anthelmintic in animals. Classified by WHO as highly hazardous (WHO Ib). Also known as vapoana.

Dicing  Cutting of materials, such as foods, into small cubes.

Dicloxacillin  Semisynthetic penicillin antibiotic used to treat a range of bacterial infections in animals, particularly those caused by staphylococci.

Dicofol  Non-systemic organochlorine insecticide and acaricide used for control of mites on a wide range of fruits and vegetables. Classified by WHO as slightly hazardous (WHO III). Also known as keltane.

Dieldrin  Persistent organochlorine insecticide that has been used for control of a wide range of insect pests in crops. A breakdown product of aldrin and a potent neurotoxin. Subject to the Stockholm Convention on Persistent Organic Pollutants and usage on crops has generally been replaced by less persistent insecticides.

Dielectric constant  One of the electrical properties, describing the ability of a material to store electrostatic energy when a unit voltage is applied. Also known as relative permittivity. Dielectric constants have been used to determine changes in foods, such as moisture content changes in sugar confectionery, or degradation of frying oils, and also to monitor processing steps such as the use of microwaves in thawing and cooking.

Dielectric heating  Heating of electrically non-conducting materials, such as foods, by subjecting them to high frequency electromagnetic fields. The material to be heated is placed between two electrodes, to which a source of high-frequency energy is connected. In homogeneous materials, the resultant heating occurs throughout.

Dielectric properties  Electrical properties of dielectric materials, i.e. non-conducting materials which can sustain electric fields and act as insulators. These properties include the dielectric constant, dielectric relaxation and dielectric loss. Examples of their use in food analysis include assessment of the stability of dough during frozen storage, and comparison of the quality of musts from different cultivars of winemaking grapes.

Diet  Selection by individuals or population groups of foods and beverages for consumption. Dietary composition is the major factor affecting nutrition status and can have profound effects on health and risks for a range of diseases.

Dietary fibre  Complex mixture of plant cell wall components including lignin and carbohydrates that are resistant to digestion in the small intestine. The carbohydrate components include nonstarch polysaccharides. Classified into insoluble fibre and soluble fibre. High-fibre diets can help control obesity and constipation, reduce the risk of cancer development and lower blood cholesterol. Fibre-rich
Dietary reference values

Foods include wholegrain foods, wholemeal cereal products, fruits and vegetables.

Dietary reference values

Usually abbreviated to DRV. Set of UK standards detailing the amounts of each nutrient needed to maintain good health. In the case of most nutrients, the measured average need plus 20% is satisfactory for the requirements of the majority of the UK population; this is termed the Reference Nutrient Intake.

Dietary study techniques

Methods for obtaining information on the diet or eating habits of individuals and population groups. Includes food frequency questionnaires, diet diaries, dietary recalls and weighed records.

Dietary supplements

Alternative term for specific types of food supplements usually taken in tablet or capsule form as a supplement to the normal diet, with the aim of increasing an individual’s intake of a specific nutrient, e.g. vitamins or minerals.

Diet drinks

Beverages that are low in calories. Usually free-from or low in sugar compared to their regular counterparts and contain added sweeteners. Generally marketed towards health-conscious consumers and those wanting to maintain or lose body wt.

May be consumed as part of a wt. loss diet in order to prevent or reverse overweight and obesity.

Dietetic foods

Products intended for consumption by individuals with metabolic disorders or allergies, such as diabetic foods or gluten free foods. Also used to refer to foods providing specific nutritional benefits to healthy individuals with particular dietary requirements, such as infants or athletes.

Diethyleneglycol

Glycol, which exists as a colourless, highly flammable, toxic liquid with an aroma of ammonia. Miscible with water, alcohol and most organic solvents. Uses include in pesticides, resins, polymerization inhibitors, rubber chemicals, pharmaceuticals, electroplating and corrosion inhibitors.

Diethylene glycol

Glycol, which exists as a colourless, viscous, combustible, extremely hygroscopic, non-corrosive liquid. Almost odourless, but has a sweetish flavour. Miscible with water, acetone, ether and ethylene glycol, but does not mix with benzene or toluene. When added to water, it lowers the freezing point while raising the boiling point. Used in the manufacture of corks, polyurethane, unsaturated polyesters, plasticizers, surfactants, dyes, textiles and paper products. Also used in antifreeze solutions and in humectants for casein. Highly toxic and banned for use in foods, diethylene glycol has been used for the adulteration of wines. There is also a risk of migration from food contact materials.

Diethylamine

Amine, which exists as a colourless, technical, non-corrosive liquid. Uses include in ammonia, pesticides, resins, polymerization inhibitors, rubber chemicals, pharmaceuticals, electroplating and corrosion inhibitors.

Diethylammonium

Amine, which exists as a colourless, technical, non-corrosive liquid. Uses include in ammonia, pesticides, resins, polymerization inhibitors, rubber chemicals, pharmaceuticals, electroplating and corrosion inhibitors.

Diethylnitrosamine

One of the volatile nitrosamines with mutagenic activity, synonym N-nitrosodiethylamine. Occurs predominantly in meat, but also detected in other foods, including cheese and fermented foods. Synthesis has been associated with addition of nitrates and nitrites to foods during processing.

Diethylpyrocarbonate

Histidine modifying reagent, and hence inhibits the activity of some enzymes and proteins. Previously used in preservatives to prevent the growth of microorganisms in wines, other alcoholic beverages and soft drinks. However, has been linked to urethane formation.

Diethylstilboestrol

Synthetic, non-steroidal anabolic agents based on oestrogens. Currently banned worldwide for use in animals produced for food, due to its genotoxicity and carcinogenicity. Previously used widely as growth promoters, principally in cattle, but also in poultry, sheep and swine.

Diet therapy

Management of a wide range of conditions and diseases, including diabetes, allergies, obesity, arthritis and cardiovascular diseases, through modulation of the diet.

Differential scanning calorimetry

Technique in which a sample and thermally inert reference material at the same temperature are heated using a temperature programme and the rate of heat flow is measured independently for each. The differential heat flow is monitored as a function of temperature. Can be used to measure heat capacity. Usually abbreviated to DSC.

Differential thermal analysis

Technique in which the difference in temperature between the sample and a reference is measured as heat is applied to the system.

Diffraction

Generally used to describe changes in the direction of waves caused by obstacles. Used specifically in terms of optical properties to describe the bending of light when it passes through an obstruction. X-ray diffraction patterns are used to analyse the structure of crystals, including proteins, carbohydrates and nucleic acids. Laser diffraction can be used to analyse the size distribution of particles. White light, electron and neutron diffraction patterns have also been determined during the analysis of foods.

Diffusers

Devices assisting in the travel or spread of gas or liquid by diffusion.

Diffusion

Spontaneous and random movement of molecules or particles in a fluid (gas or liquid) from a region of high concentration to a region of low concentration. Once a uniform concentration (or dynamic equilibrium) is achieved, net diffusion ceases and motion is random throughout the fluid. Diffusion rates are
widespread use in food analyses, and two common examples include moisture diffusion, which is routinely determined in foods during drying, and salt diffusion, which will affect the curing rate of foods.

**Diffusivity** Measure of the ability of a substance to diffuse. Includes thermal diffusivity, which describes the diffusion of heat through a material.

**Diflubenzuron** Selective, non-systemic benzoylurea insecticide used for control of a wide range of leaf eating insects and their larvae in fruits and vegetables; also used as an ectoparasiticide on sheep. Classified by WHO as unlikely to present acute hazard in normal use.

**Difructose anhydride** Non-digestible fructose disaccharides released from inulin in reactions catalysed by inulin fructotransferases (DFA-III-forming) or (DFA-I-forming). Present in chicory, which is a source of inulin. Difructose anhydride III (α-D-fructofuranosyl β-D-fructofuranosyl 1,2′:2,3′-dianhydride) enhances absorption of certain minerals, including calcium and has potential for use in prebiotics. Both DFA III and DFA I (α-D-fructofuranosyl β-D-fructofuranosyl 1,2′:2,1′-dianhydride) have approx. 50% the sweetness of sucrose and thus have potential as sweeteners in low calorie foods.

**Digestibility** Nutrition term relating to the proportion of a food absorbed from the gastrointestinal tract into the bloodstream. True digestibility is measured as the difference between intake and faecal output, with allowance being made for that part of the faeces that is not derived from undigested food residues. Apparent digestibility is an approximate measure, which is the difference between intake and output.

**Digestion** Human physiology term relating to the breakdown of large polymeric molecules into their monomeric constituents, achieved chemically or enzymically, in the gastrointestinal tract. In particular, the term is applied to the breakdown by digestive enzymes of complex food molecules, e.g. proteins to amino acids, starch to glucose, fats to glycerol and fatty acids, so that they may be absorbed through the gut lining. Digestion can include the mechanical processes, such as mastication, as well as the chemical action of digestive enzymes and other substances such as bile. Chemical digestion begins in the mouth with the action of saliva on food, but most takes place in the stomach and small intestine, where the food is subjected to gastric juices, pancreatic juices and succus entericus.

**Digitonin** Saponin derived from foxglove (Digitalis purpurea) seeds. Unlike digitoxin, the major glycoside obtained from the foxglove, it has no apparent effect on the heart. Used as a reagent in analytical techniques to determine levels of free cholesterol.

**Diglycerides** Compounds which include two molecules of glucose.

**Diglycerides Glycerides** composed of a molecule of glycerol bonded to two fatty acids. Possess emulsifying capacity and are used as additives in foods, including shortenings. Also known as diaclylglycerols.

**Dihydrochalcones** Class of minor flavonoids mainly found in apples and apple products such as cider. Biochemically related to flavonones and chalcones. Neohesperidin dihydrochalcone is used as a sweetener.

**Dihydroquercetin** One of the naturally occurring flavonoids found in a variety of fruits, vegetables and nuts with high antioxidative activity. Used by the food industry as an antioxidant in vegetable oils, animal fats, milk powders and pastry containing fats. Also used in food supplements and health foods. Synonym for taxifolin.

**Dihydrostreptomycin** Aminoglycoside antibiotic active mainly against Gram negative bacteria. Used for treatment of enteric infections in animals and mastitis in cows; also used as a topical treatment.

**Dihydroxyacetone** Ketone which exists as a colourless, hygroscopic, crystalline solid. Soluble in water and alcohol. Used in emulsifiers, humectants, plasticizers and fungicides.

**3,4-Dihydroxyphenylalanine** A β-hydroxylated form of phenylalanine, found as an antinutritional factor in faba beans and some other legumes (including velvet beans and Cassia hirsuta). Acts as a substrate for tyrosinases and other phenolases, whose activity can contribute to enzymic browning. Abbreviated to DOPA, and the L-isomer is a precursor of the neurotransmitter dopamine.

**Dika nuts** Seeds of Irvingia gabonensis (also called wild mango or African mango). Source of fat (dika butter), and hydrocolloids that are used as thickeners in foods. Seeds are ground to a paste and mixed with spices to make dika bread (gaboon chocolate), a staple food in some African regions. Also known as African mango seeds.

**Diketones** Ketones with two carbonyl groups.

**Diketopiperazines** Cyclic organic compounds formed as a result of combining ketones with piperazines. Can cause bitterness in some foods and beverages such as roasted coffee.

**Dilatometry** Measurement of thermal expansion or dilation of solids or liquids.

**Dill** Common name for the umbelliferous aromatic herb Anethum graveolens cultivated for its aromatic seeds
and leaves (dill weed). Used in flavourings for products such as pickles, bread, dressings. Essential oils obtained from leaves and seeds can be used to add flavour to pickles, confectionery and chewing gums.

Dill ether Monoterpane ether ((3R, 4S, 8S)-3,9-epoxy-1-p-menthene) found in essential oils extracted from dill leaves. Organoleptically considered the most important of the aroma compounds present in dill oils.

Dilution Making a solution less concentrated by adding water or another solvent.

Dimethoate A contact and systemic organophosphorus insecticide and acaricide used for control of a wide range of insects and mites in fruits, vegetables, cereals, tea and coffee; also used for control of flies in animal rearing facilities. May cause russetting in some varieties of apples. Classified by WHO as moderately hazardous (WHO II).

Dimethylamine Amine, which exists as a flammable, anhydrous gas with the aroma of ammonia. Soluble in alcohol and ether. Uses include the manufacture of solvents, antioxidants, dyes, pharmaceuticals, and acid gas absorbents.

N-Dimethylamino Succinimic acid Alternative term for diminozide.

Dimethylarsinic acid An arsenical herbicide. Commonly one of the organic arsenic species found contaminating foods, particularly sea foods. Classified by WHO as slightly hazardous (WHO III). Also a metabolite generated following dietary intake of inorganic arsenic, such as from contaminated drinking water, and excreted in the urine. Also known as cacodylic acid.

Dimethyl disulfide One of the volatile organic sulfur compounds, and a characteristic flavour and aroma component of many foods and beverages, including mussels, fermented soy products, cheese, whiskey and Brassica spp. such as broccoli. Also occurs as an off flavour compound in skim milk.

2,5-Dimethyl-4-hydroxy-3(2H)-furanone Chemical name for the flavour compound furaneol.

Dimethylnitrosamine One of the volatile nitrosamines, which possesses carcinogenic activity. Has been detected in a range of foods, including cured meat, fried foods, malt and beer.

Dimethylpolysiloxane An antifoaming agent added to oils and fats to prevent spattering and foaming during heating. Also used to prevent formation of foams during other food and beverage processing applications, including winemaking, sugar pro-

Dioskorin

Dioscorin

Dioxygenases A group of ubiquitous and versatile enzymes, capable of activating, inactivating, and detoxifying xenobiotics. They include the cytochrome P450 enzymes, which catalyze the oxidative metabolism of drugs, pesticides, and other environmental chemicals.

Diols Alcohols which include two hydroxyl groups.

Dioscorin Major storage protein of yams (Dioscorea batatas Decne and D. cayenensis). Possesses radical scavenging activity, indicating health benefits for people consuming yam tubers.

Dimethyl sulfide Synonym for methyl sulfide. Organic sulfur compound, in the form of a colourless liquid, which is commonly used as a solvent. Also occurs naturally in foods and beverages, generally as an off odour from bacterial metabolism of sulfur-containing amino acids.

Dimethyl sulfoxide Commonly abbreviated to DMSO, this organic sulfur compound has the formula (CH$_3$)$_2$SO and is liquid at room temp. Widely used as a solvent, alone or in combination with other organic solvents or water for solutes including starch and other biopolymers.

Dimethyl trisulfide An organic sulfur compound and one of the flavour compounds that occurs naturally in various foods, including cooked Brassica vegetables, garlic, onions, soy proteins, soy sauces and alcoholic beverages. Also added to processed foods as a flavouring ingredient. Has a powerful aroma similar to that of fresh onions.

Dimetridazole Coccidiostat traditionally used for treatment and prevention of histomoniasis in turkeys and chickens, trichomoniasis in cattle, and dysentery in swine. A suspected carcinogen; use in food animals has been banned in various countries.

Dim sum Traditional Chinese dish consisting of small portions of different foods, including steamed or fried dumplings with various fillings.

Dinners Term usually applied to the main meal of the day, served in the evening or at midday. May also refer to frozen and chilled convenience foods that comprise a whole meal, such as TV dinners.

Dinoflagellates A group of microscopic, generally single-celled organisms, between 20 and 150 μm long. Commonly regarded as microalgae. Characterized by two flagella that impart a distinctive spiral swimming motion. Abundant in both fresh- and marine waters. Some dinoflagellates produce water-soluble or lipid-soluble small molecular weight compounds (dinoflagellate toxins) toxic to humans and other vertebrates.

Dinoflagellate toxins Toxins produced by marine dinoflagellates which can accumulate in filter feeding bivalves and fish; consumption of sea foods containing these toxins can cause various types of food poisoning.
Dioxane  Heterocyclic compound with the formula C₄H₈O₂; also called 1,4-dioxane. Clear, colourless liquid classified as an ether and used as an aprotic solvent (cannot donate a hydrogen bond). Can occur as a contaminant in water supplies, and is a known carcinogen in animals.

Dioxins  Polychlorinated hydrocarbons which are very persistent environmental contaminants. Released into the environment as unwanted by-products of manufacturing processes (e.g. manufacture of industrial chemicals and during combustion and incineration processes). Many are carcinogenic, teratogenic and mutagenic. May contaminate food, especially dairy products, meat, fish and shellfish.

Dioxygenases  Members of EC 1.13.11 and EC 1.14. Oxidoreductases that incorporate two oxygen atoms from O₂ into the compound(s) oxidized.

Dipeptidases  EC 3.4.13-EC 3.4.15. Peptidases that cleave the peptide bond in dipeptides, either specifically or non-specifically (EC 3.4.13). Dipeptidyl-peptidases and tripeptidyl-peptidases (EC 3.4.14) release di- and tri-peptides, respectively, from the N-terminal ends of polypeptide chains, while peptidyl-dipeptidases (EC 3.4.15) release dipeptides from the C-terminus of polypeptide chains. Certain dipeptidases are important for flavour development in fermented meat and dairy products.

Dipeptides  Peptides consisting of two amino acid residues.

Dipeptide sweeteners  Sweeteners based on dipeptides or their derivatives. Examples include neotame and aspartame. Usually more sweet, more stable and lower in calories than conventional sweeteners.

Diphenol oxidases  Alternative term for catechol oxidases.

Diphenyl  Alternative term for the fungicide biphenyl.

Diphenylamine  Amine fungicide and plant growth regulator used as a post-harvest protectant and scald inhibitor on pome fruits.

Diphyllobothrium  Genus of parasitic tapeworms of the class Cestoda. Occurs in the gastrointestinal tracts of fish, birds, humans and animals. Infection in humans usually occurs through eating raw or undercooked fish which is contaminated with the larvae of Diphyllobothrium latum.

Dipicolinic acid  Substance that occurs as a calcium salt in bacterial spores, and that may play a role in increasing the heat resistance of spores.

Diplazium esculentum  Green fern, the young leaves of which are eaten as a vegetable mainly in India and Indonesia.

Diplococcus  Obsolete bacterial genus which included species currently assigned to various other genera.

Diplodia  Genus of fungi of the Botryosphaeriaceae family. Diplodia natalensis is responsible for stem end rot of citrus fruits. Anaerobic cultivation of D. gossypina in a nutrient medium yields jasmonic acid, methyl jasmonate and isomers of jasmonic acid that can be used as food flavourings.

Dipping  Process of submerging a food into sauces (e.g. dips) or coatings (e.g. batters). Chemical dips or hot water dips are also used to decontaminate foods.

Dips  Sweet or savoury sauces into which accompanying foods (e.g. breadsticks, crisps, vegetable cutlets) are dipped. Many savoury dips are based on sour cream, cream cheese or mayonnaise. The term may also be applied to chemical and hot water dips used to decontaminate foods.

Dipyridyl  Organic nitrogen compound formed from pyridine. Exists as two isomers. Chelating agent able to bind iron.

Diquat  Non-selective contact bipyridyl herbicide used for control of broad-leaved weeds in a wide range of crops. Also used for pre-harvest desiccation of oilseeds, legumes and cereals and for inhibition of tassel formation in sugar cane. Classified by WHO as moderately hazardous (WHO II).

Disaccharides  Sugars, e.g. maltose, sucrose or lactose, which consist of two linked monosaccharide molecules. Dietary source of carbohydrate. Some individuals show disaccharide intolerance, e.g. lactose intolerance, and are unable to absorb disaccharides due to an enzyme deficiency.

Discoloration  Alteration or spoilage of the colour of an item.

Disease resistance  Ability of an organism to resist infection by particular pathogens. In crops, the organism may have one or a few specific genes that confer a high level of resistance to a specific pathogen, or many genes that are effective against a range of pathogens. Plant breeders may specifically breed for high levels of resistance to certain plant diseases.

Diseases  Abnormalities of the structure or physiological function of an organism which are regarded as being detrimental to its health.

Dishwashers  Kitchen appliances that automatically wash, rinse and dry crockery, cutlery, pans and other utensils.

Disinfectants  Chemical agents used for disinfection, including quaternary ammonium compounds, alcohols, phenols, halogens (chlorine and iodine), halogen compounds, and mercury compounds.
Disinfection

Destruction, inactivation or removal of pathogens or spoilage microorganisms. Commonly refers to the use of disinfectants for the treatment of inanimate objects and surfaces (e.g. surfaces in food processing plants and kitchens).

Disinfection by-products

By-products of the disinfection of drinking water. Trihalomethanes are associated with chlorination, while chlorites and chlorates are associated with chlorine dioxide disinfection. Ozonation may cause formation of bromates. May be responsible for an increased risk of kidney and bladder cancer in humans and other long term health effects.

Disinfestation

Destruction of insect pests and other parasites of animals or plants. Generally involves the use of insecticides, applied either topically or as a spray.

Dispensers

Devices that supply or release a product, such as foods and beverages, by dispensing.

Dispensing

The process of supply or release of a product, such as foods and beverages, sometimes from special devices (dispensers).

Dispersibility

Measure of the ability of materials to form dispersions, in which one substance is suspended in a second material. Often determined for dried foods or ingredients such as powders to illustrate how well they can be rehydrated.

Dispersions

Two-phase systems consisting of particles (the disperse phase) suspended in a second substance (the continuous or bulk phase) which is generally present in relative excess. Includes colloids, emulsions and aerosols.

Display cabinets

Units in which items, including foods, are displayed in an appealing manner. Food should be displayed such that its quality is maintained (e.g. lighting and temperature are optimum), and so that it is protected from contamination and is attractive to potential customers.

Distillates

Spirits or their intermediate products manufactured from ethanol-containing mashes or other materials by distillation.

Distillation

Technique for separation of homogeneous mixtures based on differences in volatility. Employed in the manufacture of spirits, in which the heating of ethanol-containing mashes in a still liberates vapour (containing ethanol and flavour compounds), and this vapour is then condensed.

Distilleries

Factories used for manufacture of spirits by distillation.

Distilleries effluents

Waste water produced by distilleries during processing.

Distillers grains

Alternative term for distillers spent grains.

Distillers spent grains

Waste product from distilleries where cereals are used as the raw materials, comprising grain solids remaining after extraction of soluble material in the mashing process.

Distillers yeasts

Yeasts (Saccharomyces spp.) used for fermentation of mashes to be distilled in manufacture of spirits.

Distribution

The physical movement of commodities, including foods, into the channels of trade and industry. Can involve distributors, wholesalers, retailers, dealers and agents.

Disulfides

Sulfides which contain two atoms of sulfur.

Diterpenes

Terpenoids which include four isoprene units and thus contain 20 carbon atoms and 4 branched-methyl groups. Occur in foods, e.g. coffee beans, marjoram and rosemary. Those in rosemary, carnosol and carnosic acid, have antioxidative activity in foods. Coffee diterpenes show anticarcinogenicity in animal studies, but may have hypercholesterolaemic effects in humans.

Dittany

Common name for Origanum dictamnus, a herb native to Crete. Also known as dittany of Crete. Used as a substitute for oregano or marjoram and in some Mediterranean dishes. Flowers are used to make herb tea. Extracts display high antioxidative activity, while essential oils have antimicrobial activity.

Diuron

Systemic urea herbicide which inhibits photosynthesis. Used for selective control of germinating grasses and broad-leaved weeds in fruits, cereals and legumes. Classified by WHO as unlikely to present acute hazard in normal use.

Diverscins

Bacteriocins produced by the lactic acid bacteria Carnobacterium divergens. May be used as preservatives for meat or fish, particularly for the inhibition of Listeria monocytogenes.

Diverticulosis

Disease of the large intestine, particularly the distal portion, which is prevalent in older individuals. The wall of the colon forms blind outpockets or diverticulae which can become inflammed (diverticulitis) resulting in acute abdominal symptoms, such as pain, and potentially in severe complications such as peritonitis. Reduced risk for diverticulosis has been associated with increased consumption of fruits and vegetables and dietary fibre.

Djenkol beans

Seeds produced by Pithecellobium lobata. Contain djenkolic acid, a toxic sulfur-containing amino acid that causes kidney disorders.

DM

Abbreviation for dry matter.

DNA

Abbreviation for deoxyribonucleic acid, a nucleic acid consisting of linked deoxyribonucleotides, each of which contains one of four nitrogenous bases (ade-
DNA-directed DNA polymerases

DNA-directed RNA polymerases

DNA fingerprinting

DNA hybridization

DNA microarrays

DNA-directed DNA polymerases

DNA probes

DNases

Docosahexaenoic acid

Dodecanoic acid

Doenjang

Docosapentaenoic acid

Docosenoic acid

from conventional blotting hybridization techniques in terms of the size and number of the probe spots. Microarrays may be generated and performed using robotics and can contain thousands of probes per strip, thus allowing high sample throughputs. Can be used for qualitative or quantitative analysis of specific nucleic acid sequences, e.g. for investigation of gene expression, particularly in genomics studies. Also known as DNA chips.

DNA polymerases

DNA probes

DNases

Docosahexaenoic acid

Dodecanoic acid

Doenjang

Docosapentaenoic acid

Docosenoic acid

Delecious soy pastes, used as a base for many Korean dishes. Reported to have antitumour
activity and antimitagencicity. Also known as doenzerzang or tenjan.

Doenzang Alternative term for doenjang.

Dog biscuits Dried pet foods used as pet treats or as dietary supplements for dogs. May contain added nutrients and provide health/lifestyle benefits, such as keeping fleas away, cleaning teeth, settling upset stomachs and calming nerves. Occur in a variety of shapes, including bones, cats and hamburgers. Also available are organic and vegetarian dog biscuits, and biscuits that dogs and their owners can share.

Dogfish General name used for a number of small sharks belonging to three different families: Squalidae (spiny dogfish); Scyliorhinidae (catsharks); and Triakidae (smooth hounds). Several dogfish species are utilized as food fish, including Squalus acanthius (piked dogfish), S. blainville (northern dogfish) and Mustelus manazo (smooth dogfish).

Dog foods Pet foods specifically formulated to meet the nutritional requirements of dogs. Include complete foods (e.g. canned pet foods containing meat as the main ingredient) that can be used as the sole source of nutrients, and incomplete or mixer pet foods that can be used to complement other foods. Main types of dog food exist: moist, semi-moist and dry. Niche markets are also catered for with nutraceutical, organic, vegetarian, raw and hypoallergenic products. Home-made or human foods can also be given to dogs, apart from those containing onions, grapes, raisins and chocolate, which can be harmful.

Dogs Mammals (Canis lupus familiaris) commonly kept by humans as pets or working animals. Many different breeds exist, varying considerably in size, appearance and nutritional requirements. Most pet dogs eat commercial dog foods.

Dolphinfish Commercially important marine fish species (Coryphaena hippurus) belonging to the family Coryphaenidae. Widely distributed in tropical and subtropical water throughout the world, and also produced commercially by aquaculture. Marketed fresh and frozen. Also known as mahimahi or variations of this name, including mahi-mahi and mahi mahi.

Dolphins Marine mammals belonging to the order Cetacea; widely distributed around the world. Dolphins are not commercially exploited on a large scale; however, some species are utilized as a source of meat and oils.

Domiati cheese Egyptian brine ripened cheese made from buffalo milk or cow milk. It is consumed fresh or after ripening for three to six months. Sometimes called Damiat or Breda cheese.
Doxycycline

Doxycycline is a semisynthetic tetracycline antibiotic used to treat a range of bacterial infections in cattle, swine, sheep, goats, poultry, and farmed fish. It readily disperses throughout tissues but excreted relatively slowly. Residues in kidneys and livers may remain for up to 14 days following withdrawal.

Dracunculiasis

Infection transmitted through drinking water containing microcrustaceans of the genus Cyclops, which harbour infective larvae of the nematode parasite Dracunculus medinensis (guinea worm). Infection is initiated with liberation of the larvae in the stomach where they mature and reproduce. Fertilized female worms then migrate to the subcutaneous tissues, usually the extremities, where they form an ulcer.

This is accompanied by intense pain, fever, nausea and vomiting.

Dragees

Small hard candy pieces with hard sugar or sugared chocolate coatings.

Draught beer

Beer which is dispensed from barrels, kegs or other bulk containers, rather than packaged in bottles or cans.

Dressing

Post-slaughter process, including the steps of skinning, evisceration, trimming and washing, that follows the stage in which animals are bled. The head, feet, hides (in the case of sheep carcasses and cattle carcasses), excess fat, viscera and offal (edible and inedible) are separated from the bones and meat. With automated dressing lines, a series of mechanical devices stun the animals, remove the pelt (first from the brisket, then completely), eviscerate the carcass and process the head. Other devices debone the loin and thoracic regions. With respect to dressed meat, video image analysis can be successfully applied to grading for speedy online determination of the fat/lean ratio, and fibre optic probes permit objective prediction of such textural defects in the meat as excessive paleness or darkness. The term can also be applied to the act of applying coatings to foods, such as fish and salads.

Dressings

Condiments used to coat and add flavour to foods prior to consumption. Most common types are salad dressings.

DRI

Used for Dietary Reference Intakes. A set of reference values that provide guidance on nutrient requirements. DRIs were developed to update and expand on previously established Recommended Daily Allowances (RDA) of the US and Recommended Nutrient Intakes (RNI) of Canada. The DRI is composed of: the RDA, Estimated Average Requirement (EAR), Adequate Intake (AI) and Tolerable Upper Intake Level (UL).

Dried dairy products

Dairy products dried to a low moisture content, giving powders with a long shelf life. Packaged in materials that are impermeable to water vapour, oxygen and light to protect them during storage.

Dried egg products

Powders made by drying eggs or egg components. Include dried egg whites, dried egg yolks and dried whole eggs. Utilized in the manufacture of foods where fresh eggs would be used, such as bakery products, bakery product mixes, mayonnaise, salad dressings and egg noodles. Their long shelf life and Salmonella-free status make them ideal for use by food manufacturers and caterers.

Dried eggs

Eggs which have been dehydrated, usually by spray drying, to form powders. Also called egg powders. May be used in a range of foods, including bakery products, bakery product mixes, mayonnaise, salad dressings, confectionery, ice cream, pasta and convenience foods. Their long shelf life and Salmonella-free status make them ideal for use by food manufacturers and caterers.

Dried figs

Figs (fruits of Ficus carica) from which the majority of the water content has been removed, usually by sun drying. A rich source of dietary fibre and iron. Also contain high levels of other minerals, such as calcium, potassium and magnesium, and polyphenols, but are low in sodium and free of fats and cholesterol. Eaten as snack foods, mixed with vegetables or other fruits, or used as ingredients of bakery products, meat dishes or fish dishes. Purees prepared from dried figs are used as fat substitutes or sweeteners.

Dried fish

Fish subjected to drying processes which remove sufficient moisture to inhibit the growth of microorganisms, resulting in increased storage life. Air drying, sun drying and freeze drying are common processes for obtaining dried fish products. Many fish are marketed in dried form.

Dried foods

Foods in which the majority of water present has been removed by drying, resulting in lighter weight products of extended shelf life, e.g., dried eggs, dried fruits, dried milk, mixes and powders. Sometimes rehydrated before consumption, although some, such as dried fruits, are consumed in their dried state. Rehydration properties are affected by the type of drying process used. Also known as dehydrated foods.

Dried fruits

Fruits preserved by drying (final moisture usually less than 25%). Sweetness, and flavour in general, are concentrated by the drying process, but...
Dried meat  Meat preserved by drying, a process that reduces water activity and so limits bacterial growth and enzymatic activity. Traditional drying methods for meat include solar drying, air drying, oven drying and dry curing. A high surface to volume ratio is needed to allow effective drying of meat. Drying produces changes in nutritional values, particularly the vitamin content, and sensory properties of the meat. Only a small proportion of meat is currently preserved by drying. It is mainly prepared when a light weight, high protein product with a good shelf life is required. Some speciality products are, however, prepared. For example, dried beef prepared by dry curing or sweet pickling followed by air drying is an expensive product, usually prepared from very lean beef. It may be sold by the piece or pre-sliced; it is frequently used for hors d'oeuvres.

Dried meat products  Dried foods produced from meat. They include: pemmican, produced by sun drying strips of lean meat; and biltong and charqui, both produced by a combination of brining and air drying. Dried meat products differ considerably from fresh meat and are generally of lower eating quality.

Dried milk  Whole milk dried to a low moisture content, giving a powder with a long shelf life. Also called milk powders.

Dried peas  Peas preserved by drying. Reconstituted in water before cooking as a vegetable, stir-fried or added to dishes including soups, stews and sauces.

Dried pet foods  Pet foods containing 6 to 10% moisture. Include extruded pet foods and baked products, often in the form of kibble or pellets. Main ingredients are grain, dried vegetables, dried fruits, vegetable oils, meat meat, fish meal, vitamins and minerals. Tend to be cheaper than moist or intermediate moisture pet foods, but contain more filler, so may be less nutritious. Thought to be better for dental health than moist foods, because they encourage removal of tartar from teeth during chewing. Commercial products are available for several pet species, including dogs, cats, pet rabbits, hamsters, mice, guinea pigs, pet fish, pet birds, reptiles, amphibians and pet crabs.

Dried sea foods  Sea foods, including fish, shellfish and seaweeds, that have undergone preservation via drying in order to preserve nutrients and extend shelf life.

Dried skim milk  Skim milk dried to a low moisture content, giving a powder with a long shelf life. Also called skim milk powders and non-fat dried milk.

Dried vegetables  Vegetables preserved by drying. Commonly used types include peas, carrots, peppers and onions. Often reconstituted in water before use or added to dishes such as soups and stews.

Dried whey  Whey dried to a low moisture content, giving a powder with a long shelf life. Also called whey powders.

Dried yeasts  Active yeasts preserved by drying for ease of handling, transport and storage. Used in baking, brewing and winemaking, and as ingredients of soups, health foods, sauces and gravy.

Driers  Machines or devices for drying items such as foods. Alternative spelling is dryers.

Drinking chocolate  Chocolate preparations which are mixed with hot water or milk to form chocolate beverages. In addition to cocoa powders or chocolate, may also contain ingredients such as milk solids, sugar and thickeners. Drinking chocolate is consumed throughout the world, but is especially popular in Europe. Also known as hot chocolate.

Drinking habits  Consumer response term relating to the pattern of consumption of beverages by particular population groups.

Drinking straws  Hollow tubes, generally made of plastics or paper, through which beverages or liquid foods are sucked into the mouth.

Drinking water  Water that is suitable for drinking, particularly in terms of its purity, and sensory and hygienic qualities.

Drinking yoghurt  Yoghurt with a viscous consistency rather than a set curd, prepared by stirring during cooling to 7-8°C before packaging.

Drinks  Alternative term for beverages.

Drip  The liquid that is lost when foods, e.g. fish and meat, that have been frozen are thawed.

Dripping  The liquid that is lost when foods, e.g. fish and meat, that have undergone preservation via drying in order to preserve nutrients and extend shelf life.

Drugs  Chemical substances which affect the functioning of living things and the organisms (such as bacteria, fungi and protozoa) that infect them. Predominant application relevant to the food industry is in animal husbandry, where they are used to cure or prevent diseases in animals, to increase feed efficiency and/or growth rate, and to sedate animals in order to minimize the effects of stress. Major classes include antibiotics, anthelmintics, anabolic agents and barbitu-
rates. Potential presence of drug residues in animal foods represents a health hazard to consumers.

Drum Alternative term for croakers.

Drum drying A process in which drying is undertaken continuously on the external surface of an internally steam heated rotating cylinder. A thin film of the product to be dried is applied at one location and removed at another, usually after less than one complete revolution of the cylinder. These driers may be atmospheric or vacuum types, and are classified as single drum, double drum, or twin drum (in which the two drums function almost as single drums).

Drums Cylindrical containers used for storage and transportation of liquids.

DRV Abbreviation for dietary reference values.

Dry beans Type of common beans (Phaseolus vulgaris).

Dry cured ham Ham which is cured by rubbing curing agents in dry form over the surface. Some are cooked after curing, e.g. York ham, whilst others are dried and eaten raw, e.g. Parma ham. For large hams, the curing agents must be applied several times during the curing period. Costs of producing dry cured ham tend to be high because dry curing is slow and requires large amounts of hand labour. However, dry curing of ham can be accelerated through production techniques such as tumbling, blade tenderizing, microbial inoculation, use of nitric oxide, and processing as skinned such as tumbling, blade tenderizing, microbial inoculation, use of nitric oxide, and processing as skinned and/or boneless legs.

Dryers Alternative spelling of driers.

Dry ham Raw ham that is dry cured and then dried, either by air drying or mechanical means. It is a highly valued speciality product. Some dry ham is smoked. The ham is soft in texture and when freshly sliced is pink or red in colour. It has a high content of salt. Factors affecting quality of dry ham include: genetic type, age, weight, sex, feeding and slaughter of the swine; pH value and water holding capacity of the raw ham before drying; and composition, particularly lipid and protein contents, of the raw ham before drying. Known as prosciutto crudo in Italy and roshchinkel in Germany. Varieties include Corsican, Bayonne, Parma, Italian country, Serrano and Iberian hams.

Dry Ice Solid CO₂ that sublimes under atmospheric pressure at -78.5°C. Used for the refrigeration of foods, the carbonation of beverages and other liquids, and the cleaning of processing equipment.

Drying Removal of moisture or liquid from an item to a level of <5%, a process also known as dehydration. A wide range of drying methods are applied to foods, including: air drying; drum drying; freeze drying; impingement drying; roller drying; solar drying; spray drying; thin layer drying; and vacuum drying.

Dry matter Measure of the proportion of a material remaining after the removal of water, also referred to as dry weight. Commonly abbreviated to DM.

Dryness Sensory properties relating to the extent to which a product is perceived as being dry.

Dry sausages Sausages which are dried during preparation. Often the sausages are hung in a dry room for 2-10 days at 21-27°C before they are transferred to a dry room, which has lower temperature and relative humidity levels, for a further 10-120 days. Natural casings are often used as they shrink and thereby remain in close contact with the surface of the sausage as it loses moisture.

DSC Abbreviation for differential scanning calorimetry.

Duck eggs Eggs produced by ducks. Consist of approximately 13% protein and 14.8% lipids, and have a mean weight of 70 g. Egg shells may be a variety of colours (e.g. white, bluish, greenish, cream, light brown) with speckled or mottled patterns.

Duck livers Livers from ducks; part of edible offal. Duck livers are cooked by sauteing, frying or grilling, or are used to make pates or mousses. In France, the livers of specifically fattened ducks are used to prepare foie gras.

Duck meat Meat from ducks. Duck carcasses have higher fat contents, thicker skin and contain a lower proportion of meat than other poultry carcasses; however, duck meat has a very rich flavour. It has a higher collagen content and is darker in colour than chicken meat. Compared with farmed duck meat, wild duck meat has a lower content of fat and a different fatty acid profile.

Ducks The common name given to various domesticated and wild, small water fowl of the family Anatidae; there are many species. Many kinds of ducks are domesticated and are reared for production of duck meat and/or duck eggs. Wild ducks are hunted for their meat. Different gender and age groups of ducks are known as drakes (adult entire males), ducks (adult females) and ducklings (in general, sexually immature young birds with down rather than feathers).

Dudh churpi Traditional Indian shelf stable dairy product made from partially defatted yak milk, cow milk or milk from crosses between the two animals. Milk is coagulated using acid and heat, and the curd is cooked to remove moisture, cut into pieces and dried. Partially dried product (prechurpi) is cooked or dipped in a milk-sugar solution, and dried. The final product is chewed. It is a rich source of energy, proteins and minerals.
Dulce de leche  Milk-based confectionery products popular in Latin America, particularly Argentina. Prepared by condensing a mixture of milk and sugar to a syrup that is then slightly caramelized by heating and flavoured with vanilla.

Dulche de leche  Alternative term for dulce de leche.

Dulcin  One of the non-nutritive artificial sweeteners (4-ethoxyphenylurea), which is about 200-250 times sweeter than sucrose. Most countries have banned its use in foods, due to concerns about toxicity and carcinogenicity. Also called sucrol and valzin.

Dulcitol  Synonym for galactitol. Polyol comprising 6 carbon atoms, produced by isomerization of sorbitol. Has approximately 0.1 times the sweetness of sucrose. Present in dulcite (Madagascan manna, Melampyrum nemorosum).

Dulse  One of a number of marine red algae or seaweeds (Palmaria palmata) found along shores of the North Atlantic and Northwest Pacific. Eaten as a delicacy in dried form. Also used in flavourings for stews and soups, and in food thickeners.

Dumplings  Small balls of leavened dough, formed from flour or meal bound with egg, which are boiled, steamed or baked. Frequently cooked in and served with soups and stews. Dessert dumplings are made with sweet dough stuffed with fruits and served with sauces.

Dunaliella  Genus of unicellular halotolerant green microalgae of the family Dunaliellaceae. Dunaliella salina and D. bardawil are important natural sources of β-carotene.

Durian  Fruits produced by Durio zibethinus. Emit a characteristic sulfurous odour. Often sold in a ready-to-eat form, packaged as the whole edible pulp or in segments, or preserved by drying, fermentation, salting or deep freezing. Used as a source of flavour in ice cream and cookies. Rich in sugars and vitamin C.

Dursban  Alternative term for the insecticide chlorpyrifos.

Durum wheat  Species of hard wheat (Triticum durum), the flour of which is glutinous and yellow and used to produce semolina from which pasta is made.

Dust explosions  Explosions caused by clouds of flammable particles at an appropriate concentration coming into contact with an ignition source. Dust and powders present a potential explosion hazard in processing plants, including those in the food industry. Common processes generating explosible dust include milling of flour, grinding of sugar, spray drying of milk and instant coffee, and conveyance/storage of whole grains and finely divided materials. Parameters influencing explosions include nature of the combustible material, reactivity, particle dimensions, powder concentration, humidity, ignition energy and presence of inflammable gas. Powders can be classified on the basis of their explosion hazard, with explosible dusts including custard powder, dried milk, flour, instant coffee, potato powder, soup powder and sugar. Methods to control dust explosions include containment, suppression, inerting and venting.

Dyes  Natural or synthetic colorants used in foods. In contrast to pigments, dyes can usually be solubilized using an appropriate solvent or binder.
Earthworms  Segmented, burrowing invertebrates of the class Oligochaeta, especially those of the genus *Lumbricus*. Earthworms, such as the red worm *Eisenia fetida*, are used as foods in some areas of the world, including China and the Philippines. They serve as a readily available source of proteins and minerals.

Eating disorders  Psychiatric disorders characterized by severe disturbances in eating behaviour, such as extreme overeating (with or without subsequent purging) or extreme reduction of food intake, and often accompanied by low self-esteem and negative feelings about body wt. or shape. Anorexia nervosa and bulimia nervosa are the most common eating disorders.

Eating habits  Consumer response term relating to the pattern of consumption of foods by particular population groups.

Eating quality  The extent to which a food is assessed as being edible, i.e. possessing acceptable sensory properties.

Eau de vie  French generic term for brandies and other spirits.

EC  Abbreviation for European Community.

Echinacea  A genus of native North American flowering plants commonly known as purple coneflowers. Three species have attracted particular interest owing to their purported medicinal properties, namely, *Echinacea purpurea*, *E. angustifolia* and *E. pallida*. These medicinal plants contain a number of bioactive compounds, including flavonoids, alkamides, glycoproteins, caffeic acid derivatives and polysaccharides. Claimed benefits include antioxidative activity and immunological effects.

*Echinacea purpurea*  A species of flowering plant of the genus *Echinacea* that is claimed to possess medicinal properties, particularly antioxidative activity and immunological effects. Contains a number of bioactive compounds, including flavonoids, alkamides, glycoproteins, caffeic acid derivatives and polysaccharides. Commonly used in medicinal preparations.

Echinococcus  Genus of tapeworm of the class Cestoda. Infection in humans with *Echinococcus granulosus* may occur after ingestion of water or vegetation contaminated with larval cysts.

Echinoderms  A group of exclusively marine invertebrates in the phylum Echinodermata, which contains five classes: Asteroidea (starfish); Ophiuroidea (brittle stars); Echinoidea (sea urchins); Crinoidea (feather stars); and Holothuroidea (sea cucumbers). Some echinoderms are edible, including the sea urchin species *Loxechinus albus*, *Paracentrotus lividus* and several sea cucumber species.

Echinoids  Alternative term for sea urchins.

Echoviruses  Highly infectious enteroviruses of the Picornaviridae family. Predominantly transmitted via the faecal–oral route, and through contaminated foods and water.

Eclairs  Finger-shaped bakery products made with choux pastry which is baked and filled with whipped cream or custards and topped with fondant icing, usually flavoured with chocolate or coffee. Also a name given to confectionery products comprising toffees filled with chocolate.

Ecology  Biological science, involving the study of interactions of organisms with their environment, including interrelationships between organisms.

E-commerce  Buying and selling of products and services transacted electronically via the Internet. Includes dealings among businesses and between companies and consumers. Also called electronic commerce.

Edam cheese  Dutch semi-hard cheese made from cow skim milk or semi skimmed milk. Usually coated with red wax, but cheese matured for 17 weeks or longer is coated with black wax. Mainly eaten young for an elastic and supple texture and a smooth flavour.

Edestin  One of the vegetable proteins present in certain plant seeds, including barley and hemp seeds.

Edible containers  Holders for foods which are intended to be consumed along with the food they contain. Mainly made from dough. Examples include ice cream cones and taco shells.

Edible films  Flexible films that can be used as coatings on foods. Edible films have many applications,
including extending the shelf life of foods by reducing moisture loss, respiration and colour change, preventing oxidation, reducing the need for packaging, improving product integrity and reducing loss due to damage. They can be made from a range of materials, such as celluloses, starch, cereal proteins, soy proteins and milk proteins.

Edible flowers Flowers such as day lilies and marigolds that are suitable for use as foods. May be used fresh or after drying as ingredients or garnishes. Also available in crystallized or candied form.

Edible fungi Alternative term for mushrooms.

Edible oils Lipid-rich substances which are liquid at room temperature and are used in preparing foods. Usually have a high content of triacylglycerols and those of plant origin can be a source of bioactive phytochemicals. Should be of high quality, pale in colour, free from off odour and off flavour, and of high nutritional values. Includes vegetable oils and marine oils.

Edible packs Packages for foods made from films and coatings that are suitable for consumption along with the products they enclose. The films and coatings are made from natural ingredients such as proteins, carbohydrates or lipids, or their combinations.

EDTA Abbreviation for ethylenediaminetetraacetic acid. Commercially available in the form of sodium and calcium salts, EDTA is one of the best known sequestrants and chelating agents, controlling the reaction of trace metals present in foods, and thus providing a variety of functions in foods. Applications include prevention of discoloration in canned corn, avoidance of crystals formation in canned sea foods and prevention of rancidity and microbial spoilage in mayonnaise and fatty spreads.

Edwardsiella Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae which occur in the intestines of mammals, fish and reptiles. Edwardsiella tarda may be an opportunistic pathogen in humans. Infection usually occurs through the ingestion of faecally-contaminated food or water, resulting in diarrhoea.

EEC Abbreviation for European Economic Community.

Eels General name used for a number of unrelated fish species belonging to the order Apodes and the family Anguillidae; characterized by elongate serpentine bodies lacking scales or pelvic fins. Most species are marine (including moray, snake and conger eels) or have a marine phase. Species within the genus Anguilla are particularly valued as food fish, including A. anguilla (European eel), A. rostrata (American eel) and A. japonica (Japanese eel). Flesh tends to be firm, with a rich, sweet flavour. Marketed in a variety of forms; smoked, jellied and pickled products are especially popular.

Effluent Liquid wastes (waste water) discharged into a river or the sea, usually from a factory or plant.

EFTA Abbreviation for European Free Trade Association. EFTA is a trading bloc that was established in 1960 by Austria, Denmark, the UK, Norway, Portugal, Sweden and Switzerland. The aim of EFTA was to work for the removal of trade barriers among its members and to promote closer economic cooperation between EFTA and the rest of Western Europe. EFTA membership expanded when Finland became an associate member in 1961 and a full member in 1986. Iceland and Liechtenstein joined the organization in 1970 and 1991, respectively. However, with the growing success of the EU in the 1970s and 1980s, many members left EFTA to join the EU, and, in late 1993, the only remaining EFTA countries were Norway, Liechtenstein, Iceland and Switzerland. By 1994, EFTA states were concerned that the success of the EU could affect their own economies negatively. The EFTA states negotiated with the EU to establish a broader common market called the European Economic Area (EEA). The EEA comprises all the members of the EU and EFTA, with the exception of Switzerland, which declined to join. The headquarters of EFTA are in Geneva, Switzerland.

Egg nog Alcoholic beverage made using sweetened milk, eggs and sherry and/or spirits, e.g. brandy or rum.

Egg pasta Pasta which contains eggs as an ingredient.

Egg plants Alternative term for aubergines.

Egg powders Alternative term for dried eggs.
Egg products Products such as liquid egg yolks, meringues, omelettes and egg nog that are made from eggs or contain eggs as a major constituent.

Egg proteins Proteins found in eggs, such as ovalbumins, ovomucoid and conalbumin.

Eggs External reproductive structures produced by the females of certain animals, such as birds, reptiles and fish. The term is used without qualification usually to refer to eggs laid by hens, although eggs produced by other birds, some reptiles (e.g. turtles) and fish (roes) are also eaten. Generally composed of egg yolks and egg whites surrounded by hard egg shells. Eaten raw or cooked in a variety of ways, e.g. scrambled, fried, poached or boiled. Also incorporated into a range of foods and beverages, and can be used as thickeners, emulsifiers, binding agents and foaming agents.

Egg shell membranes Two semi-permeable membranes located on the inside of egg shells. One membrane adheres to the shell and the other surrounds the albumen. These biological membranes are composed of thin layers of protein fibres and, with the egg shell, help protect eggs against attack from bacteria.

Egg shells Exterior hard coverings of eggs, which are composed mainly of calcium carbonate. Vary in colour according to breed and species of bird. Responsible for permitting gaseous exchange, conserving water, inhibiting microbial penetration and providing mechanical protection.

Eggs lysozymes Alternative term for egg whites lysozymes.

Egg whites Portions of eggs which surround the egg yolks. Composed mainly of water and albumins. Form foams upon incorporation of air during whipping. Used in this form to make light products such as meringues and sponge cakes. Also known as albumen.

Egg whites lysozymes Lysozymes found in egg whites with good foaming properties and emulsification properties, particularly after modification or thermal processing. The antibacterial activity of these enzymes makes them useful for preventing spoilage in foods and beverages (e.g. in meat, dairy products and beer). Also potentially useful as sweeteners along with other sweet proteins. Contribute to the allergenicity of egg whites.

Egg yolks Portions of eggs which are surrounded by the egg whites. Usually yellow in colour. Composed mainly of water, protein and fat. Colour may be enhanced by incorporation of pigmented feeds (e.g. yellow corn, alfalfa meal, corn gluten meal, dried algae meal and marigold petal meal) which contain carotenoid xanthophylls (e.g. lutein, zeaxanthin, carotenoids and cryptoxanthin) into the poultry diet. Separated egg yolks may be used as emulsifiers in mayonnaise and salad dressings.

Egusi Type of watermelon (Citrullus lanatus, C. vulgaris or Colocynthis citrullus) cultivated mainly in West Africa for its seeds. Dried seeds are rich in oils and represent a good source of group B vitamins. They are commonly added to rice and legume based dishes, or ground to make a meal. The meal is used as a thickener in soups and stews, also adding flavour and increasing protein contents, or used in preparation of meat-like patties.

Eicosanoids Compounds synthesized in the body from polyunsaturated fatty acids (PUFA). Examples are leukotrienes, prostaglandins, prostacyclins and thromboxanes. Act as local hormones and mediate of a wide range of physiological processes, including inflammation, wound healing and blood clotting. In general, eicosanoids derived from ω-6 fatty acids have pro-inflammatory effects, while those derived from ω-3 fatty acids have anti-inflammatory activity.

Eicosapentaenoic acid One of the ω-3 or n-3 polyunsaturated fatty acids (PUFA), with 20 carbon atoms and 5 double bonds. The most important isomer is the (all-Z)-5,8,11,14,17-isomer, and rich sources of this important dietary fatty acid include fish oils and marine algae. Suggested health benefits associated with eicosapentaenoic acid and its related n-3 PUFA docosahexaenoic acid include reduced risks of coronary heart diseases and cancer, and improved immune response and neural development in infants.

Eicosatetraenoic acid One of the ω-3 or n-3 polyunsaturated fatty acids (PUFA), with 20 carbon atoms and 4 double bonds. An important component of the human diet and a precursor of a range of physiologically active compounds such as prostaglandins. Occurs in esterified form as a major component of membrane phospholipids. Intermediate in formation of eicosapentaenoic acid.

Eicosenoic acid One of the monounsaturated fatty acids with 20 carbon atoms; the major isomers are the Δ9 (n-11) and Δ11 (n-9) forms. Found in a range of foods, including fish oils, peanuts, olives and Brassica seeds.

Einkorn Species of wheat (Triticum monococcum or T. monococcum) grown in arid regions as a livestock feed and one of the first cereals grown for food. Ancestor of modern wheat varieties.
Eiswein A German term for ice wines which is employed as a Praedikat designation in the quality classification system for German wines.

Ekalux Alternative term for the insecticide quinalphos.

Elaeis Genus of oil palm, the most common species of which is Elaeis guineensis. Seeds are the source of oils similar to coconut oils that are used in manufacture of margarines, shortenings and cocoa butter substitutes.

Elaeis oils Alternative term for palm oils.

Elaidic acid The trans form of an unsaturated fatty acid, which in its cis form is oleic. Exists as a combustible, white solid, which is insoluble in water, but soluble in alcohol and ether. Hydrogenation of fats for use in margarines and cooking fats creates trans fatty acids, including elaidic acid. Elaidic acid occurs in foods, including butter, margarines, cereal products and snack foods. As with other trans fatty acids, high levels of dietary elaidic acid may have negative lipaemic activity.

Elands Large antelopes (Tragelaphus oryx or Taurotragus oryx) found widely distributed in scrub, grasslands and savannah woodland of southern Africa. Hunted as game. Attempts have also been made to farm small herds in South Africa and Ukraine for their meat and rich milk. Antelope meat is red, has a low fat content, and is tender and juicy when cooked. Pot roasting is the favoured method of cooking eland meat, but it can also be used in place of beef in many dishes.

Elastase Proteinases of the serine-endopeptidase class (EC 3.4.21.-) able to catalyse the hydrolysis of elastin, a protein of mammalian connective tissues. 3 mammalian elastase enzymes have been classified - pancreatic elastase (EC 3.4.21.36), leukocyte elastase (EC 3.4.21.37) and pancreatic elastase II (EC 3.4.21.71), which differ in the nature of their preferred cleavage sites. Microorganisms also produce elastase which may have potential use in meat tenderization.

Elasticity Rheological properties relating to the ability of a substance to return to its original size and shape after being deformed. The deforming force is known as a stress, and the resulting deformation is the strain. A body is elastic only below a certain stress; above this point, known as the elastic limit, the body is permanently deformed. The point at which the material begins to give is called the yield point.

Elastin One of the animal proteins present in mammalian connective tissues, and thus a component in meat and meat products. Particularly rich in glycine residues and also contains high levels of proline, alanine and valine.

Elderberries Small purple-black berries produced by the elder, Sambucus nigra, or American elder, S. canadensis. Used in wines, fruit juices and other beverages, and also in pies and jams. Rich in vitamin C. Contain high levels of anthocyanins, making them suitable for use in natural food colorants.

Elderberry juices Juices extracted from elderberries (Sambucus nigra).

Elderflowers Flowers of the elder, Sambucus nigra, or American elder, S. canadensis. Used to make wines and cordials; also used in preserves, syrups, sorbets, ice cream and fritters.

Electrical conductivity Ability of a substance to transmit an electric current. One of the electrical properties commonly determined in food analyses. It can be used, for example, as an indicator of post mortem changes in meat quality and to monitor the composition of food factories effluents. Electrical conductivity values that have been normalized to 25°C are called specific conductivity values.

Electrical properties Generalized term for the physical properties of a food relating to its ability to conduct electricity. Includes capacitance, dielectric properties, conductivity/resistance and electrostatic interactions.

Electrical resistance One of the electrical properties commonly determined in food analyses, electrical resistance is a measure of the extent to which a material withstands passage of an electric current. Inversely related to electrical conductivity. Heat is generated as a consequence of resistance and this characteristic is exploited in some cooking or heating methods, an example being ohmic heating.

Electrical stimulation Controlled application of an electrical current to animal carcasses immediately after slaughter. It is used to increase meat tenderness, and also to give meat a lighter, brighter colour. In particular, it is used to achieve accelerated conditioning (ageing) of animal carcasses, and to decrease cold shortening and subsequent toughness, which accompany very rapid chilling of meat. Electrical stimulation of carcasses breaks cross-linkages between actin and myosin filaments in the muscles, increases enzyme activity and causes some tissue damage; all of these effects increase meat tenderness. It may considerably improve the quality of beef, veal, lamb and goat meat, but has negative or negligible effects on the quality of pork. Electrical stimulation is well established in lamb slaughtering practice and has also been widely used in deer slaughtering.
Electrical stunning  A form of stunning, which is used during slaughter to immobilize animals and birds before bleeding. It is widely used during the slaughter of swine, sheep and poultry, but can also be used effectively during cattle slaughter. Before consciousness returns, bleeding can be carried out humanely and effectively. As well as improving animal welfare during slaughter, the method has beneficial effects on meat quality; for example, it reduces the incidence of the PSE defect in pork. There are two basic types, namely high voltage and low voltage. Electrical stunners include: pillar types; electrically charged knives; stunning tongs; and electrified water baths.

Electric fields  A region of space characterized by the existence of a force generated by electric charge. The magnitude of the electric field around an electric charge depends on how the charge is distributed in space. Each point in space has an electric property associated with it, the magnitude and direction of which are expressed by the value of the electric field strength. The value of the electric field has dimensions of force/unit charge. In the SI system, units are Newtons/Coulomb, equivalent to Volts/Metre.

Electrocution  To kill by electric shock. Electrocution may be used to slaughter chickens or fish. Some evidence indicates that, in comparison with electrical stunning, electrocution may reduce faecal loads on poultry carcasses under commercial slaughtering conditions. Electrocution is also used as a method to efficiently control insects and mites in food industry premises.

Electrodes  Conductors through which current is applied to or extracted from an electric circuit or system. Usually made of metal. Used as integral parts of instruments employed in detection of sample components.

Electrodialysis  Technique in which dialysis is accelerated by application of a potential across the compartments of the apparatus.

Electrolysed water  Salted water which has been passed through an oxidizing unit, causing it to undergo ionic changes. Depending on which electrode the water is passed over, either acidic or alkaline electrolysed water is formed. Acidic water is lethal to foodborne microorganisms and is considered more efficient for washing food, especially fruits and vegetables, during preparation than using chlorine-containing solutions or, in some cases, heat treatment. Its use has little effect on food sensory properties. Alkaline water is useful as a sanitizer, as it functions like a soap to remove substances from food preparation surfaces.

Electrolytes  Liquid or solid compounds which, when dissolved in or in contact with water, will dissociate into ions and conduct electricity. In physiological use, the term refers to certain inorganic compounds, e.g. those containing sodium, potassium or calcium, which dissociate into ions that conduct electrical currents and play an important role in controlling body fluid balance. Electrolytes are a common constituent of sports drinks.

Electromagnetic fields  Fields of force associated with electric charge in motion, having both electric and magnetic components and containing a definite amount of electromagnetic energy. The mutual interaction of electric and magnetic fields produces an electromagnetic field, which is considered as having its own existence in space apart from the charges or currents with which it may be related. Under certain circumstances, this electromagnetic field can be described as a wave transporting electromagnetic energy. In the food industry, electromagnetic fields are utilized in dielectric heating.

Electron beam irradiation  Exposure of foods to a field of electrons generated and accelerated by an electron beam linear accelerator. The electrons collide with unwanted organisms within and on the surface of the food, and destroy them. Thus, bacteria, fungi, yeasts and insects responsible for spoilage are controlled by the irradiation process, and shelf life is extended.

Electronic noses  Apparatus, consisting of arrays of semiconductor metal sensors coated with polymers, used for characterization of aroma compounds. The polymers in the sensors adsorb volatile compounds from aromas, vapours and gases. Each polymer adsorbs a different combination of ingredients, so that conductivity changes and variations may be processed electronically to produce visual fingerprints.

Electronic tongues  Apparatus, consisting of arrays of lipid/polymer membrane based sensors, which can quantify the taste of substances such as amino acid mixtures, foods and beverages. The lipid/polymer membranes are fitted onto a multichannel electrode, and electric signals from the sensors are fed into a computer; voltage differences between the multichannel electrode and a reference electrode are measured. Output from the sensors varies for chemical substances with different taste qualities but is similar for substances with similar tastes. The sensor array detects the five types of taste quality, i.e. sourness, saltiness, bitterness, sweetness and umami.

Electron microscopy  Microscopy technique which utilizes extremely short wave radiation from electrons in a vacuum tube to give high resolution. Commonly abbreviated to EM.

Electron paramagnetic resonance  Spectroscopy technique for studying the structure and bonding of a paramagnetic substance based on microwave-
Electron spin resonance

Electron spin resonance

Electrophoresis

Electrolyte

Electrolyte

Electrolyte

Electrospray ionization MS

Electroprotein

Electroprotein

Elicitation

Elicitation

Elicoic acid

Elk

Elk

Elk

Elk

Elk

Elk

Elk

Elk

Elk

Elk

Elk

Elk

Elk

Elk

Ellagitannins

Ellagitannins

Ellagitannins

Elements

Eleostearic acid

Elephant yams
Emamectin  Insecticide belonging to the avermectins group used to control a range of insects including mites, leaf miners, aphids, moths and bees. Also used as a parasiticide, effective against sea lice in fish.

Emmental cheese  Swiss hard cheese made from unpasteurized cow milk. A difficult cheese to produce due to intricacies of the fermentation process required to form the characteristic walnut-sized holes.

Emmer  Species of awned wheat (Triticum dicoccon) that exhibits good breadmaking properties. Also known as farro in Italy, where the whole grain is used in soups.

Emodin  Naturally occurring anthraquinone present in the roots and bark of numerous plants of the genus Rhamnus. Extracts from the roots, bark, and/or dried leaves of some of these plants, e.g. buckthorn, senna, cascara, aloes, frangula and rhubarb, are widely used in the preparation of herbal laxative preparations.

Emu eggs  Eggs produced by emus. Consist of approximately 11.9% protein and 16.0% lipids, and have a mean weight of 610 g. Egg shells are dark green in colour.

Emulsification  Process for forming fine dispersions (emulsions) of minute droplets of one liquid in another in which it does not dissolve or form a homogeneous mixture.

Emulsification properties  Functional properties relating to the ability of food components to form emulsions, suspensions of small globules of one liquid in a second liquid with which it will not mix.

Emulsifiers  Substances which aid the uniform dispersal (emulsification) of one immiscible liquid in another and thereby help in formation of emulsions. Widely used in the food industry, where applications include manufacture of bakery products, confectionery, ice cream, mayonnaise and margarines. Types of emulsifiers used in foods include carrageenans, lecithins and glycerides.

Emulsifying agents  Alternative term for emulsifiers.

Emulsifying capacity  Functional properties relating to the extent to which food components can form emulsions.

Emulsions  Types of colloids or dispersions composed of a mixture of immiscible liquids in which one forms droplets suspended in the other. Processed foods based upon emulsions include sauces, salad dressings, soups, spreads, coatings, mayonnaise, sausages and some dairy products. Emulsions display variable stability, and most require the addition of emulsifiers to maintain emulsion structure.

Emu meat  Meat from emus. Emus have a lower percentage of hot carcass weight and total fat to body weight, but a higher proportion of lean meat to carcass weight than ostriches or rheas. The meat is generally taken from the underbelly and thighs as there is not much meat on the breast. Meat cuts commonly prepared from emu carcasses include the side, forequarter, strip loin, neck, hindquarter, thigh, drum, fore saddle and hind saddle. Fat content of emu meat is low and colour is an intense red (pigment content increases with increasing age). Collagen content, colour and tenderness vary between muscles; some muscles are sufficiently tender for roasting or grilling.

Emus  Large, flightless, swift-running Australian birds (Dromaius novaehollandiae), which are farmed for the production of emu meat, emu eggs, feathers, hides and emu oils.

Enamels  Semi-transparent or opaque ceramics substances applied as protective or decorative coatings to the surface of metals, pottery or glass. Often applied to the surfaces of food containers, e.g. cans and cooking pots. Enamelled objects that come into contact with food or beverages may release lead or cadmium, posing a health risk. Also used to describe paints or varnishes which become smooth and hard when dried.

Enantiomers  Stereoisomers of a compound which are mirror images of each other. The left- and right-handed forms of these chiral isomers are optically active and generate a racemate when mixed in equal proportions. Chirality may affect the biological activity and functional properties of the compound; for example, D-amino acids but not L-amino acids are useful as sweeteners.

Enantioselectivity  Preferential formation of one enantiomer over another in a chemical reaction, expressed quantitatively as enantiomer excess. Enantiomers formed may affect the biological activity and functional properties of the product, e.g. D-amino acids but not L-amino acids are useful as sweeteners.

Encapsulation  A technology that allows sensitive ingredients to be physically enveloped in a protective matrix or wall material in order to protect these ingredients or core materials from adverse reactions, loss of volatile compounds, or nutritional deterioration. Spray drying is a microencapsulation technique readily used in the food industry. Carbohydrates, such as maltodextrins, starch and corn syrup solids, and acacia gums are widely used examples of encapsulating agents.

Endives  Common name for Cichorium endivia. Leaves are used fresh in salads or blanched to reduce bitterness. Common form used is the curled endive; other type is the escarole group, which has broad flat

Endives
Endocrine disrupters

Exogenous chemicals, both natural and synthetic, that interfere with the function of the endocrine system. These substances may disrupt the production, release, transport, metabolism, binding, action or elimination of natural hormones in the body that are responsible for the regulation of many physiological activities. Known human endocrine disruptors include contaminants such as bisphenol A, dioxins, polychlorinated biphenyls, DDT and some other pesticides. Naturally occurring phytoestrogens present in some plant foods (e.g. isoflavones in soybeans) also have the potential to act as endocrine disruptors due to their oestrogenic activity.

Endocrine system

A complex system of the body comprised of specialized glands that release carefully-monitored amounts of a wide variety of hormones into the bloodstream where they are transported to target cells having hormone-specific receptors. These hormones act as chemical messengers controlling and coordinating many physiological functions. Endocrine glands include the hypothalamus, pituitary, thyroid, adrenals, pancreas, ovaries and testes. Chemicals referred to as endocrine disruptors, which may be contaminants of foods, are known to interfere with the endocrine system, disrupting the normal physiological activity of hormones.

Endo-1,3(4)-β-glucanases

EC 3.2.1.6. Glycosidases that hydrolyse the 1,3- and 1,4-β-D-glucosidic bonds in β-glucans, which are typically found in oats, barley, some fruits and certain microorganisms. Also known as laminarinases, these enzymes are useful in the brewing industry where β-glucans can cause difficulties during clarification of worts and filtration of beer. Also useful in the winemaking industry where Botrytis contamination is a problem.

Endomyces

Genus of fungi of the family Endomycetaceae. Occur in soil and plant debris. Some species are plant pathogens. Endomyces fibuliger may be responsible for the spoilage of bread and other bakery products, and is also used in the commercial production of β-glucosidases.

Endomyces fibuliger

Obsolete name for a fungal genus whose species have been reclassified into other genera, including Hyphopichia, Trichosporon and Guillermondella.

Endonucleases

EC 3.1.21-EC 3.1.31. Nucleases that cleave nucleic acids at positions within their chains, producing poly- or oligo-nucleotides. Most act specifically on either DNA or RNA, while some (e.g. Aspergillus nuclease $S_1$) can act on both DNA and RNA. Includes restriction endonucleases and homing endonucleases.

Endopeptidases

EC 3.4.21-EC 3.4.25 and EC 3.4.99. Proteinases that hydrolyse proteins by cleaving specific peptide bonds within protein molecules. These enzymes are classified on the basis of their catalytic mechanism and can be serine (EC 3.4.21), cysteine (EC 3.4.22), aspartic (EC 3.4.23) metalloendopeptidases (EC 3.4.24) or threonine endopeptidases (EC 3.4.25). Examples include chymotrypsin, elastase, pepsins, thermolysins and trypsin. These enzymes have numerous applications in food processing.

Endopolygalacturonases

Alternative term for polygalacturonases.

Endosulfan

Non-systemic organochlorine insecticide and acaricide used to control a variety of sucking, chewing and boring insects and mites on a wide range of crops. Classified by WHO as moderately hazardous (WHO II). Also known as thiodan.

Endothia

Genus of fungi of the family Cryphonectriaceae. Part of the Cryphonectria-Endothia complex.

Endotoxins

Lipopolysaccharide toxins of Gram negative bacteria, or any microbial toxins which are released only upon cell lysis.

Endo-1,3-β-xylanases

Alternative term for xylan endo-1,3-β-xylosidases.

Endo-1,4-β-xylanases

EC 3.2.1.8. Glycosidases that catalyse the endohydrolysis of 1,4-β-D-xyloligosaccharides. Produced by a number of bacteria and fungi, these enzymes can be used for improving the handling and stability of dough, degradation of lignocellulosic materials and production of novel oligosaccharides.

Endpoint temp.

Temperature to which a food product, particularly meat, needs to be heated to ensure destruction of pathogens.

Endpoint temp. indicators

Indicators showing the adequacy of heating of foods, particularly meat and meat products, in relation to destruction of pathogens. The bovine catalase test and tests based on protein solubility, enzymes activity, colour, electrophoresis patterns of proteins, differential scanning calorimetry (DSC) of muscle proteins, near infrared spectroscopy (NIR spectroscopy) and enzyme linked immunosorbent assays (ELISA) can be used for this purpose.

Endrin

Persistent organochlorine insecticide used to control a wide range of insects. Subject to the Stockholm Convention on Persistent Organic Pollutants and use on crops has generally been displaced by less persistent insecticides.
Energy conservation  Planned management of energy supplies by various means. One type of energy conservation is curtailment (doing without). A second type is overhaul (for example, using less energy-intensive materials in production processes, and decreasing the amount of energy consumed by certain products). Another type involves the more efficient use of energy and adjusting to higher energy costs (for example, capturing waste heat in factories and reusing it).

Energy density  The amount of energy per unit of weight or volume. In nutrition terms, it relates to the number of calories contained in a given amount of food. Excess consumption of energy dense foods is a risk factor for overweight and obesity. Low energy density foods, such as fruits and vegetables, form a large part of many weight loss diets.

Energy drinks  Soft drinks containing ingredients intended to enhance or maintain the physical energy of the consumer. Commonly include high levels of sugar and caffeine, and may also contain ingredients such as guarana, taurine, ginseng, vitamins, carnitine, creatine and Ginkgo biloba.

Energy foods  Health foods designed for people, such as sportsmen and sportswomen, requiring a source of high energy. Energy foods are frequently available in the form of carbohydrate-rich energy food bars. Energy drinks and isotonic drinks are popular for the same purpose.

Energy values  Alternative term for calorific values.

English muffins  Thick, round bread products which are rapidly fermented using yeasts and are well aerated. Baked on a hot plate or griddle and often split and toasted before being eaten, sometimes with sweet or savoury fillings, such as jams, bacon or cheese.

Enniatins  Like beauvericin, these are cyclohexa-depsipeptide mycotoxins produced by certain Fusarium spp. Their potential presence as contaminants of Fusarium-infected cereals has food safety implications.

Enokitake  Alternative term for the edible fungi Flammulina velutipes.

Enrichment  Improvement of the quality or nutritional value of a food, usually by addition of nutrients.

Enrichment techniques  Procedures which specifically promote the growth of a particular microorganism, thereby increasing its proportion in a mixed population.

Enrobing  Coating of a centre material, for example nougat, biscuits, fondants or caramel, in chocolate. It is necessary to use tempered chocolate for enrobing processes. The centres for coating are placed on a continuous moving wire chain belt, which transports them underneath a flow of chocolate. Below the belt is a bottoming trough that retains the chocolate that falls through the chain belt and recirculates it, forming a layer of chocolate on the undersides of the centres. Sometimes two chocolate streams are used in enrobers; this is particularly useful when the product to be enrobbed has an uneven surface. The first coating flows into all the crevices and provides a good moisture barrier to the product. The second coating gives the chocolate a more rugged appearance. Products finally pass through a cooling tunnel to set the chocolate.

Enrofloxacin  Broad-spectrum semisynthetic fluoroquinolone antibiotic used to treat local and systemic infections in animals and poultry. Active against a wide range of Gram negative bacteria and also some Gram positive bacteria. Metabolized in the liver, the main product being ciprofloxacin, which is detected along with the parent compound in tissues, milk and eggs of treated animals and poultry. Residues persist longest in poultry skin, and livers and kidneys of animals and birds.

Entamoeba  Genus of protozoan parasites of the family Entamoebiidae. Infects humans and other vertebrates. Entamoeba histolytica may be responsible for amoebiasis.

Enteric viruses  Viruses that live in the gastrointestinal tract. Human enteric viruses may exist as commensals or may be pathogens which can cause gastroenteritis (particularly members of the families Adenoviridae, Astroviridae, Caliciviridae and Reoviridae). Usually transmitted via the faecal-oral route.

Enterobacter  Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae. Occur in soil, water, gastrointestinal tracts of humans and animals, and foods (e.g. dairy products, raw shellfish and raw vegetables). Some species may cause opportunistic infections in humans (e.g. Enterobacter cloacae).

Enterobacteria  Bacteria of the family Enterobacteriaceae.

Enterobacteriaceae  Family of facultatively anaerobic, rod-shaped Gram negative bacteria of the order Enterobacteriales. Members occur in soil, water, plants and the gastrointestinal tract of humans and animals. May occur as pathogens in vertebrates (e.g. species of Escherichia, Edwardsiella, Klebsiella, Citrobacter, Salmonella, Shigella, Yersinia, Providencia and Enterobacter) or as food spoilage bacteria (e.g. species of Hafnia, Serratia, Proteus and Erwinia).

Enterocins  Bacteriocins produced by Enterococcus spp.
Enterococci  Term which can be used in two ways. It is used to refer to members of the bacterial genus *Enterococcus*. Alternatively, it can be used loosely with reference to any streptococcal bacteria found in the human gastrointestinal tract, including species of *Enterococcus* and *Streptococcus*.

*Enterococcus*  Genus of Gram positive, facultatively anaerobic, cocoid lactic acid bacteria of the family Enterococcaceae. Occur in the gastrointestinal tracts of humans and animals. *Enterococcus faecalis* may be an opportunisitic pathogen in humans.

Enterotoxicity  Quality or degree of being capable of exerting a toxic effect on the gastrointestinal tract.

Enterotoxins  Bacterial toxins (e.g. cholera toxin) which, upon ingestion or production by microorganisms within the gastrointestinal tract, cause disturbances of the gastrointestinal tract. Diarrhoea is a common symptom.

Enteroviruses  Viruses of the genus *Enterovirus* (e.g. coxsackieviruses, polioviruses and echoviruses) which may be pathogenic in humans. Commonly transmitted via contaminated food and water.

Enthalpy  Measure of energy (heat) commonly used to study the thermodynamics of chemical reactions. Changes in the structure of food macromolecules, such as denaturation, gelatinization and crystallization, are often associated with changes in enthalpy.

Entolettes  Machines used in disinestation of cereals and other foods. Food is fed to the centre of a high-speed rotating disc which bears studs. The impact of the food being thrown against the studs kills insects and destroys their eggs.

Entrees  In Europe, a term applied to dishes served before the meat (main) course. In the USA, the term is usually applied to main meals.

Entropy  One of the thermodynamic properties that measures disorder in a system. High entropy levels indicate disordered states.

Environmental protection  Ecology term describing measures taken to limit the impact to the environment of human activities. Examples within the food industry include bioremediation processes which decrease the chemical and biological value of effluents and other wastes released into the environment, and the use of readily degradable packaging materials.

Environment friendly packaging materials  Materials developed for packaging of products including foods and beverages, with special consideration given to biodegradability and recycling.

Environment friendly processes  Processing procedures that are not harmful to the environment.

Enzyme electrodes  Type of ion selective electrodes in which the electrodes are coated with a layer containing an enzyme that reacts with the analyte to form a product to which the electrodes respond. Commonly used examples include glucose sensitive electrodes, which are coated with glucose oxidases.

Enzyme immunoassay  Immunoassay (often abbreviated to EIA) in which antibodies used to bind to the antigens to be measured are attached to an enzyme as a marker. Antibody-antigen complexes formed are measured on the basis of catalytic activity of the enzyme. ELISA is a type of enzyme immunoassay.

Enzyme inhibitors  Substances which reduce the activity of enzymes and, when present in foods, may act as antinutritional factors. Certain proteinases inhibitors such as calpastatins and cystatins play a role in development of meat tenderness and also may be useful for maintaining the quality of fish and surimi by inhibiting proteolysis. However, trypsin inhibitors and chymotrypsin inhibitors present in plant foods, particularly legumes, can reduce the digestibility and nutritional values of these foods.

Enzymes  Proteins that act as highly efficient and specific biological catalysts. Increase the rate of reactions by decreasing the activation energy but do not alter the equilibrium constant. Divided into six main groups: oxido-reductases, transferases, hydrolases, lyases, isomerases and ligases. Enzymes are named by the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (NC-IUBMB) and all enzymes can be recognized by their recommended names and Enzyme Commission (EC) numbers.

Enzymic browning  Formation of brown coloration of cut fruits and vegetables due to the action of catechol oxidases (polyphenol oxidases). In the presence of oxygen, the enzymes break phenols down into quinones, which polymerize to form brown coloured melanins.

Enzymic techniques  Analytical techniques in which enzyme reactions form a major part.

Epicatechin  One of the catechols found in green tea and black tea. Present in lower amounts than epigallocatechin. Also found in other plant sources. Displays antioxidative activity and, along with other catechols, is associated with the health benefits attributed to green tea consumption, e.g. anticarcinogenicity and antimutagenicity.

Epicatechin gallate  One of the catechols found in green tea and black tea. Present in lower amounts than epigallocatechin gallate. Also found in other plant sources. Displays antioxidative activity and,
along with other catechols, is associated with the health benefits attributed to green tea consumption, e.g. antitumouricity and antimutagenicity.

**Epichlorohydrin** This organochlorine epoxide is a colourless, water-insoluble liquid which is used to make plastics, including packaging materials and other food contact materials. Due to its carcinogenicity, levels are regulated to limit migration into foods. Also used as a cross-linking agent in immobilization of enzymes and other biopolymers and in insect fumigants.

**Epidemiology** Study of the incidence, distribution and causative factors of diseases that are associated with a particular environment or way of life, and of their control and prevention. Epidemiology is fundamental to preventive medicine and public health.

**Epidermal growth factors** Polypeptide hormones which stimulate and sustain epidermal cell proliferation. Synthesized by several glands and organs in the human body. Have numerous beneficial physiological effects on the intestinal mucosa and marked effects on epithelial turnover and microvillus ultrastructure. Epidermal growth factors present in human milk affect gastrointestinal tract development in infants. In vitro and animal studies indicate a role in protection of the gastrointestinal tract against colonization with pathogenic bacteria, but epidermal growth factor and its receptors are also involved in many aspects of the development of carcinomas.

**Epidermin** One of the antibiotics group of polypeptide antibiotics. Epidermin is synthesized by *Staphylococcus epidermidis* and displays inhibitory activity towards many Gram positive bacteria.

**Epigallocatechin** One of the major catechols found in green tea and black tea. Also found in other plant sources. Displays antioxidative activity and, along with other catechols, is associated with the health benefits attributed to green tea consumption, e.g. antitumouricity and antimutagenicity.

**Epigallocatechin gallate** Member of the catechols, and a characteristic component of green tea and black tea. Also found in seaweeds and other plant foods. Has antioxidative activity and, along with other catechols, is associated with several health benefits attributed to green tea consumption.

**Epimerases** Isomerases that include members of EC 5.1. Catalyse the reversible conversion of an epimer into its counterpart form. Can act on amino acids, hydroxy acids, carbohydrates and derivatives of these compounds. Useful for preparation of rare sugars, and for altering the physical and immunological properties of polymers such as alginates.

**Epinephrine** Alternative term for adrenaline.

**Epoxides** Organic compounds containing a cyclic ether (epoxy) substituent comprising an oxygen atom directly attached via single covalent bonds to two carbon atoms, which may be adjacent or non-adjacent and cyclic or linear. A number of plastics used in food packaging materials contain an epoxide group.

**Epuration** Form of purification. Sometimes applied to processing of water, fruit juices and cane sugar juices.

**Equisetum** One of the isoflavones, this non-steroidal phytoestrogen is a metabolite of daidzein produced by intestinal bacteria upon consumption of soy products. May have a variety of health benefits including reducing the incidence of prostate cancer and physiological changes following the menopause.

**Eremothecium** Genus of fungi of the family Sclerotiniaceae. *Eremothecium ashbyii* is used in the commercial production of riboflavin.

**Ergocalciferol** Synonym for calciferol and vitamin D₂; one of the group of sterols which constitute vitamin D. Synthesized by irradiation of the plant provitamin ergosterol. Alternative recommended name is ercalciol.

**Ergosterol** Sterol which occurs naturally in algae, bacteria, fungi, yeasts, higher plants and animals. When exposed to UV radiation it is converted into vitamin D₂ (ergocalciferol), a potent antirachitic substance. Used in synthesis of oestradiol.

**Ergot** Ascomycetous fungi (*Claviceps purpurea* of the family Clavicipitaceae) that attack mainly rye, but also other cereals, replacing one or more of the kernels in the mature grain head with a mass called a sclerotium. Sclerotia contain several toxic alkaloids, one of which is ergotamine. As well as reducing crop yields, ergot contamination is a health hazard for man and animals. Ergotism affects humans and animals that have ingested foods containing ergot alkaloids.

**Ergotamine** One of the alkaloids produced by the ergot fungus *Claviceps purpurea*, which attacks cereals, predominantly rye. Also a secondary metabolite of some strains of *Penicillium, Aspergillus* and *Rhizopus*. Can cause poisoning (ergotism) if contaminated grain is used for food, but modern grain cleaning and milling procedures remove most of the ergot, leaving low levels of ergotamine in flour. Baking and cooking usually cause destruction of remaining alkaloid. Ergotamine is commonly used, in combination with caffeine, for treatment of migraine.

**Ercic acid** Monounsaturated fatty acid, which exists as a combustible solid with low toxicity. Insoluble in water, but soluble in alcohol and ether. Occurs naturally as a minor component of many plant seeds and is obtained from plant seed oils, particularly hydrogen-
ated mustard seed oils and rapeseed oils. Uses include manufacture of waxes, plasticizers, water-resistant nylon and stabilizers and as an additive in polyethylene films. Alternative term for docosenoic acid.

**Erwinia** Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae. Occur on plants. Species (e.g. *Erwinia amylovora* and *E. carotovora*) may be responsible for plant diseases (dry necroses, vascular wilts and soft rots) and storage rots of fruits and vegetables (e.g. potatoes and carrots).

**Erysipelothrix** Genus of facultatively anaerobic, rod-shaped Gram positive bacteria of the Erysipelotrichaceae family. Widely distributed in nature, and occur as parasites in humans, mammals, birds and fish. Infection with *Erysipelothrix rhusiopathiae* in humans is rare, and usually occurs through the handling of contaminated fish and meat, resulting in the occupationally related infection called erysipeloid.

**Erythoboric acid** Alternative term for the antioxidant isoascorbic acid.

**Erythritol** Tetrahydric polyol with approximately 70% of the sweetness of sucrose, but which is non-cariogenic and low in calories. Used in bulk sweeteners for foods and beverages, and is a common component in hard coatings for sugar confectionery. Produced during fermentation of glucose by microorganisms, including *Candida* spp., and is found in fermented foods and beverages including wines and sake. Soluble in water, but only slightly soluble in alcohol. Has low hygroscopicity, high endothermic reaction and easy crystallization. Also known as erythrol.

**Erythrocytes** Blood cells containing the pigment haemoglobin which is responsible for carrying oxygen from the lungs to the tissues and for transporting carbon dioxide back to the lungs. In anaemia, the size or number of erythrocytes and/or the quantity of haemoglobin are reduced. Also known as red blood cells.

**Erythromycin** Macrolide antibiotic used to treat bacterial infections (particularly those caused by staphylococci) in cattle, swine, sheep and poultry. Readily disperses throughout tissues. Residues remain for relatively long periods of time after administration.

**Erythrosine** Artificial red colourant used for colouring cherries, meat products, candy and confectionery. Also known as FDC red 3.

**Escarole** Group of cultivars of *endives* with broad, flat leaves that may have red pigmentation due to the presence of anthocyanins.

**Escherichia** Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae. Most are motile by peritrichous flagella. *Escherichia* colonize the gastrointestinal tract of humans and animals, and may be present in soil and water (as a result of faecal contamination). Most are opportunistic normal flora, but some are potent pathogens. Virulent strains of *Escherichia coli* can cause gastroenteritis, and are transmitted to humans via contaminated food or water. Transmission often occurs via the faecal-oral route. Serotype O157:H7 can cause serious food poisoning. Four general categories of pathogenic *Escherichia coli* are recognized: enterotoxigenic (ETEC); enteroinvasive (EIEC); enteropathogenic (EPEC); and enterohaemorrhagic (EHEC). Food products associated with *E. coli* outbreaks include raw beef mince, raw seed sprouts, spinach, raw milk and unpasteurized fruit juices. The ability of *E. coli* to survive for short periods outside the body makes them ideal indicator organisms for detection of faecal contamination in environmental samples, including water. *Escherichia* is considered a very versatile host for production of heterologous proteins in biotechnology applications.

**Esculetin** Metabolite of coumarin found in a range of plants. Displays a variety of properties including anticarcinogenicity, antioxidative activity and inhibition of lipoygenases. Also known as 6,7-dihydroxycoumarin.

**Espresso coffee** Coffee beverages made by a process based on steam extraction of ground coffee in a special apparatus. Usually very dark in colour and strong.

**Essences Extracts** which contain at least 1 constituent that defines the quality of the source material, particularly in terms of flavour. Extracts may be of natural origin (e.g. essential oils) or may be synthetic.

**Essential oils** Volatile aromatic oils of complex composition extracted from plant material, usually by distillation, although supercritical CO₂ extraction and cold pressing may also be used. Widely used as flavourings, either by adding their characteristic flavour to an end product or in the creation of natural flavouring blends. Some of the most widely used essential oils are citrus essential oils, peppermint essential oils and cinnamon oils.

**Esterases** EC 3.1. Enzymes that hydrolyse esters forming acids, alcohols or thiols. Sub-divided into carboxylic ester hydrolases, thioester hydrolases, phosphoric monoester, diester and triester hydrolases, triphosphoric monoester hydrolases, diphosphoric monoester hydrolases and sulfuryl ester hydrolases. These subgroups include phosphatases, lipases, exonucleases and endonucleases.

**Esterification** The reversible process by which acids and alcohols react to form esters. Can be catalysed
enzymically by esterases. Includes transesterification, interesterification, acidolysis and alcoholysis reactions. Employed in the modification of fats and oils, and in the synthesis of structured lipids and flavour compounds.

**Esters** Organic compounds which are formed by combination of an acid with an alcohol. Some esters have a pleasant, generally fruity aroma and occur in plant essential oils. Uses vary widely according to type of ester, but include synthesis of flavourings and perfumes.

**Estragole** Phenol (1-allyl-4-methoxybenzene) which occurs widely in essential oils of herbs and spices. Used in flavourings for a wide range of foods, and displays antioxidative activity. Concerns exist over possible hepatotoxicity and carcinogenicity associated with chronic consumption. Also known as methylchavicol.

**Ethanal** Aldehyde (systematic name for acetaldehyde) which in pure form exists as a volatile, colourless liquid with a pungent, fruity aroma. Produced by oxidation of ethanol and soluble in water and alcohol.

**Fruits and vegetables** produce ethanal during ripening. It is also produced during fermentation, and is present in foods such as fermented dairy products and alcoholic beverages. Used in food flavourings and in the manufacture of acetic acid. Also known as acetic aldehyde.

**Ethanol** Alcohol which constitutes a major component of alcoholic beverages. Formed by fermentation of sugars by yeasts. Synonym for alcohol.

**Ethanolamine** Amin which in pure form exists as a colourless, combustible, hygroscopic liquid with an aroma of ammonia. A member of the biogenic amines group, which occurs in various foods, including wines and cheese. Synonym for aminoethanol.

**Ethanoic fermentation** The process by which certain yeasts, fungi and bacteria metabolize sugars anaerobically to produce ethanol. In this process, glucose is converted to pyruvic acid, which is decarboxylated to acetaldehyde. The acetaldehyde is subsequently reduced to ethanol. Synonymous with alcoholic fermentation.

**Ethephon** White, solid plant growth regulator which is highly soluble in water. By promoting the release of ethylene, it promotes the flowering of plants and increases the rate of ripening. Uses include as a flowering agent in pineapples and as a ripening agent in sugar cane. Also known as chloroethylphosphonic acid, (2-chloroethyl)phosphonic acid or ethrel.

**Etherification** A modification process resulting in the formation of ether bonds. Used to improve the physicochemical properties of starch for food and other applications. For example, hydroxypropylation of starch with propylene oxide disrupts inter- and intra-molecular H bonds, weakening the granular structure and improving the solubility and reconstitution properties of formulated products. Carboxymethylated food polysaccharides (e.g. carboxymethylcellulose) can be generated by etherification with chloroacetic acid. Can be combined with cross-linking to improve stability during processing and storage.

**Ethion** Non-systemic organophosphorus acaricide and insecticide used to control a range of pests (especially mites and aphids) on crops. Classified by WHO as moderately hazardous (WHO II).

**Ethiopian mustard** Common name for Brassica carinata. Eaten as a green leafy vegetable in Africa. Its potential as an oilseed crop is decreased by the high levels of glucosinolates in the seeds and of erucic acid in the oil.

**Ethnic foods** Foods belonging to the traditional cuisine of other ethnic groups. For example, Chinese, Indian and Mexican foods are all popular ethnic foods in the UK and USA. There is an increasing tendency for consumers to try foods from other countries as cultural diversity increases. This is reflected in the continuing increase in international sales of ethnic foods, including ethnic ready meals, flavourings and take away foods.

**Ethoxyquin** Used as an antioxidant to prevent pigment discoloration in paprika and chilli powder. Also used as a herbicide and to prevent superficial scald in fruits. Alternative term for santouquin.

**Ethrel** Alternative term for ethephon.

**Ethyl acetate** Ester which in pure form exists as a flammable, colourless, volatile liquid with a fruity aroma. Slightly soluble in water and soluble in alcohol. Used as a solvent, and in flavourings and perfumes.

**Ethyl alcohol** Alternative term for ethanol.

**Ethylamine** Amine which in pure form exists as flammable, colourless, volatile liquid with a strong aroma of ammonia. Soluble in water and alcohol.

**Ethyl butyrate** Ester which in pure form exists as a flammable, colourless liquid with a pineapple-like aroma. Virtually insoluble in water, but soluble in alcohol. Occurs as one of the flavour compounds in many fruits, e.g. apples. Used in flavourings and perfumes.

**Ethyl caproate** Synonym for ethyl hexanoate.

**Ethyl carbamate** Organic nitrogen compound derived from urea, which in pure form is a white or colourless crystalline solid. Soluble in water, alcohol and ether, and slightly soluble in oils. A possible carcinogen that
is used in pesticides and fungicides. Formed in wines, other alcoholic beverages and fermented foods during processing or storage. Synonym for urethane.

Ethylcarbamate Alternative spelling of ethyl carbamate.

Ethyl decanoate A fatty acid ester also known as ethyl caprate. One of the aroma compounds that occurs naturally in alcoholic beverages (e.g. wines, whiskey, beer, brandies) and fruits (e.g. apples, pears). Can be a source of off flavour in milk. Also a colourless, transparent liquid with a fruity, brandy-like aroma used in food flavourings.

Ethylene Highly flammable, colourless hydrocarbon gas with a sweetish aroma and flavour. Slightly soluble in water and alcohol. Occurs in natural gas and coal gas, and is produced by fruits and vegetables during ripening. Removal of ethylene from food packages is used to delay ripening of fruits. As a plant growth regulator, ethylene has many horticultural uses, e.g. as a fruit ripening accelerator.

Ethylenediamine Amine which exists as a toxic, colourless, alkaline gas or liquid with an aroma of ammonia. Soluble in water and alcohol, and readily absorbs CO₂ from air. Uses include in the manufacture of chelating agents, such as EDTA, and in emulsifying agents.

Ethylene dibromide Colourless, non-flammable liquid with a sweetish aroma. Toxic and carcinogenic. Slightly soluble in water andmiscible with most organic solvents and thinners. Used in fumigants for grain and tree crops, as a general solvent and as a water-proofing preparation.

Ethylene glycol One of the glycols or polyols. A colourless, viscous, hygroscopic liquid commonly used as a solvent, osmotic solute, antifreeze or plasticizer. Has been used as an additive in edible films.

Ethylene oxide Highly flammable, colourless gas which liquefies at temperatures below 12°C. Soluble in organic solvents andmiscible with water and alcohol. It has sporicidal and viricidal activities, and is probably carcinogenic. Sometimes used in fumigation of spices. Also known as epoxethane or oxirane.

Ethylbenzthiourea Primary degradation product of ethylene-bisdithiocarbamate fungicides (such as maneb and zineb), which are used on a wide range of crops. A suspected carcinogen.

Ethyl formate An ester also known as ethyl methanoate. One of the fumigants used to control insect infestation in crops (e.g. grain, legumes and fruits) during storage. Effectiveness is often improved when combined with carbon dioxide. Naturally occurring volatile compound with GRAS status. Also used as a component of artificial lemon, strawberry and rum flavourings.

Ethyl hexanoate One of the fatty acid esters, this colourless to light-yellow liquid has a characteristic aroma and is used as a flavour compound. Insoluble in water, but soluble in alcohol. Occurs naturally in apples, cherries, peaches and mangoes, and is also found in brandies and wines. Also known as ethyl caprate.

Ethyl octanoate A fatty acid ester also known as ethyl caprylate. One of the volatile compounds responsible for wine aroma, but can cause bitterness when present in large amounts. Colourless liquid with a wine, brandy, fruity and floral aroma used as an ingredient of food flavouring essences.

Ethyl oleate One of the fatty acid esters, this colourless to light-yellow liquid is insoluble in water. Used in dips for drying fruits, and is one of the food additives regulated by the FDA. Also used as a solvent, plasticizer and lubricant, and occurs as a minor aroma compound in cuttlefish. Synonym is oleic acid ethyl ester.

Ethyl vanillin Artificial flavouring, approximately 2 to 4 times stronger than vanillin. Synthesized from eugenol, isoeugenol or safrole. Used to enhance fruit and chocolate aroma notes in ice cream, beverages and bakery products.

EU Abbreviation for European Union.

Eubacteria Former name for a superkingdom of prokaryotes, now known as Bacteria.

Eucalyptol Former name for a superkingdom of eukaryotes.

Eucalyptus Monocyclic terpene distributed widely in plants. Occurs as a colourless liquid with a characteristic aroma and pungent flavour. Major food sources include eucalyptus oils, spices including sage, rosemary and basil, and essential oils extracted from herbs and spices. It is used in flavourings for foods and beverages. Cough candy contains particularly high levels of eucalyptol due to a high content of eucalyptus oil.

Eucalyptus Genus of trees found mainly in Australia. Leaves of some species are the source of essential oils that are used mainly for medicinal purposes, but can in some cases be used as food flavourings. Major floral source for honeys in Australia.

Eucaryotes Alternative spelling for eukaryotes.

Eucheuma Genus of red seaweeds occurring abundantly along shores in the southwest Pacific and Indian Ocean. Several species, such as Eucheuma cottoni and E. spinosum, are a commercially important source of carrageenans used by the food industry. The Philippines, Indonesia and Malaysia are the largest producers of these seaweeds.
Eugena gracilis  Species of microalgae of the family Euglenaceae. Used in biotechnology for the production of vitamins such as tocopherols.

Eukaryotes  Organisms in which the cells have a distinct nucleus containing the genetic material (DNA) in contrast with prokaryotes. Includes all organisms except bacteria and archaea. Alternative spelling is eucaryotes.

Euparen  Alternative term for the fungicide dichlofluanid.

Euphorbia  Plant genus characterized by its members producing a milky juice. Its seeds are of potential use as oilseeds, being a rich source of oil which contains high levels of vernolic acid.

European Community  In July 1967, three organizations (the European Economic Community (EEC), the European Coal and Steel Community (ECSC), and Euratom) fully merged as the European Community (EC). The basic economic features of the EEC treaty were gradually implemented, and, in 1968, all tariffs between member states were eliminated. A meeting of leaders of the member states in December 1969 paved the way for creation of a permanent financing arrangement for the EC based on contributions from the member states, development of a framework for foreign policy cooperation among the member nations, and the opening of membership negotiations with Britain, Ireland, Denmark and Norway. In 1972, it was agreed that the four applicant countries would be admitted on 1 January 1973. Britain, Ireland and Denmark joined as scheduled; however, in a national referendum, the people of Norway voted against membership.

European Economic Community  In 1957, the participants in the European Coal and Steel Community (ECSC) signed two more treaties in Rome, one of which created the European Economic Community (EEC, often referred to as the Common Market). The EEC treaty allowed for gradual elimination of import duties and quotas on all trade between member nations and for the institution of a common external tariff. Member nations agreed to implement common policies regarding transportation, agriculture, and social insurance, and to permit the free movement of people and funds within the boundaries of the community.

European Union  The European Union (EU) is an organization representing European countries dedicated to increasing economic integration and strengthening cooperation among its members. The EU was formally established on 1 November 1993, and its headquarters are in Brussels, Belgium. The EU is the most recent in a series of European cooperative organizations that originated with the European Coal and Steel Community (ECSC) of 1951, which became the European Community (EC) in 1967. The members of the EC were Belgium, Britain, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. In 1991, governments of the 12 member states signed the Treaty on European Union (commonly called the Maastricht Treaty), which was then ratified by the national legislatures of all the member countries. The Maastricht Treaty transformed the EC into the EU. In 1995, Austria, Finland and Sweden joined the EU. These were followed in 2004 by Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. Bulgaria and Romania joined in 2007, bringing the total membership to 27 nations. The EU primarily works to promote and expand cooperation among its members in areas such as economics and trade, social issues, foreign policy, security and judicial matters. Another goal was to implement Economic and Monetary Union (EMU), which established a single currency for EU members.

Eurotium  Genus of xerophilic fungi (order Euroti-ales) commonly found in soil and concentrated or dried foods. Have anamorphic states in the form genus Aspergillus. Cause spoilage in some foods and beverages, including stored grain, fruit juices and bakery products.

Eurygaster  Genus of insects of the order Hemiptera that are serious pests of grain, particularly wheat, in Europe, central and western Asia, and the former USSR. Eurygaster species inject enzymes into the grain which destroys the natural gluten and thereby reduces milling quality. Economically important species include Eurygaster integriceps (Sunn pest) and E. maura (wheat bug).

Evaporated milk  Milk concentrated by partial removal of water with the aid of a vacuum to reduce the boiling point and thus maintain the quality of the milk during the process. May have a range of fat contents depending on the concentration ratio used. After evaporation, the product is homogenized, mixed with stabilizers and sterilized in cans, or is UHT (ultra high temperature) treated combined with aseptic packaging in cartons. May be reconstituted by addition of water.
Evaporation  Gradual change of state from liquid to gas that occurs at a liquid's surface. The average speed of particles within a liquid depends on the liquid's temperature. Fast-moving particles striking other particles near the liquid's surface may impart enough speed, and therefore enough kinetic energy (energy of motion), to cause the surface particle to leave the liquid and become gas atoms or molecules. As particles with the most kinetic energy evaporate, the average kinetic energy of the remaining liquid decreases. Because a liquid's temperature is directly related to the average kinetic energy of its molecules, the liquid cools as it evaporates.

Evaporators  Equipment used in turning a liquid into a vapour by evaporation.

Evening primrose oils  Plant oils, extracted from seeds of members of the genus *Oenothera*, which are rich in γ-linolenic acid and linoleic acid. Used mainly in dietary supplements.

Evening primrose seeds  Oilseeds produced by plants of the genus *Oenothera*. Used in the food industry as a source of evening primrose oils.

Evisceration  The process of disembowelment, the cutting open and removal of the inner organs or entrails of animal carcasses. Similar to gutting of fish.

Ewe cheese  Cheese made from ewe milk. Well-known examples include Manchego cheese, Peccorino cheese and Roquefort cheese. Also known as ewe milk cheese, sheep milk cheese or sheep cheese.

Ewedu  Common name for *Corchorus olitorius*. Leaves are used as a pot-herb in West Africa, and eaten as a spinach substitute in other parts of the world. Also known as moroheiya, Jew's mallow, Egyptian mallow and bush okra.

Ewe milk  Milk produced by dairy ewes. Differs from cow milk in having significantly higher protein and fat contents. Most minerals and vitamins are also present in higher amounts in ewe milk than in cow milk, the notable exception being carotenes, contents of which are much lower in ewe milk. Often used in cheesemaking. Also known as sheep milk.

Ewe cheese  Alternative term for ewe cheese.

Ewes  Mature female sheep. The term may also be used to describe adult females of various related animals including goats and the smaller antelopes.

Ewe yoghurt  Yoghurt made by fermenting ewe milk.

Exercise performance  Performance (including endurance, stamina, speed, strength) during physical activity. A wide variety of products including performance drinks, sports foods, sports drinks and sports supplements are available which claim to enhance physical performance during exercise.

Exopolysaccharides  Extracellular polysaccharides synthesized and secreted by microorganisms. Includes polysaccharides produced during fermentation of foods, and which influence the viscosity of the finished product, such as those produced by lactic acid bacteria in yoghurt or fermented milk, and also isolated microbial polysaccharides such as gellan which have food applications.

Exotic fruits  Fruits from another part of the world or introduced from another country.

Exotic vegetables  Vegetables from another part of the world or introduced from another country.

Exotoxins  Potent extracellular toxins secreted by certain species of bacteria (e.g. *Clostridium botulinum* and *Staphylococcus aureus*).

Exo-1,4-β-xilosidases  Alternative term for xylan 1,4-β-xilosidases.

Expansins  Plant proteins found in cell walls. α-Expansins are believed to influence cell wall disassembly during ripening, by reversible disruption of H bonds between cellulose microfibrils and matrix polysaccharides, leading to softening of plant tissues. Some β-expansins, previously known as group-1 grass pollen antigens, are thought to facilitate pollination. Transgenic plants (e.g. tomatoes) over-expressing expansins could be used to generate crops with improved processing properties.

Expansion  One of the physical properties comprising an increase in size or volume. Can result when a food is processed, such as through the application of pressure or high temperature, extrusion or by soaking. Cereals are often expanded by puffing to produce breakfast cereals such as puffed rice and puffed wheat, and for making snack foods and puffed rice cakes.

Expert systems  Computer application programs that make decisions or solve problems in a particular field by using knowledge and analytical rules defined by experts in the field. In an expert system, a knowledge base provides specific facts and rules about the subject, and an inference engine provides the reasoning ability that enables the expert system to form conclusions.

Exports  Goods or services that are domestically produced but are sold abroad.

Expression vectors  Vectors, generally constructed from plasmids, carrying structural genes encoding a protein whose expression in host cells is desired. Usually incorporate genetic elements that regulate expression of these genes, e.g. promoters.

Expresso coffee  Alternative term for espresso coffee.
Extensibility  Extent to which a material can be distorted or stretched without breaking. It is often expressed as a proportion of the material's original size. A decrease in extensibility resulting from shortening of muscles has traditionally been used to define rigor mortis. Also commonly measured during assessment of the rheological properties of dough.

Extensographs  Instruments used to investigate the physical properties of dough. Similar to alveographs.

Extractive fermentation  Simultaneous extraction of fermentation products during fermentation processes. Organic solvents are frequently used for extraction, and the process often results in higher yields since it eliminates the problem of product inhibition.

Extracts  Term usually applied to concentrated flavourings obtained by solvent extraction or supercritical extraction of substances such as herbs, meat, yeasts or fruits. May also more generally apply to any product obtained by extraction.

Extrudates  Items which have been shaped by forcing them through a die (extrusion).

Extruded foods  Products such as breakfast cereals, snack foods and textured vegetable proteins that have undergone shaping and texturization by way of extrusion.

Extruded pet foods  Dried pet foods subjected to extrusion. Usually in the form of kibble or pellets. A dry mix is preconditioned with water and steam prior to extrusion, during which the mix is propelled down a barrel, where it generates its own heat and is cooked.

After cooling, the pellets are enrobed with other ingredients that may interfere with the extrusion process, such as oils and preservatives. Extrusion increases starch digestibility, reducing risk of diarrhoea. Many dog foods and cat foods are extruded. High fibre versions are available for pet rabbits and guinea pigs.

Extruders  Die equipment that is used to shape items during extrusion.

Extrusion  A processing technique which involves forcing materials through a die. Widely applied in the food industry for shaping and texturization, particularly with a view to modifying the sensory properties and quality of the resultant extruded foods.

Extrusion cooking  A processing method for cooking foods which involves heating materials under pressure combined with extrusion through a die. Employed widely in food manufacture, particularly in the production of snack foods and cereal products.

Eye disorders  Any of a wide range of disorders or diseases of the eye. Some are minor and easily treatable, while others may lead to a permanent loss of vision. Examples include age-related macular degeneration, cataracts, glaucoma, diabetic retinopathy and conjunctivitis. Several dietary components, especially the carotenoids lutein and zeaxanthin, as well as some vitamins and minerals, play an important role in eye health and may offer protection against some of these conditions.
**Faba beans** Seeds produced by *Vicia faba*. Vary in shape, colour and size. Immature seeds are eaten cooked, canned or frozen, while mature seeds are dried. Immature pods are also eaten. Types of faba beans include broad beans, horse beans, field beans, tick beans and Windsor beans. Also known as fava beans. In individuals with glucose-6-phosphate dehydrogenase deficiency, an X-linked recessive hereditary disease, intake of faba beans and certain other legumes can provoke sudden destruction of red blood cells and lead to favism, a type of haemolytic anaemia.

**σ Factors** Alternative term for **sigma factors**.

**Faecal contamination** Contamination, e.g. of foods or drinking water, with faeces.

**Fagara seeds** Seeds produced by plants of the genus *Fagara* or *Zanthoxylum*, some of which are used as the source of oils used in cooking.

**Fair trade** A trading partnership which seeks greater equity in international trade to ensure that farmers receive fair prices for their products. Fair trade foods range from bananas to coffee to chocolate. The International Fairtrade Certification Mark is a logo that appears on products as an independent guarantee that disadvantaged producers, such as in developing countries, have been treated fairly.

**Falafel** Fried croquettes of ground chick peas and fava beans seasoned with sesame seeds.

**Falling number** Indicator used to measure the activity of α-amylases in cereal flours. In wheat, a low falling number may signal reduced grain quality and poor breadmaking properties.

**FAO** Abbreviation for **Food and Agriculture Organization**.

**Farina** A fine flour or meal which is prepared from cereals, particularly wheat, or other plant foods with a high starch content. Can be used in the manufacture of foods such as pasta.

**Farinographs** Instruments used to investigate the physical properties of dough.

**Farmed fish** Fish produced by fish farming for food purposes. A wide range of fish species are farmed worldwide. Major farmed fish of commercial importance include *Atlantic salmon*, *rainbow trout*, *carp*, *channel catfish*, *tilapia* and *yellowtail*.

**Farmed shellfish** Shellfish produced for food purposes by aquaculture. A wide range of shellfish species are produced by this process worldwide. These include *mussels*, *clams*, *oysters*, *scallops*, *shrimps* and *lobsters*.

**Farm milk** Milk collected directly from the producer.

**Farnesene** One of the sesquiterpenoid volatile aroma compounds. Isomers include α-farnesene, which is synthesized in apples and is related to the development of scald, and β-farnesene which, along with α-farnesene, is a constituent of essential oils in several plants including hops and citrus species.

**Farnesol** Terpenoid alcohol which exists as a combustible, colourless liquid with a delicate floral aroma; it has low toxicity. Occurs naturally in many essential oils and flowers. Used in flavourings and perfumes.

**Fasciola** Genus of parasitic flatworms of the class Trematoda. *Fasciola hepatica* is the causative agent of fascioliasis, which is of great economic importance in cattle and sheep. Human fascioliasis may result from eating raw or improperly cooked watercress.

**Fast foods** Prepared foods obtained from restaurants and other catering establishments, where the aim is to provide a fast service and rapid customer turnover at reasonable prices. Examples of fast foods include burgers, pizzas, sandwiches and French fries.

**Fat mimetics** Alternative term for fat substitutes.

**Fatness** A measure of the excess portion of fats found on animal carcasses. Fatness affects the quality and economic value of carcasses, with lower levels often being preferred. As animals grow, fatness tends to increase, so selecting animals that are less mature can yield carcasses with lower fatness levels.

**Fat replacers** Alternative term for fat substitutes.

**Fats** Non-volatile, water insoluble substances that are usually solid at room temperature and are greasy to the touch. Composed of esters synthesized by reaction of fatty acids with glycerol in a ratio of 3 to 1 to form triacylglycerols or triglycerides. Arrangement and type of the fatty acids in the glycerol molecule affect the physical properties of the fat.
Fat substitutes  Substances of various types and origins that show similar properties to triacylglycerols in that they have a creamy and fat-like texture but have low calorific values. Used in the complete or partial replacement of fats in foods, e.g. low fat foods. Also known as fat mimetics or fat replacers.

Fattening  Feeding of domesticated animals to produce a desirable body weight and body composition for slaughter.

Fatty acid esters  Esters formed between fatty acids and a range of other compounds including sugars, alcohols, polyols, carotenoids and sterols. Fatty acid methyl esters are commonly prepared from triglycerides for GC analysis of fatty acid composition.

Fatty acids  Organic acids consisting of a chain of alkyl groups containing between 4 and 22 or more carbon atoms with a terminal carboxyl group. In saturated fatty acids, e.g. butyric acid, palmitic acid and stearic acid, the carbon atoms of the alkyl chains are connected by single bonds. Unsaturated fatty acids, e.g. oleic acid, linoleic acid and linolenic acid, contain at least one double bond. Fatty acids occur naturally and are derived from animal fats, fish oils and vegetable fats. Some, e.g. linoleic, linolenic and arachidonic acid, are essential nutrients (essential fatty acids) that are not synthesized in the human body and must be obtained from the diet.

ω-3 Fatty acids  Polyunsaturated fatty acids having double bonds in the ω-3 position; found in oily fish and certain vegetable oils. May have beneficial effects on health, in particular hypolipidaemic activity and anti-inflammatory activity, and may provide resistance against cardiovascular diseases. Examples include eicosapentaenoic acid, docosahexaenoic acid and α-linolenic acid.

ω-6 Fatty acids  Polyunsaturated fatty acids having double bonds in the ω-6 position. Found in vegetable oils. May have beneficial effects for health, especially reducing the risks for cancer, stroke and coronary heart diseases. Include arachidonic acid, linoleic acid and γ-linolenic acid.

Fatty acid synthases  EC 2.3.1.85. Acyltransferases which catalyse the synthesis of long chain fatty acids. Studies have shown that dietary polyunsaturated fatty acids can reduce the activity of this enzyme in animal models. Also thought to be involved in the biosynthesis of aflatoxins in Aspergillus.

FDA  Abbreviation commonly used for the US Food and Drug Administration.

Fenitrothion  A non-systemic organophosphorus insecticide with cholinesterase inhibitory activity, used for control of chewing, sucking and boring insects in fruits, vegetables and cereals. Also used for con-
Fennel  Common name for the plant *Foeniculum vulgare*. Florence or Florentine fennel is eaten as a vegetable. The edible part, eaten raw or cooked, is a false bulb formed by the leaf bases. Has an aniseed flavour, and is a good source of potassium and selected vitamins and minerals. Fennel seeds are also harvested for use as a spice and for their essential oils.

Fennel seeds  Liquorice-flavoured seeds from *Foeniculum vulgare*. Used for seasoning bakery products, cheese, and a number of meat and vegetable dishes. Seed oils are used in liqueurs and fragrances.

Fenthion  Organophosphorus avicide and insecticide. Classified by WHO as moderately hazardous (WHO II). Also known as baytex, lebaycid and mercaptophos. Classified by WHO as moderately hazardous (WHO II). Also known as baytex, lebaycid and mercaptophos.

Fenugreek  Common name for the leguminous plant *Trigonella foenum-graecum*. Fenugreek seeds are used as spices in curry powders, chutneys and imitation maple syrups. The plant itself is rich in carotenes and is consumed as a vegetable.

Fenvaralate  Non-systemic pyrethroid insecticide and acaricide used on crops for control of a wide range of insects, including those resistant to organochlorine, organophosphorus and carbamate insecticides. Classified by WHO as moderately hazardous (WHO II).

Fermentation  Energy-yielding process in which organic compounds are metabolized, usually under anaerobic or microaerobic conditions, to simpler compounds without the involvement of an exogenous electron acceptor. Commonly refers to processes carried out by microorganisms, regardless of whether fermentative or respiratory metabolism is involved. Used frequently in the food industry, e.g. for production of alcohols, bread, vinegar, flavour compounds, and a wide variety of fermented foods and fermented beverages.

Fermentation products  Products of microbial fermentation processes, e.g. alcohols, flavour compounds, food additives, surfactants and organic acids.

Fermentation technology  Technologies and methods used for production of specific products by means of microbial fermentation.

Fermented beverages  Beverages whose manufacture involves a fermentation process, generally alcoholic fermentation and/or lactic fermentation.

Fermented cream  Cream acidified naturally or artificially by the action of lactic acid bacteria. Lactose in the cream is converted to lactic acid by fermentation. Types of fermented cream include sour cream, ripened cream and smetana. Used in cooking and baking, and in dips.

Fermented dairy products  Produced by fermentation of liquid dairy products by lactic acid bacteria (starters). During fermentation, lactose is converted into lactic acid and sometimes flavour compounds such as diacetyl, depending on the organisms used and fermentation conditions. Fermentation is allowed to proceed until the required acidity is achieved. In some cases, where yeasts are also present, alcohol is formed in the final product, e.g. kefir, koumiss. Fermented dairy products include fermented cream, some types of butter, cheese, cultured buttermilk, and fermented milk, a popular type of which is yoghurt. Many traditional fermented dairy products exist throughout the world. Consumption of fermented dairy products, especially those containing specific organisms or probiotic bacteria, can enhance intestinal health.

Fermented foods  Foods subjected to fermentation by beneficial microorganisms in order to bring about desirable changes. These changes are mainly concerned with preservation (e.g. manufacture of cheese and yoghurt from milk), enhancement of nutritional value (e.g. removal of antinutritional factors from legumes), or alteration of flavour and texture (e.g. manufacture of soy sauces from soybeans). Many different types of fermented foods and fermented beverages are available, and play a major part in the human diet. Fermentation is favoured as an inexpensive method of preservation in developing countries and many items, such as fermented dairy products, are attracting increasing attention as functional foods due to the beneficial actions of the microorganisms and/or enzymes involved in fermentation. Also known as fermented products or cultured foods.

Fermented milk  Produced by fermentation of milk (of various species) by lactic acid bacteria (starters). During fermentation, lactose is converted into lactic acid, aroma compounds are formed and milk proteins are partly decomposed to peptides and free amino acids, improving digestibility of the milk. If yeasts are included in the starter mixture, alcohol is also present in the final product. Consumption of fermented milk may have many health benefits including alleviation of the symptoms of gastrointestinal disorders. Many types of fermented milk are produced throughout the world, including yoghurt, kefir, dahi, shubat and shrikhand.

Fermented products  Alternative term for fermented foods.

Fermented sausages  Traditionally produced by chance contamination of sausages with local mi-
croorganisms. In modern practice, however, starters are usually added to sausage emulsions in order to produce a more uniform product. Lactic starters are often included, but other microorganisms, particularly those with good nitrate reducing abilities, are also used. As well as affecting sausage colour and consistency, fermentation has major effects on flavour. Raw fermented sausages are prepared from unheated raw meat, which is fermented and then held at a controlled temperature and relative humidity until the desired degree of dryness is obtained. In contrast, heat-treated fermented sausages are pasteurized after fermentation and then dried, usually for a brief period.

Fermenters Vessels in which aerobic or anaerobic fermentation processes can be carried out, in either batch culture or continuous culture. Typically vertical, closed, cylindrical steel vessels that can range in volume from less than one litre to several thousand litres. Usually have means for ensuring adequate heat transfer, mixing and aeration.

Ferns Non-flowering plants often used as a food. Young shoots (fiddleheads) and rootstocks of wild and cultivated species are consumed in a number of countries.

Ferritin Globular protein complex consisting of 24 protein subunits, and is the main intracellular iron storage protein in prokaryotes and eukaryotes. Regularly measured as an indicator of iron status in diet studies, or following iron fortification of foods.

Fertilizers Natural or synthetic substances supplied to plants via the soil or in water to enhance their growth or yield of produce. Commonly contain nitrogen, phosphorus and/or potassium. Concerns about environmental and health hazards associated with their use have led to increasing popularity of organic foods that are cultivated without the use of artificial fertilizers.

Ferulic acid A phenol which in pure form exists as colourless needles and is soluble in water and alcohol. Occurs naturally in plant cell walls and is an in vivo substrate for plant peroxidases. Displays antioxidative activity and is used in food preservatives. Microbial and enzymic transformations of ferulic acid can be used to produce useful aromatic compounds, including flavour compounds, such as vanillin.

Feruloyl esterases EC 3.1.1.73. Carboxylic acid hydrolases which catalyse the hydrolysis of ester bonds linking 4-hydroxy-3-methoxycinnamoyl (feruloyl) groups to sugars in feruloylated polysaccharides to release ferulic acid, a preservative and vanillin precursor. Substrates include arabinoxylans and xylan present in the hemicelluloses fraction of plant cell walls. Feruloyl esterases from microor-

ganisms may be used for biodegradation of plant material, including agricultural and food industry wastes, e.g. cereal processing by-products.

Feta cheese Greek soft cheese made originally from ewe milk or a mixture of ewe and goat milks. Pure white, with a crumbly texture and high salt content. Saltiness can be reduced by soaking in cold water or milk for a few minutes before consumption.

FIA Abbreviation for flow injection analysis.

Fibre In general, a class of materials of elongated structure or comprising continuous filaments. Sometimes used to refer to dietary fibre and crude fibre, but also to thread-like structures, such as muscle, glass, nylon and nerve fibres.

Fibreboard Strong material made from wood or other plant fibres which are compressed, with or without binders, into boards. Used to make containers, such as crates, and panelling. May be corrugated to improve cushioning characteristics. Compared with plastics, fibreboard has both cost advantages and environmental benefits, particularly as it may be made from recycled fibres.

Fibre concentrates Concentrates prepared from fibre that may be used for food enrichment. Obtained from fruit, vegetable and cereal processing wastes such as apple pomaces and citrus peel.

Fibre optics Application of superfine glass fibres as light conduits in sensors where measurement is based on light transmission. Used in analytical procedures and also in monitoring food processing operations.

Fibrin Insoluble animal protein which is produced on hydrolysis of fibrinogen by thrombin. Forms a network of fibres during blood clotting.

Fibrinogen Soluble animal protein which is secreted into blood plasma by the liver. Converted into fibrin by the action of thrombin during blood clotting.

Fibrinolysin Alternative term for plasmin.

Fibrobacter Genus of obligately anaerobic, rod-shaped or coccoid Gram negative bacteria of the family Fibrobacteraceae. Occur in the rumen of ruminants and gastrointestinal tract of humans. Fibrobacter succinogenes is a cellulolytic bacterium present in the rumen of cattle that converts β-glucans to formates, acetates and succinates. Also produces esterases, endo-1,3(4)-β-glucanases and xylan degrading enzymes.

Ficains EC 3.4.22.3. Also known as ficins, these proteinases are found in fig latex. They are classified as cysteine endopeptidases, cleave preferentially at tyrosine and phenylalanine residues, and can act on a wide variety of protein substrates. Used as milk clotting enzymes and for tenderization of meat.

Ficins Alternative term for ficains.
Fiddleheads Edible tightly-curl ed tips of young fern fronds taking their name from their resemblance to the end of a violin, or fiddle. Deep green in colour with a chewy texture. Eaten cooked as a starter or side dish, or raw in salads. Rich in vitamin A and vitamin C.

Field beans Type of faba beans.

Field peas Variety of peas grown specifically for drying, usually not requiring soaking before cooking. Called split peas when split along the natural seam. Can be yellow or green.

Fig juices Fruit juices prepared from figs (Ficus carica).

Figs Fruits produced by Ficus carica. Consumed fresh or preserved by canning or drying. Used as ingredients in bakery products. During the process of drying, sugar content of figs increases to about 50%, potassium content increases approximately 5-fold, but the already low vitamin C level is halved.

Filbertone Principal flavour compound in hazelnuts. This ketone has the chemical formula (E)-5-methylhept-2-en-4-one, and occurs as R- and S-enantiomers.

Filberts Alternative term for hazelnuts.

Filefish Marine fish from the family Balistidae, chiefly found in tropical ocean waters. Generally characterized by a flat body and rough spiny scales. Some species are caught as food fish, including Alutera monoceros (unicorn filefish) and A. schoepfi (orange filefish). Usually sold fresh with skin removed.

Filter aids Materials such as bentonite, clays, diatomaceous earths and kieselguhr employed to facilitate the course of filtration.

Filters Porous devices for removing solid particles from a liquid or gas passed through them.

Filling Sweet or savoury ingredients used to fill a cavity within or between layers of a food, e.g. confectionery fillings, pie fillings and stuffings.

Filling equipment Devices used to transfer products into containers or casings for storage or retail. Also refers to substances, e.g. buttermilk powders, whey protein concentrates or corn starch, used to extend meat batters or emulsions to add bulk or functional properties.

Filleting Removal of the bones from a piece of meat or fish, so creating a fillet.

Filling Process of transferring products, e.g. foods and beverages, into containers or casings for storage or retail. Also refers to the developmental stage in cereals in which kernel dry matter increases.

Filling equipment Devices used to transfer products into containers or casings for storage or retail. Also sometimes called fillers.

Firmness Texture term relating to the extent to which a product is dense and firm.

Fisetin One of the flavonoids found in vegetables, fruits and wines. Has antioxidative activity.

Fish Any of a variety of cold-blooded vertebrate animals found in the fresh and salt waters of the world, ranging from the primitive, jawless lamprey, through the cartilaginous sharks, skate and ray, to the abun-
Fish balls  Fish products consisting of flesh from white fish (such as cod or haddock) mixed with milk, fish stock, flour or other binding ingredients, and seasonings, which are then shaped into balls and cooked. Marketed as semi-processed, canned or frozen products. Alternatively known as fish dumplings.

Fish bones  Bones from fish. Commonly used to prepare fish stocks which can be used as a base for soups and accompaniments such as gravy and sauces. As wastes of the industrial filleting process, they can be employed in both food and non-food applications.

Fish burgers  Fish products consisting of minced fish flesh, seasonings and preservatives. Often coated with batters, and sold in pre-cooked, frozen form.

Fish cakes  Cooked fish products made from fresh fish or salted fish, mixed with potatoes and seasonings; sometimes eggs, butter and onions are added. Fish content may range from 35 to 50% by weight. A variety of fish are used, including cod, haddock, coalfish and salmon.

Fish crackers  Fish products popular as snack foods in some Asian countries (known as keropok in Malaysia). Commonly made by mixing minced fish flesh with sago flour, tapioca flour, salt and monosodium glutamate. The mixture is then moulded into cylinders, steamed, cooled, sliced and sun-dried.

Fish farming  Production of fish (usually referring to finfish) under controlled or semi-controlled conditions for food or industrial purposes. Major farmed fish in commercial terms include Atlantic salmon, rainbow trout, carp, channel catfish, tilapia and yellowtail.

Fish fillets  Strips of fish flesh cut parallel to the backbone, starting just behind the head of the fish; fins, bones and discoloured flesh are normally removed, but skin may remain.

Fish fingers  Fish products consisting of rectilinear portions cut from a block of frozen fish flesh; typically the length is about three times the breadth and product weight is approximately 18 g. Often coated with batters or breadcrumbs and fried in oil.

Fish foods  Pet foods specially formulated to meet the nutritional requirements of pet fish in aquariums and ponds. Dried pet foods for fish include flakes, pellets, tablets, sticks and blocks, with fish meal, shrimps, soy meal, squid, insects, worms, spirulina and seaweeds as major ingredients. Also include frozen pet foods for tropical or marine fish, live worms and insects for tropical fish and newly hatched shrimps, protozoa and microworms for young fish and larvae.

Fish hydrolysates  Products formed from minced or comminuted fish (often processing wastes) after treatment with hydrolytic enzymes, filtration and drying. Average protein consists of 85% hydrolysed protein (mainly small peptides and free amino acids), 10% inorganic material and 5% water. Mainly used as flavourings in soups and in animal feeds.

Fish in juices  Fish stored in their own juices.

Fish in marinades  Fish, especially herring, soaked in marinades (seasoned liquids containing acetic acid, vinegar, olive oils, or brines, with or without spices) to retard the action of bacteria and enzymes. Have a characteristic flavour and an extended, but limited, shelf life.

Fish in oils  Fish (e.g. tuna, mackerel) stored in edible oils, especially vegetable oils such as soybean oils or sunflower oils. Usually sold as canned products.

Fish in sauces  Fish (e.g. sardine) stored in sauces, such as tomato sauces. Usually sold as canned products.

Fish liver oils  Lipid extracts from fish livers, which are rich in ω-3 fatty acids, vitamin A and vitamin D. Include shark, dogfish, halibut and cod liver oils.

Fish livers  Livers from some fish species which are utilized as foods. Fish valued for their livers include cod, halibut, tuna, certain sharks and mackerel. Marketed in fresh, frozen, salted and canned forms; also mixed with fish oils and spices to make pastes.

Fish meal  Dried, powdered or granular product obtained from cooked whole fish or fish processing wastes; fish species frequently used for its production include anchoveta, capelin, sand eel, herring and mackerel. Constitutes a valuable ingredient of animal feeds. Sold on the basis of its protein content and rated according to the percentage of protein contained in the product.

Fish mince  Fish flesh finely cut or crushed into small particles. Often used to make a variety of fish products such as kamaboko, fish fingers and surimi.

Fish noodles  Fish products consisting of minced fish flesh mixed with wheat flour (or other cereal flour), cassava starch and various additives; the mixture is extruded through tubular holes to form long strands which are dried in hot air. Products are boiled prior to consumption. A popular meal accompaniment is some parts of South East Asia.
Fish nuggets  Fish products comprising pieces of fish flesh (not minced) formed into small irregular shapes. May be formed from fillets, fillet pieces or fish blocks; normally occurs in breaded form. Marketed frozen.

Fish oils  Oils obtained from muscle, livers or other organs of fish, particularly herring, menhaden, anchovy, sardine and cod. Contain n-3 polyunsaturated fatty acids, which are the principal ones being eicosapentaenoic acid and docosahexaenoic acid, which are reported to protect against heart disease. Used in manufacture of margarines and cooking oils.

Fish pastes  Fish products consisting of minced fish flesh mixed with salt, with or without spices and flavourings, and ground to a fine consistency with reduced moisture content and often added fat. Frequently marketed as a sandwich spread.

Fish preserves  Fish products consisting of finely ground fish flesh (having reduced moisture content), with added seasonings and flavourings. Available in spreadable or sliceable forms.

Fish cakes  Fish products prepared from ground whole fish, which contain enhanced protein content (around 80%) and are marketed in powdered and granular forms; used as food ingredients. Commonly abbreviated to FPC. Occur in two forms, A and B; type A is odourless and colourless, type B has an odour and flavour associated with its higher fat content.

Fish protein concentrates  Dried fish products prepared from ground whole fish, which contain enhanced protein content (around 80%) and are marketed in powdered and granular forms; used as food ingredients. Commonly abbreviated to FPC. Occur in two forms, A and B; type A is odourless and colourless, while type B has an odour and flavour associated with its higher fat content.

Fish protein concentrates  Fish proteins extracted from fish bodies, often from processing wastes such as fish heads and offal. Some fish proteins form useful food ingredients due to their functional properties. Fish proteins are major components of fish protein concentrates and fish hydrolysates.

Fish sauces  Fish products prepared by fermenting salted fish with endogenous enzymes for long periods at elevated temperatures until solubilization is achieved. A rich source of certain amino acids, especially lysine and methionine. Popular in South East Asia.

Fish soups  Fish soups made from fish or other marine animals; usually contain seasonings and may contain pieces of fish flesh. Marketed in canned, dried or bottled forms.

Fish skin  Fish skin from fish. A source of collagen that may be used to produce gelatin.

Fish skin  Fish skin produced by Averrhoa carambola. The waxy fruits are yellow and juicy, and star-shaped in cross-section. Rich in vitamin C, with moderate amounts of sugar. Eaten raw or preserved, and used in beverages. Also known as carambolas and star fruit.

Flagella  Helical and hollow tubular filaments composed of flagellins that project from the cell membranes of some bacteria, which rotate to provide motility. Important virulence factors. Different species of bacteria have different numbers and arrangements of flagella. Flagellar antigens, or H antigens, are used in the serotyping of bacteria.

Flagellins  Protein subunits that make up the filaments of bacterial flagella.

Flake bread  Flake bread that is flat in appearance. It is typically, but not always, made from dough that has not undergone leavening. Several varieties exist, including chapattis, pita bread, roti and nan.
Flatulence The presence of excess gas (‘flatus’) in the gastrointestinal tract which is expelled from the anus. This flatus consists of a number of gases, including methane, nitrogen, hydrogen, carbon dioxide and hydrogen sulfide. Flatus is generated by swallowed air, digestion, high fibre foods and the by-products of intestinal bacteria. Some digestive system disorders, such as irritable bowel syndrome, can also produce excess gas. Several foods are associated with flatulence due to the presence of flatulence factors, including legumes, cabbages, onions, Brussels sprouts and prunes. Foods rich in sulfur, such as eggs and meat, are more likely to make the gas have a more intense smell.

Flatulence factors Dietary components that can cause flatulence. Raffinose, stachyose and verbascose have been identified as flatulence factors in legumes. The α-galactosidases required for digestion of these oligosaccharides are absent in humans and other mammals and so they pass into the intestine where they are fermented by bacteria. This can result in the accumulation of gas. Certain processing methods may reduce or eliminate flatulence factors in foods.

Flavanols Flavonoids which contain a hydroxyl group. In pure form they exist as yellow, needle-like crystals. They include the hydroxyflavones, chrysin, fisetin and quercetin. Occur in many plant foods and wines, and are associated with bitterness and astringency. They may be used to reduce the perceived sweetness of foods and beverages.

Flavanones One of the major groups of flavonoids derived from flavone. In pure form they are colourless, crystalline solids. Found in the tissues of higher plants, including fruits, particularly citrus fruits and apples, and vegetables, either in free form or as glucosides. Flavanones occurring in foods include hesperidin, naringenin and eriodictyol.

Flavins Naturally occurring yellow pigments which have a tricyclic aromatic molecular structure. Soluble in water. Include riboflavin and its products, e.g. flavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD).

Flavobacterium Genus of aerobic, rod-shaped Gram negative bacteria of the family Flavobacteriaceae. Occur in soil, water, raw meat and milk. Species may be responsible for spoilage of meat, fish, milk and dairy products. Some species are opportunistic pathogens of humans. Some species from this genus have been reclassified as Chryseobacterium.

Flavomycin Aminoglycoside antibiotic used primarily as a growth-promoting agent in cattle, swine and poultry. Rarely absorbed in the gut of animals and normally excreted rapidly. No withdrawal period is required.

Flavones Flavonoid pigments which in pure form exist as colourless, crystalline solids. Insoluble in water. Occur in higher plants, including fruits and vegetables, and are responsible for the ivory and yellow colours in plants and flowers. Some plants contain high levels of flavones, e.g. parsley (Petroselinum crispum) contains high levels of apigenin. Dietary flavones are believed to have various health benefits, e.g. flavones in tea and red wines may protect against cancer and cardiovascular diseases. Flavones are used to derive various yellow dyes.

Flavonoids Large group of aromatic, oxygen-containing, heterocyclic pigments. Include various subgroups of compounds, such as catechins, flavonols, flavanones, flavones, flavonols, anthocyanins and leucoanthocyanidins. Occur widely in higher plants and are responsible for the majority of yellow, red and blue colours in fruits, vegetables and flowers (with the exception of colours produced by carotenoids). Major dietary sources are apples, onions, red wines and tea. Believed to protect against cancer and cardiovascular diseases. Mechanisms of these inhibitory effects are not fully understood, but they are thought to involve inhibition of low density lipoprotein oxidation.

Flavonones Flavonoids, distinct from flavanols, which contain a hydroxyl group. Include kaempferol and quercitrin. Occur naturally in plants and are responsible for the ivory and yellow colours of many flowers. Dietary sources include fruits, vegetables, red wines, green tea and black tea. Believed to protect against cardiovascular diseases and cancer.

Flavour Sensory properties of foods. The tongue can distinguish five separate tastes (sweet, salt, sour, bitter and savoury/umami) due to the stimulation of the taste buds. The overall flavour of foods is a combination of these components, together with astringency in the mouth, texture, and aroma.

Flavour compounds Compounds present in substances that give foods their characteristic flavour; components capable of stimulating the sense of taste.

Flavoured beverages Beverages with added natural or synthetic flavourings.

Flavoured milk Milk containing flavourings.

Flavoured yoghurt Yoghurt containing flavourings, usually fruit-based.

Flavour enhancers Flavourings used to enhance the original flavour and/or aroma of a food, without
Imparting a characteristic taste or aroma of their own. Include monosodium glutamate and ribonucleotides. Similar to flavour modifiers.

**Flavourings** Substances whose primary purpose as food additives is to impart flavour and/or aroma when added to foods. Include natural flavourings, such as essential oils and spices, artificial flavourings, seasonings, condiments and extracts. Also known as aromatizing agents or flavours.

**Flavour modifiers** Flavourings used to modify the original flavour and/or aroma of a food. Similar to flavour enhancers.

**Flavours** Alternative term for flavourings.

**Flavour thresholds** Term used in sensory analysis relating to the levels at which perception of increasing concentrations of flavour compounds begins.

**Flax seed oils** Amber to yellow coloured oils derived from the cotyledons of flax seeds (Linum usitatissimum). Use of hydraulic pressure extraction results in pale coloured oils which are bland in flavour, while heat and pressure extraction produces darker oils with a bitter flavour and off odour. Rich in α-linolenic acid and often used as a food oil. Also known as linseed oils.

**Flax seeds** Seeds from plants belonging to the species Linum usitatissimum which are used principally in the production of flax seed oils. The flax seed meal which remains when the oil has been extracted from flax seeds is used as a livestock feed. Dried flax seeds are also sometimes used in medicinal preparations.

**Fleischwurst** Ring-shaped German sausages which are a type of bruehwurst and have a high percentage fat content. Preparation involves smoking and scalding.

**Flexible packs** Packs which are capable of bending easily and repeatedly without breaking.

**Flies** Common name for species of insects of the order Diptera (e.g. blowflies, fruit flies and midges) characterized by one pair of wings and another pair of modified wings used for equilibrium (balancers). May specifically refer to the common housefly, Musca domestica, which can carry bacteria, inside its body or on its body hair, that can contaminate foods and thereby spread diseases.

**Floc** A small clump or mass of colloidal particles formed in a fluid by the process of flocculation.

**Flocculants** Substances that induce the formation of a mass of colloidal particles (floc) in a dispersion of solids in a liquid.

**Flocculation** Formation of a mass of colloidal particles (floc) in a dispersion of solids in a liquid, or alternatively, removal of suspended solids by coalescence.

**Florentines** Chewy, thin biscuits, often chocolate-coated on one side, containing nuts and dried fruits or candied fruits.

**Florenicol** Broad spectrum bacteriostatic antibiotic which is a fluorinated analogue of thiamphenicol. Similar range of activity to that of chloramphenicol, including many Gram negative bacteria and Gram positive bacteria. Used mainly in treatment of cattle and salmon. Not labelled for use in lactating cattle or veal calves in some countries.

**Flotation** Technique in which different types of solid particles in a liquid are separated out, the principle being that some particles will absorb water while others will not.

**Flounders** General name used for a number of marine flatfish species, especially those in the order Pleuronectidae; many species are highly valued food fish, having fine-textured flesh with a delicate flavour. Commercially important flounders include Platichthys flesus (European flounder) and Limanda ferruginea (yellowtail flounder).

**Flour** Powders made from finely ground, sifted cereal grains. Used as a basic ingredient for bakery products and many other products. Unless specified otherwise, the term usually refers to the product of wheat grains.

**Flour improvers** Substances added to milled flour to improve its colour and/or baking properties. These include oxidizing agents to accelerate flour ageing (e.g. potassium bromate, ascorbic acid) and bleaching agents such as chlorine dioxide.

**Flour mills** Machines or devices for milling grain into flour and other cereal products.

**Flow** Rheological property concerned with the characteristics of movement of a substance. Flow behaviour affects processing properties of a substance and texture of the final product. It is affected by properties such as cohesion and internal friction.

**Flow cytometry** Technique for sorting, selecting or counting individual cells in a suspension as they pass individually through a small hole or tube in a flow cytometer. May refer specifically to such a technique which involves the detection of a cell-bound fluorescent or fluorochrome label.

**Flowers** Part of a plant where the fruit or seed develops. Usually brightly coloured to attract insects. Not all flowers are edible, but those that are may be used as a garnish or integral part of a dish. Edible types include nasturtiums, pansies, violas, roses, chrysanthemums and marigolds. Flowers may also be candied or crystallized and used to decorate desserts or cakes.

**Flow injection analysis** Automated technique in which liquid samples are injected into a stream in...
Flow meters Devices for measuring the flow of a gas or liquid through pipes or other types of equipment.

Fludioxonil Short-lived pyrrole contact fungicide used to control plant diseases in a variety of crops.

Fluidization Process in which finely divided solids (e.g. catalysts) are made to behave in the same way as fluids by suspending them in moving gases or liquids. The principle is used in fluidized beds.

Fluidized beds Novel class of heat transfer media. A fluidized bed is produced by passing a stream of gas or liquid upwards through a bed of particles at sufficient velocity to suspend the particles (fluidization). In this state, the mixture of particles and fluid behave like a liquid having density equal to the bulk density of the particles. Circulation of particles in the bed, particularly by the vigorous mixing action of bubbles rising through the bed, results in large heat transfer rates between the bed and immersed surfaces. In some instances, the heat transfer rate may be orders of magnitude greater than achieved using the same fluid flow conditions in the absence of particles. Fluidized beds are used in many chemical engineering processes where small solid particles must be brought into intimate contact with a gas stream. Examples are drying of finely divided solids, adsorption of solvent vapours from air, and heterogeneous catalytic reactions.

Fluids Substances that have no fixed shape and which flow when external pressure is applied to them. Includes liquids and gases.

Flukes Common name for parasitic flatworms belonging to the class Trematoda.

Flumequine A quinolizine carboxylic acid derivative belonging to the quinolones group of synthetic antibiotics. Used for treatment of enteric infections in food animals, and is effective against Gram negative bacteria. Residues may occur in the meat or milk of treated animals. Questions have been raised over its potential genotoxicity. Alternative names are R-802 and Apurone.

Fluoranthene Polycyclic (tercyclic) aromatic hydrocarbon which in pure form exists as small white crystalline plates. A mutagen which is insoluble in water, but soluble in alcohol or ether. May occur in foods as a result of certain food processing practices, e.g. can be formed in wood smoked cheese or barbecued meat. Contamination of foods may also result from pollution.

Fluorescence Absorption of radiation to produce radiation of a longer wavelength, a phenomenon exploited in fluorescence microscopy.

Fluorescence in situ hybridization One of the genetic techniques, used to visualize DNA or RNA in cells or chromosomes. It involves hybridization to a target DNA or mRNA sequence of a DNA probe which shows complementary base-pairing with the target and includes nucleotides labelled with fluorescent molecules. The target-probe hybrid can be visualized in situ using fluorescence microscopy. In the field of food science it has been used for detection and enumeration of microorganisms.

Fluorescence microscopy Microscopy in which samples are illuminated with UV or blue light causing them to emit light of longer wavelengths.

Fluorescent light Visible light produced by fluorescence, especially that from a discharge tube in which a phosphor on the inside of the tube is made to fluoresce by ultraviolet light from mercury vapour. Fluorescent light can accelerate oxidative deterioration of foods such as oils, nuts and milk during storage.

Fluoridation Addition of traces of fluorides, particularly to water supplies and toothpastes as a means of preventing tooth decay. Fluoridation of water supplies is a controversial issue due to possible health hazards associated with long-term ingestion of high levels of fluorides.

Fluorides Salts which contain fluorine. Often added to toothpastes or drinking water in order to reduce the incidence of dental caries. Fluoridation of water supplies is a controversial issue due to possible health hazards associated with long-term ingestion of high levels of fluorides.

Fluorimetry Alternative term for fluorometry.

Fluorine Non-metallic element. Member of the halogens family, of which it is the most electronegative and the strongest oxidizing agent. Has the chemical symbol F and atomic number 9. Exists as a pungent, pale yellow gas or liquid. Normally present in bone; both deficiency and excess can lead to skeletal disease. Used to manufacture fluorides.

Fluorodensitometry Technique, often combined with TLC or HPLC, in which concentration of an analyte is determined on the basis of its fluorescence.
Fluorometry Technique used to identify a substance from the wavelength of the light that it emits during fluorescence. Also called flurometry.

Fluorosis Diseases typified by damage to teeth (dental fluorosis; characterized by brown mottling of the enamel) and bones, caused by an excessive intake of fluorides. Incidence of dental fluorosis increases when the level of fluoride in the water supply is above a certain limit. The mottled enamel is resistant to dental caries. When the level of fluorides rises still further, systemic fluorosis may occur, with calcification of ligaments.

Flushing Cleansing by passing large quantities of water through an object.

Fluted pumpkins Common name for Telfairia occidentalis, a plant cultivated for its leaves, which are used as a vegetable, and its seeds, which are eaten or used as a source of oils.

Fluvalinate Pyrethroid insecticide and acaricide used for control of a wide range of insects on fruits, vegetables and cereals. Also used for control of mites in beehives. \( \tau \)-Fluvalinate is classified by WHO as unlikely to present acute hazard in normal use.

Flying fish Any of several marine fish species in the family Exocoetidae; very fast swimming fish that can propel themselves out of the water with the aid of specially developed caudal and pectoral fins. Widely distributed in warmer oceanic regions. Species utilized as food fish include Exocoetus volitans, Cypselurus spp. and Prognichthys spp. Marketed fresh or dried; particularly popular in Japan.

Foamed plastics Lightweight plastics made by solidifying plastic foams. Plastic foams are produced from liquid plastics, and contain many small bubbles. Useful for food packaging.

Foam fractionation A method for the separation of the components of a liquid or sol. Bubbles are passed through the bulk liquid in a specialised column and soluble, surface-active substances are selectively adsorbed at the gas-liquid interface. The bubbles form a stable foam, which overflows to remove the adsorbed components. Foam fractionation may be used for the separation and purification of proteins.

Foaming Formation of a mass of small bubbles on or in a liquid (foams).

Foaming agents Substances that promote foaming.

Foaming capacity Functional properties relating to the extent to which an item is able to form foams.

Foaming properties Functional properties relating to the ability of food components to be formed into foams.

Foams Light textured colloidal dispersions of a gas, such as air, in a liquid or solid, typically achieved by whipping or frothing. Foams are unstable, requiring the presence of stabilizers to form the gas bubble membranes. Egg whites have good foaming capacity and are used to produce foamed foods such as meringues and soufflés. Gelatin and modified milk proteins are also widely used to produce foams, e.g. in manufacture of foamed confectionery. Foamed plastics are useful for food packaging.

Foie gras A smooth rich paste prepared from fattened goose livers or duck livers. It is traditionally made in France, where it is a speciality of the Alsace and Perigord regions. It is valued highly for its silky, melting texture. Ideally, it has a delicate rose colour with beige mottlings. When aged, it develops a rich flavour. Foie gras prepared from goose livers has a richer flavour and is more expensive than foie gras prepared from duck livers. Ducks and geese reared for foie gras production are force-fed and prevented from exercising, so that they develop hugely enlarged, fat-infiltrated livers. This force feeding raises animal welfare concerns and is banned in many countries. After the fattened birds are killed, their livers are removed and often soaked overnight in milk, port or water, before draining and marination in Armagnac, Madeira or port with a mixture of seasonings. The livers are then cooked in their own fat and pressed to prepare foie gras. In contrast, pate de foie gras is prepared from a high proportion of pureed goose or duck livers, but usually contains other ingredients such as swine livers.

Foils Thin, flexible metallic sheets or strips. Commonly, thickness is specified as being less than a given amount. Used widely as packaging materials, e.g. aluminium foils.

Folic acid Water soluble member of the vitamin B group. In its active form, tetrahydrofolate, it is a coenzyme in various reactions involved in the metabolism of amino acids, purines and pyrimidines. Synthesized by intestinal bacteria and widespread in food, especially green leafy vegetables. Deficiency causes poor growth and nutritional anaemia. Daily intake should be increased prior to conception and during early pregnancy to prevent neural tube defects (NTD, e.g. spina bifida) and other congenital malformations (e.g. cleft lip and cleft palate) in the fetus.

Fluorometry

Fluoroscopy

Fluorosis

Flushing

Fluted pumpkins

Fluvalinate

Flying fish

Foamed plastics

Foam fractionation

Foaming

Foaming agents

Foaming capacity

Foaming properties

Foams
Folpet

One of the fungicides used for control of plant diseases (including powdery mildew, leaf spot disease and scab) in a range of fruits and vegetables. Classified by WHO as unlikely to present acute hazard in normal use. Also known as phalan.

Fomes

Genus of fungi of the class Hymenomycetes. Occur on trees and on wood. Some species may be responsible for plant diseases. Fomes fomentarius produces enzymes which are capable of degrading celluloses, xylan and lignin.

Fondants

Low moisture sugar syrups which are made by boiling concentrated sugar solution, adding glucose syrups or inverting agents, and cooling rapidly while mixing, to produce fine sugar crystals in a saturated sugar solution. Used to make fondant sweets, as fillings in chocolates and biscuits, and as toppings for cakes.

Fondues

Traditional Swiss dishes made using blends of cheese types, such as Gruyere, Emmental and Raçlette, which are melted together with white wines, flour and seasonings. The mixture is kept hot by placing it in a pot over a burner and is eaten on cubes of bread which are dipped into the pot. The term is also applied to a meat dish in which cubes of raw meat are dipped into a pot of oil which is kept hot over a burner, and consumed once cooking is complete.

Fontio

Type of millet (Digitaria exilis or D. iburua) grown in Africa. Utilization is hampered by difficulties in removing the husks from the grain. Also known as hungry rice.

Fontina cheese

Italian soft cheese made from cow milk. Dense and smooth in texture with small round holes. Ripens in about 3 months. Genuine Fontina comes from the Val d’Aosta region of Italy in the Alps near the French and Swiss borders. The primary ingredient of Italian fonduta.

Food additives

Additives used specifically in foods.

Food aid

Provision of food and related assistance to relieve hunger and improve food security. Various types include: relief aid, typically for emergency situations; aid delivered as part of a specific project promoting agricultural or economic development; and government-to-government aid in which food is grown in the donor country for sale or distribution abroad.

Food and Agriculture Organization

The Food and Agriculture Organization (FAO) was founded in October 1945 with a mandate to raise levels of nutrition and standards of living, to improve agricultural productivity, and to better the conditions of rural populations. Today, FAO is the largest autonomous agency within the United Nations (UN) system, with 189 Member Nations plus the EC (Member Organization) and more than 3600 staff members around the world. FAO works to alleviate poverty and hunger by promoting agricultural development, improved nutrition and the pursuit of food security. The Organization is active in land and water development, plant and animal production, forestry, fisheries, economic and social policy, investment, nutrition, food standards, and commodities and trade; it also plays a major role in dealing with food and agricultural emergencies. FAO aims to meet the needs of both present and future generations through programmes that do not degrade the environment and are technically appropriate, economically viable and socially acceptable. FAO offers direct development assistance, collects, analyses and disseminates information, provides policy and planning advice to governments, and acts as an international forum for debate on food and agriculture issues.

Food and Drug Administration

US agency within the Department of Health & Human Services which was formed in 1927 by division of the Bureau of Chemistry (established 1862) into the Food, Drug and Insecticide Administration (name shortened in 1930) and the Bureau of Chemistry and Soils. The name is commonly abbreviated to the FDA. It is a scientific, regulatory and public health agency including under its jurisdiction most foods, animal and human drugs, therapeutic agents of biological origin, medical devices, radiation emitting devices, cosmetics and animal feeds. The FDA evaluates applications for new drugs, foods, food additives, infant formulas and medical devices, as well as monitoring manufacture, import, transport, storage and sale of these products. Its mission is to promote public health by helping safe and effective products to reach the market in a timely manner, and monitoring products for continued safety once in use. With respect to foods, the agency aims to ensure that they are safe, wholesome, sanitary and properly labelled.

Food antioxidants

Antioxidants used specifically in foods.

Food bars

Hand-held snack foods, usually in the shape of a rectangular block, e.g. cereal bars, chocolate bars, ice cream bars and meal-replacement bars.

Foodborne diseases

Diseases whose causative agents are transmitted through food.

Food colorants

Colorants used specifically in foods.

Food composition tables

Tabulated data on the nutritional composition of a wide range of foods and
Food emulsifiers  Emulsifiers used specifically in foods.

Food emulsions  Colloidal suspensions in which a substance is dispersed in another, e.g. oil in water emulsions. Emulsions can be formed from immiscible water and oil phases with the aid of emulsifiers; stabilizers are used to maintain structure. Examples of food emulsions include milk, cream, margarines and mayonnaise.

Food enrichment  Historically referred to the addition of nutrients, e.g. vitamins and minerals, to processed foods, such as cereal products, to correct for losses occurring during processes such as milling. Now generally expanded to cover fortification in which nutrients that are not necessarily naturally present in the foods are added to increase nutritional value. Also included are agricultural and breeding approaches to manipulate the nutritional values of plant and animal foods.

Food factories effluents  Liquid wastes (waste water) often discharged into a river or the sea from food factories.

Food factories wastes  Solid wastes generated in food factories during food processing operations.

Food flavourings  Flavourings used specifically in foods.

Food frequency questionnaires  One of a variety of dietary study techniques used to gather information on the eating habits of individuals or population groups, particularly the frequency of consumption of certain foods and beverages. Commonly used in nutritional epidemiology to examine the role of diet in health and diseases.

Food guide pyramids  Graphically-represented, food-based guidance tools designed to help people make healthful food choices. They have a characteristic triangular shape, and comprise a number of layers that represent the major food groups. The tip of the pyramid represents foods which should be limited in the diet (such as fats, oils and sweets), while the lower levels represent the foods that should form the basis of a healthy diet (such as cereals, vegetables and fruits).

Food handlers  Personnel involved in the preparation, processing or handling of foods.

Food intolerance  Group of diseases in which there is inability to digest a particular food or food constituent properly, often resulting in malabsorption syndromes. Examples include lactose intolerance, resulting from lack of a gastrointestinal tract brush border enzyme, and coeliac disease, in which an immunological response to wheat gluten results in histopathological changes to the intestinal mucosa. Exclusion of the appropriate food from the diet can result in elimination of the symptoms of the disease, and also, in cases such as coeliac disease, reversal of intestinal pathology.

Food poisoning  Human disease that results from ingesting food contaminated with toxins or pathogens. May range in severity from mild to life-threatening.

Food policy  A broad term used to encompass those programmes, usually governmental, that most directly affect the food chain. Issues encompassed by this term include the role of food in international trade, agricultural pricing policies, food security, food aid, nutrition planning and food control.

Food portions  Individual portions or servings of foods. Portion size is an important component of many weight loss diets.

Food powders  Alternative term for dried foods or powders made for use as foods.

Food preservatives  Preservatives used specifically in foods.

Food reference materials  Reference samples comprising food materials of certified composition (e.g. bovine liver and skim milk powder) that are used as standards in analytical procedures.

Foods  Substances intended to be ingested by humans that are composed primarily of carbohydrates, fats, water and proteins, and also vitamins and minerals. These nutrients are metabolized in the body to produce energy, and sustain life and growth. The study of foods is called food science. Almost all foods are of plant or animal origin, but other sources exist (e.g. edible fungi). Food is obtained through farming, fishing, hunting, foraging and other methods of subsistence. Food is traded and marketed on a global basis.

Food safety  Encompasses activities and policies which are essential for ensuring that food will not cause injury or illness upon consumption.

Food science  The scientific discipline examining all aspects of foods, from harvesting and manufacture through to ingestion by the consumer.

Food security  Access (both physical and economic) by all people at all times to sufficient food for an active, healthy life.
**Foods service**  Catering systems, which supply prepared foods to large groups of consumers. Food is typically prepared and packaged in a central location and then transported and served to the consumer. Examples include school meals, airline meals, fast foods operations and vending machines services.

**Food stabilizers**  Stabilizers used specifically in foods.

**Food Standards Agency**  An independent UK Government department established in 2000 to protect the interests of consumers in relation to foods, and, in particular, to guard against public health risks arising from consumption of foods. Provides advice and information to the public and Government on food safety, nutrition and diet. Aims to ensure that imported foods meet required UK standards.

**Food supplements**  Substances consumed as extra sources of specific nutrients in the diet with a view to improving nutritional status or health. May be added to foods during processing, e.g. calcium or iron fortification of cereal products, as a form of food enrichment. Alternatively, taken separately from foods in the form of tablets, capsules, liquids or oils, depending upon the nature of the dietary constituent. Such preparations may be single or multi-component. Dietary components commonly consumed in this form include vitamins, minerals, proteins, oils (e.g. fish oils and evening primrose oils), phytochemicals and plant extracts, such as those from garlic.

**Food technology**  Application of a diversity of scientific and practical disciplines, including chemistry, biology, physics and engineering, to the development of food products and to their worldwide distribution.

**Food thickeners**  Thickeners used specifically in foods.

**Foot and mouth disease**  Highly infectious viral infection affecting a wide range of animals, including cattle, swine, sheep, goats and buffaloes. Endemic in some parts of the world. Outbreaks in countries previously free of the disease can have serious economic implications due to restrictions on movement of livestock and the widespread slaughter of infected and at-risk susceptible animals. The virus may be present in milk of an infected animal before clinical signs of disease appear and is capable of surviving milk pasteurization. In meat products, the virus is inactivated by cooking.

**Forcemeat**  Stuffings made from a seasoned mixture of finely chopped or minced ingredients, such as meat mince, onions, breadcrumbs and herbs.

**Foreign bodies**  Alternative term for contaminants.

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**Formaldehyde**  Simplest of the aldehydes, has the formula CH₂O and is also known as methanal. Exists as a highly reactive, colourless gas, is soluble in water and alcohol, and can cause toxicity and carcinogenicity. Occurs naturally in most organisms as a by-product of metabolism; increasing postharvest levels in some fish and other sea foods can cause denaturation of proteins, thereby accelerating spoilage. Has been linked to metabolism of aspartame. Used in disinfectants and germicides, and, when in solution, as a preservative for biological specimens. Commercially available as a 37-50% aqueous solution, formalin.

**Formalin**  Solution of formaldehyde in water. Also known as formol.

**Formic acid**  Organic acid which exists as a combustible, colourless, fuming liquid with a penetrating aroma. Soluble in water, alcohol, ether, acetone and benzene. Occurs naturally in pine needles, stinging nettles and certain insects. Used in preservatives, animal feeds, fumigants, insecticides, refrigerants and in vinyl resin plasticizers. Also known as methanoic acid.

**Formol**  Solution of formaldehyde in water. Alternative term for formalin.

**Fortification**  Increasing the nutritional quality of a food by addition of nutrients such as vitamins and minerals.

**Fortified foods**  Foods that have had nutrients such as vitamins and minerals added to them for the purpose of enrichment. Common foods that may undergo fortification include breakfast cereals, flour, sugar and margarines.

**Fortified wines**  Wines to which ethanol has been added, as spirits or neutral alcohol. Important types include sherry and port.

**Fossa cheese**  Italian hard cheese made from raw or pasteurized ewe milk, cow milk or a mixture of both. The name derives from the practice of ageing ripened cheese for up to 3 months in underground pits dug into tuffaceous rock. During this period, anaerobic fermentation takes place, and the cheese develops a unique flavour and aroma. The final product is white to straw in colour, with an irregular shape. After removal from the pit, the cheese can be stored under vacuum for up to a year without loss of its characteristic properties.

**Fouling**  Accumulation of unwanted materials on the surfaces of processing equipment, such as heat exchangers and membranes employed in filtration systems. The fouling layer has a low thermal conductivity, so increasing resistance to heat transfer and reducing the effectiveness of heat ex-
Fractions. In membrane systems, the fouling layer decreases productivity through a decline in permeate flux. Chemical reaction fouling involves deposits that are formed as the result of chemical reactions at the surface. This kind of fouling is a common problem in chemical process industries, oil refineries and dairy plants. Biological fouling is the development and deposition of organic films consisting of microorganisms and their products. Effective fouling control methods involve: prevention of foulant formation; prevention of foulants from adhering to themselves and to surfaces; and removal of deposits from the surfaces.

Fourier transform IR spectroscopy Type of IR spectroscopy that utilizes the Fourier transform mathematical technique, in which samples are irradiated with polychromatic radiation and the entire range of frequencies is recorded at the same time, giving an interferogram. Fourier transformation then sorts the interferogram into its components, which can be represented as a traditional spectrum. Advantages over conventional IR spectroscopy include increased speed and sensitivity. Usually abbreviated to FTIR spectroscopy.

Fowl Any birds kept for production of meat and/or eggs, particularly domesticated birds such as chickens, turkeys and ducks. In most commercial production of fowl, hybrids have largely replaced pure and crossbred fowl. The term may also be used in the names of birds that resemble domestic fowl, e.g. spur-fowl; additionally, it may be used for birds collectively, particularly those which are hunted.

Foxtail millet Cereal plant belonging to the species Setaria italica. This millet is an important food crop in China and other Asian countries.

f.p. Abbreviation for freezing point.

FPC Abbreviation for fish protein concentrates.

Fractionation Separation of the components of a mixture into fractions, using techniques such as gel filtration and electrophoresis. This term also relates to precipitation and phase-separation methods used to determine the molecular weight distribution of polymers; these techniques are based on the tendency of polymers of high molecular weight to be less soluble than those of low molecular weight.

Fracture properties Mechanical properties governing the way in which, and conditions under which, a structure will break down when an external force is applied.

Franchising Authorization granted by a government or company to an individual or group enabling them to carry out specified commercial activities, for example to market a company’s goods or services, in a designated territory. In return for a specified fee and usually a share of the profits, the franchiser provides the product, the name, and sometimes the plant and advertising.

Francisella Genus of Gram negative bacteria of the family Francisellaceae that act as human and animal pathogens. Includes Francisella tularensis, the causative agent of tularemia, a disease that predominantly affects wild rodents, rabbits and hares. This disease is one of the zoonoses, and potential routes for transmission to humans include blood-contact with infected animals or carcasses, or via consumption of infected meat. Other species, namely F. philomiragia and F. piscicida act as fish pathogens.

Frangipans Pastry products or flans made with a pastry similar to choux pastry often filled with force-meat. Also, an almond flavoured cream or paste that is used as toppings or fillings for cakes and pastries.

Frankfurters Mild flavoured, smoked, cooked sausages originally produced in Frankfurt, Germany. Varieties include hot dogs and wiensers. They can be made from beef, chicken meat, pork, turkey meat or veal; typically, they are prepared from a blend of 40% pork and 60% beef. Frankfurter seasonings include coriander, garlic, mustard, nutmeg, salt, sugar and white pepper. They tend to have high contents of fat and salt. Some are retailed in natural sausage casings, but most are prepared in cellulose casings, which are later removed. Most commonly, frankfurters are about 15 cm long, but they are produced in a wide range of sizes. When traditionally made, frankfurters are smoked over hardwood, in order to improve colour and flavour; however, now smoke flavourings are mostly applied as a paint. Despite being precooked, frankfurters taste better after reheating; usually, they are boiled, fried, grilled or steamed immediately before serving.

Frappe Sugar confectionery products made by dissolving egg whites in water, adding sugar syrups, and whipping to form an aerated foam. Used in nougat and fondants.

Free radicals Highly reactive molecular entities, containing one or more unpaired electrons, that are usually short-lived and capable of initiating or mediating a wide variety of chemical reactions. Often formed by the splitting of a molecular bond.

Freeze concentration Concentration of a liquid by freezing out pure ice, leaving a more concentrated solution. This process requires less input of energy and causes less loss of flavour than concentration by evaporation; it is used primarily in the concentration of fruit juices, vinegar and beer. Limitations of freeze concentration are its high cost, the difficulty in separation of ice from solid, and the degree of concentration that can be achieved.
Freeze dried foods  Foods dehydrated by freeze drying. Used to make various types of products, including instant soups, dried herbs, instant coffee granules and meat products. Dried foods obtained in this manner are light, porous, easy to rehydrate and tend to have better shape and colour retention than foods obtained by other drying processes.

Freeze driers  Apparatus for preservation of foods by applying rapid freezing followed by a high vacuum which removes ice by sublimation (freeze drying).

Freeze drying  Preservation of foods by rapid freezing followed by subjection to a high vacuum, which removes ice by sublimation. Adequate control of the processing conditions contributes to satisfactory subsequent rehydration, with substantial retention of nutrients, and colour, flavour and texture characteristics.

Freezers  Refrigerated cabinets or rooms for preserving frozen foods at very low temperatures. Foods are usually frozen to an internal temperature of -18°C in freezers; the food must be maintained at this temperature or slightly lower during transport and storage. Commercial freezers include the following types: blast freezers, where air is circulated at -40°C; contact freezers, in which refrigerants are circulated through hollow shelves; immersion freezers, where, for example, fruit is frozen in a solution of sugar and glycerol; and cryogenic freezers, which use, for example, liquid nitrogen spray.

Freeze-thaw stability  One of the physical properties of a substance relating to its ability to undergo freezing and subsequent thawing without damage to its structure or properties. Important quality for ingredients of frozen foods.

Freezing  Method of preservation in which microorganisms are prevented from multiplying by application of freezing temperatures. Foods are usually frozen to an internal temperature of -18°C in freezers; the food must be maintained at this temperature or slightly lower during transport and storage. During freezing, a proportion of the water in the food changes from liquid to solid to form ice crystals, so lowering its water activity. Because the process does not kill all types of bacteria, those that survive reanimate in thawing food and often grow more rapidly than before freezing. Enzymes in the frozen state remain active, although at a reduced rate. Freezing does, however, cause the water in foods to expand, and tends to disrupt the cell structure by forming ice crystals. With quick-freezing, however, the ice crystals are smaller, producing less cell damage than with slowly frozen products. Freezing has been a key technology in bringing convenience foods to homes and restaurants; it causes minimal changes in quality of food in terms of size, shape, texture, colour, flavour and microbial load.

Freezing point  Temperature at which the liquid and solid forms of a substance exist together in equilibrium. Value varies according to pressure and is affected by purity of the substance. Also known as the melting point. Freezing point measurement can be used to detect the adulteration of milk with water, since the value increases when water has been added.

French beans  Type of common beans (Phaseolus vulgaris). Both the pods and seeds are eaten.

French bread  A European style of white bread with a crisp crust and bread crumb that exhibits both coarseness and chewiness. It is typically shaped into long thin loaves or baguettes and contains no fats, so is susceptible to rapid staling.

French dressing  Popular salad dressing made from vinegar, oils and seasonings. Also known as vinaigrette.

French fries  Potato products made by cutting potatoes into thick or thin strips, soaking in cold water, drying and deep frying in oil. Also called chips (UK), pommes frites (France), fries or French-fried potatoes.

Freons  Series of nonflammable, nonexplosive fluorocarbons (FC) or chlorofluorocarbons (CFC) once widely used as refrigerants. The manufacture and use of freons is now restricted due to the detrimental effects of CFC upon the ozone layer.

Fresh cheese  Low-fat cheese high in moisture and mild in flavour.

Freshness  Extent to which a product is fresh and of good eating quality.

Fresh produce  A generic term for goods, particularly fruits and vegetables, that are produced on farms and are sold without preservation.

Freshwater clams  Any of a number of bivalves inhabiting rivers and lakes.

Freshwater fish  Fish that inhabit inland waters (lakes and rivers). Some fish species, e.g. salmon, occur in both freshwater and marine phases at different stages during their life history.

Friabilimeters  Devices used in assessment of malt quality on the basis of friability, a measure of the breakdown of malt endosperm cell wall components. Malt samples are subjected to an abrasive action for separation of hard and ripe constituents which are then weighed. The presence of hard and glassy components, which will cause problems with brewing, is detected in this way. May be used in quality control of the malting process or to determine malt quality in breweries.
Friabilins  Water-soluble proteins which control wheat kernel hardness and are located on the surface of wheat starch granules.

Fricadelles  Flattened, round meat products prepared from meat mince. They include a high percentage of meat, often beef and pork in equal quantities, and also binders, such as bread, spices and onions. Varieties include boulettes, bratklopse and bratlinge. They are often served in sauces or gravy.

Fricans  One of the rheological properties which describes the resistance that an object or surface encounters when it moves in contact with another.

Fried foods  Foods fried in fats or oils, e.g. French fries, fritters and doughnuts. Often coated in batters or breadings prior to frying.

Frigate mackerel  Name applied to two species of marine fish (Auxis rochei rochei, also called bullet tuna, and A. thazard thazard, also called frigate tuna). Both species are popular game fish of high commercial importance and belong to the family Scombridae (mackerels, tunas, bonitos). Widely distributed in the Atlantic, Pacific and Indian oceans, where they are highly migratory. Marketed fresh, frozen, dried-salted, smoked and canned.

Fritters  Pieces of food (e.g. fruits, meat, fish) that have been dipped in batters and deep fried.

Frogs  Insectivorous amphibians of the family Ranidae with a short tailless body, smooth moist skin and long hind legs designed for hopping. The species normally consumed is Rana esculenta, a large type of frog, but sometimes other species are used as food. Usually, only the hind legs are eaten. Frogs legs are particularly popular in France, but are also eaten in many other parts of the world.

Frogs legs  Tender, white meat from the hind legs of frogs. The meat has a very low fat content and a delicate sweet flavour; it is particularly popular in France. Ideally, frogs legs are cooked briefly with very little seasoning.

Fromage frais  French soft cheese of variable fat content, traditionally made from a mixture of ewe and goat milks and eaten soon after production. Moist, creamy and white, the cheese is unripened and made from milk coagulated by lactic fermentation; lactic acid bacteria are active in the cheese when sold.

Frostings  Alternative term for icings, used particularly in the USA and Canada. Used more specifically in the UK to refer to soft icings made with sugar and egg whites.

Frothing  Process of forming a mass of small, light bubbles in a liquid by agitation or fermentation.

Frozen beverages  Beverages, generally soft drinks or fruit beverages, which have been frozen. May be served and consumed in a soft-frozen (slush) state.

Frozen confectionery  Confectionery products such as ice cream bars that are served frozen.

Frozen desserts  Desserts preserved by freezing and requiring frozen storage. These are often premium quality products, such as ice cream products, gateaux and cheesecakes. Some require cooking before consumption, but others can be eaten immediately after thawing or while still frozen. Unlike many other frozen foods, texture is not usually compromised by freezing.

Frozen dough  Dough prepared at a lower temperature than conventional dough (in order to minimize fermentation activity of yeasts), followed by immediate freezing to extend its shelf life. Used for production of bakery products in in-store bakeries.

Frozen foods  Foods preserved by freezing and requiring frozen storage. Usually of higher quality than canned foods or dried foods, with any losses in quality being due to texture deterioration. A wide variety of foods can be frozen, either cooked (ready meals and some desserts) or uncooked (vegetables, fish fillets and poultry meat). Some products are thawed before use, while others can be cooked/reheated directly from the freezer.

Frozen meals  Frozen foods in the form of complete dishes. Usually reheated directly from frozen form prior to consumption. Common types include pizzas, ready meals, entrees, vegetarian foods and savoury pies.

Frozen pet foods  Pet foods stored by freezing, for dogs, cats, ferrets, reptiles, some pet birds and pet fish. Include frozen whole animals (e.g. mice, rats, hamsters and day-old chicks) for reptiles, and raw meat products containing bones, meat mince, offal and meat pieces (e.g chicken wings, necks, meat chunks). Tend to be more natural than dried pet foods. Organic versions exist.

Frozen storage  Storage of foods at freezing temperatures (below 0°C).

Frozen yoghurt  Fermented low-fat dairy desserts served in a similar manner to ice cream.

Fructans  Group of oligosaccharides and polysaccharides which consist of fructose residues attached to a single glucose molecule. Depending on the source, chain lengths can range from 3 to 50 residues. In cereals, shorter fructans predominate, while Jerusalem artichokes contain high levels of inulin, a fructan of about 35 residues. Onions, garlic and asparagus are other dietary sources of fructans. In the stomach and small intestine, hydrolysis of fructans is negligible; any trisaccharides which are ab-
Fructose EC 4.1.2.13. Fructooligosaccharides Oligosaccharides include kestose, inulin and nystose. Also found naturally in fruits and vegetables, contained in ripe fruits, vegetables, fruits, berries and rice. They are present in about 5% of the dry matter of potatoes and vegetables. They are produced by fermentation of fructose in the presence of certain bacteria. They are used in the production of prebiotic foods and beverages, often to provide sweetness in fruits during ripening.

Fructokinases EC 2.7.1.4. Kinases which phosphorylate D-fructose in the presence of ATP to form D-fructose 6-phosphate and ADP. Involved in the metabolism of carbohydrates, particularly fructose, in many food plants, including tomatoes, rice, potatoes and sugar beets. Can influence sweetness in fruits during ripening.

Fructooligosaccharides Oligosaccharides composed of fructose monomers used as functional ingredients in prebiotic foods. Fructooligosaccharides are found particularly in Allium spp. Individual fructooligosaccharides include kestose and nystose.

Fructose Monosaccharide ketose sugar comprising six carbon atoms. Constituent of sucrose which occurs naturally in fruits and honeys. Commercially produced from glucose by isomerization, a reaction catalysed by glucose isomerases. May be crystallized from fructose syrups by addition of an organic solvent, such as ethanol. Fructose is the sweetest natural saccharide and is approximately 1,5 times as sweet as sucrose. It is also known as laevulose and fruit sugar.

Fructose-bisphosphate aldolases EC 4.1.2.13. Lyases that catalyse the conversion of D-fructose 1,6-bisphosphate to glyceraldehyde 3-phosphate and D-glyceraldehyde 3-phosphate. Involved in the ripening of strawberries and the development of corn. Also known as aldolases.

Fructose high corn syrups Syrups containing between 40 and 90% fructose that are produced from glucose syrups which have been manufactured by hydrolysis of corn starch using α-amylases and glucan 1,4-α-glucosidases. The resulting glucose syrups are enzymically converted, using glucose isomerases, to syrups containing both glucose and fructose. Higher purity fructose syrups are produced using gel filtration chromatography to separate fructose from glucose and other sugars present. Applications for these syrups include soft drinks, marmalades, jams, canned fruits, fruit juices, dairy products and bakery products.

Fructose syrups Aqueous solutions, containing predominantly fructose, which are used as sweeteners.

Fructosyltransferases Group of glycosyltransferases (all within EC 2.4.1) which catalyse the transfer of fructosyl groups to various substrates, commonly sucrose. Include inulosucrases, levansucrases and sucrose:fructosyltransferases. Present in many microorganisms and plants and are used commercially in the synthesis of fructooligosaccharides.

Fruit beverages Beverages derived from fruit juices, fruit extracts or fruit homogenates.

Fruit brandies Spirits manufactured by distillation of fermented fruit musts.

Fruit bread Bread made by adding up to 50% (flour basis) raisins to the dough mixture. May also contain other dried fruits such as currants, dates or bananas.

Fruit compotes Desserts made from fruits stewed in sugar or cooked in syrups. Eaten hot or cold.

Fruit concentrates Products made by concentration of fruit pulps using techniques such as ultrafiltration and evaporation. Used in a variety of foods and beverages, often to provide flavour.

Fruit cordials Term referring to fruit juice beverages, often presented as concentrates for dilution, or to sweet fruit-based liqueurs.

Fruit desserts Desserts based on fruits. Include fruit salads, fruit cocktails, fruit compotes, mousses, flans and sorbets.

Fruit extracts Preparations obtained from fruits by a variety of means that can be used as flavourings in foods and beverages.

Fruit flies Common name for species of insects of the family Tephritidae, especially those of the genus Drosophila. Serious plant pests whose larvae feed on fruit or decaying vegetable matter.

Fruit gums Sugar confectionery products made with sucrose, glucose, fruit flavourings and gum arabic either alone (to produce hard gums) or mixed with gelatin (to produce soft gums).

Fruitiness Extent to which a product has the aroma or flavour of fruits.

Fruit jellies Semi-solid foods with an elastic consistency, made either by setting of fruit juices containing pectins or gelatin, or by addition of gelatin to fruit juices.
Fruit juice beverages  Beverages containing fruit juices, together with other ingredients such as water, sugar or flavourings.

Fruit juice concentrates  Fruit juices which have been concentrated by evaporation, membrane processes or freezing. May be diluted to make reconstituted juices, or used as ingredients in a wide range of foods and beverages.

Fruit juices  Juices extracted from fruits consumed as drinks or used as ingredients in a wide range of foods and beverages.

Fruit leathers  Fruit products made from fruit purées, sometimes sweetened with sugar or honeys, that are spread in a thin layer and dried. The dried sheets may be cut into strips or rolled into cylinders.

Fruit liqueurs  Liqueurs made from or flavoured with fruits.

Fruit nectars  Beverages manufactured from fruit juices by addition of water and/or sugar, optionally with addition of other ingredients.

Fruit pastes  Pastes prepared using fruits as the base ingredient. These fruit products may be eaten alone or used in various food or beverage product formulations, such as yoghurt, bakery products and confectionery products.

Fruit peel  Rind or skin of fruits. May be removed before consumption of the fruits or eaten at the same time. Rich in fibre. Some types are removed and used in garnishes or as ingredients of various dishes. Peel most commonly used in cooking is that from citrus fruits.

Fruit pies  Dishes, usually served as desserts, having one or more crusts and fruit-based fillings. Crusts, generally made from pastry, can be on the bottom or top of the dish only, or on both the bottom and top. The fruit fillings can be prepared from a single fruit or a combination of several fruits.

Fruit preserves  Prepared by cooking pieces of fruits with sugar and sometimes pectins. Similar to jams, except that the fruit pieces tend to be larger in preserves.

Fruit products  Products such as compotes, fruit pies and fruit extracts that are made from fruits or contain fruits as a major constituent.

Fruit pulps  The soft, succulent part of fruits or a preparation made from them by mashing and concentration. Used in the manufacture of a range of foods and beverages, including syrups, milkshakes, fruit juice beverages and ice cream.

Fruit purees  Fruit flesh that is mashed to a smooth, thick consistency by various means, such as forcing through sieves or blending in food processors. Used as garnishes and side dishes or as the base of many types of product, including beverages, parfaits, ice cream, mousses and soufflés.

Fruits  Seed-bearing parts of plants, formed from the ovary after flowering. May be dry or fleshy. The term is commonly restricted to fleshy fruits, which are of economic importance to humans. When other parts of the flower contribute to the structure, they are called false fruits.

Fruit salads  Desserts comprising a mixture of fruits cut into pieces and covered with syrups or fruit juices. Eaten fresh or available canned.

Fruit syrups  Syrups produced by concentration of fruit juices. Used as flavourings and sweeteners.

Fruit teas  Tea-type infusion beverages made by hot water extraction of soluble constituents from materials derived from dried fruits.

Fruit wines  Wine-like alcoholic beverages made by fermentation of fruit musts or mashes.

Fruit yoghurt  Yoghurt containing pieces of fruit, fruit pulps or fruit purees, either as a separate layer or stirred in to give a homogeneous product.

Frying  Cooking of foods in hot fats or oils over a moderate to high heat. In deep frying, the foods to be cooked are immersed in the fats or oils.

Frying fats  Fats which are usually solid at room temperature and used as a medium in which to cook foods by frying. Heating of the fat results in it acting as a thermal transfer agent, with some of it remaining in the fried foods. Repeated use of the fat for frying may result in its degradation by means of autoxidation, cyclization or polymerization.

Frying oils  Oils which are usually liquid at room temperature and used as a medium in which to cook foods by frying. Heating of the oil results in it acting as a thermal transfer agent, with some of it remaining in the fried foods. During frying, the heated oil may undergo several degradative changes.

Frying properties  Ability of foods to maintain or develop acceptable properties upon application of frying procedures.

FTIR spectroscopy  Abbreviation for Fourier transform IR spectroscopy.

F2 toxin  Mycotoxin produced by Fusarium graminearum, F. culmorum and other Fusarium spp. May be formed when the fungus grows on damp cereal grain (e.g. wheat, barley and corn) used as animal feeds. Has oestrogenic activity and can cause hyperoestrogenism in swine, cattle and poultry. Also known as zearalenone.

Fucoidans  Sulfated fucose-containing polysaccharides produced by brown seaweeds. Exhibit health benefits, including anticarcinogenicity and...
**Fucose**

One of the **reducing sugars** found in plant foods and animal foods. Both D- and L- forms occur naturally. Synonym 6-deoxygalactose.

**Fucosylation** A form of **glycosylation** involving **fucose** residues. Final stage in the **in vivo** synthesis of several biologically important side chains of **glycoproteins** and **glycolipids**. Catalysed by fucosyl-transferases. Levels of fucosylated glycoproteins in the **gastrointestinal tract** increase considerably during **weaning**; their formation is thought to be influenced by components present in **weaning foods**.

**Fucoxanthin** One of the xanthophyll **carotenoids** present as accessory **pigments** in edible brown **algae**, giving them a brown or olive-green colour. Also found in other edible **seaweeds**. **Anticarcinogenicity** has been demonstrated.

**Fucus** Genus of **seaweeds** found in lower intertidal zones along rocky shores. Some species, e.g. *Fucus vesiculosus* and *F. spiralis*, are utilized for foods and animal feeds, usually in dried form. **Alginates** are often extracted chemically from dried *Fucus* spp. for use as **bulking agents**, **gelling agents** or **stabilizers** in foods such as **cheese** and **ice cream**.

**Fudges** Toffee-like **sugar confectionery** products made with **sugar**, **butter** and **milk**, and formed either by rapid agitation or addition of a small quantity of **fondants**, causing sugar crystallization.

**Fufu** Unfermented or fermented product usually made from **cassava**, but also from other tubers and corms, such as **taro**, **yams** or **cocoyams**. The unfermented form is prepared by boiling or steaming and pounding the vegetables, either individually or in combination. Fermented fufu is prepared from roots which have been soaked for 3-4 days before being formed into pastes. In some areas, fufu is sold as a convenience food. Usually served as an accompaniment to dishes with sauce, such as stews.

**Fumarases** Alternative term for **fumarate hydratases**.

**Fumarate hydratases** EC 4.2.1.2. **TCA cycle enzymes** which catalyse the reversible conversion of **fumaric acid** to **L-malic acid**. Since **organic acids** are essential **flavour compounds** in **alcoholic beverages** and **fermented foods**, modification of fumarate hydratase levels in **yeasts** and **bacteria** can potentially be used for development of fermented foods and beverages with distinctive **flavour**.

**Fumaric acid** *Trans* isomer of **maleic acid**, used in **acidulants** and **flavourings** in the food industry. Its lack of solubility and nonhygroscopic nature make it particularly suitable for powdered food and beverage mixes. Can improve **dough** **machineability** and **functional properties** of **tortillas**. Also ubiquitous in nature, as one of the **organic acids** synthesized during the **TCA cycle**. Commonly determined as a component of **fruits** and **mushrooms**.

**Fumigants** Gaseous **pesticides** used for fumigation.

**Fumigation** Use of gaseous **pesticides** to rid an area of **insect pests**.

**Fumonisins** One of the **mycotoxins**. Produced by *Fusarium moniliforme* (syn. *F. verticilloides*), a fungus prevalent on **corn** and other **cereals**. Weather conditions that favour *Fusarium* kernel rot cause significant accumulation of fumonisin B1. The mycotoxin is stable to several **processing** techniques. Hepatotoxic and nephrotoxic in animals. An inhibitor of ceramide synthase. Consumption of infected corn can lead to outbreaks of poisoning in humans. Although acute **toxicity** in humans is believed to be low, some reports indicate an association between exposure and development of **cancer**.

**Fumonisin B1** Analogue of fumonisin B1 with a similar toxicological profile, though it is not as toxic.

**Fumonisin B2** Analogue of fumonisin B1 with a similar toxicological profile, though it is not as toxic as fumonisin B1 or fumonisin B2.

**Fumonisins** Mycotoxins produced by *Fusarium* spp. (e.g. *F. moniliforme* and *F. proliferatum*) growing on **corn** and other **cereals**.

**Functional beverages** Beverages that contain biologically active components, such as **phytochemicals** and **bioactive peptides**, at levels that induce beneficial **physiological effects** and may improve health.

**Functional foods** Term originally introduced in Japan to mean foods with a physiological function or activity. Used for products containing biologically active components (such as **nutrients**, **bioactive peptides** or **phytochemicals**) at levels that may confer specific health benefits. Examples include bifidus **yoghurt**, **eggs** incorporating **ω-3 fatty acids** and **brine-enriched breakfast cereals**. Also known as **nutraceutical foods**. Similar terms include **designer foods**, **medical foods** and **probiotic foods**.

**Functional properties** Characteristics of a substance that affect its behaviour and that of products to which it is added. Influence potential applications of a substance in the food industry, as a particular functional property may be especially useful for the manufacture and stability of specific types of foods. Include a wide range of characteristics, such as **buffering capacity**, **emulsification properties**, **foaming properties**, **preservation properties**, **texture** and **flavour**.
Fungal decay

- **gelling capacity**, water binding capacity and whipping properties.

**Fungal decay** Decay caused by the action of fungi.

**Fungal proteins** Fungal mycelia which are used as foods or food ingredients, e.g. Quorn (produced by the continuous fermentation of Fusarium graminearum). Also know as mycoprotein.

**Fungal spores** Spores produced by fungi, e.g. ascospores, basidiospores, chlamydospores, sporangiospores and zygospores.

**Fungi** Eukaryotic microorganisms of the kingdom Fungi, that possess cell walls and lack chlorophyll. Some species are pathogens of humans, animals and plants. Certain fungi are used commercially (e.g. in the production of enzymes and fermented foods). Species such as Penicillium and Aspergillus are important agents of food spoilage, while other species (e.g. Penicillium camemberti and P. roqueforti) are desirable and essential in the ripening of certain types of cheese.

**Fungicides** Chemical substances with antifungal activity. Used to kill or inhibit the growth of fungi that cause diseases of plants and animals. Most are applied as sprays or dusts and either have a systemic or protectant effect. Residues in foods and the environment can represent a health hazard. Also known as antimycotics.

**Fural** Alternative term for furfural.

**Furaldehyde** Alternative term for furfural.

**Furaneol** Synonym for 2,5-dimethyl-4-hydroxy-3(2H)-furanone. One of the main flavour compounds in strawberries, and also present in pineapples and roasted foods such as coffee. May be used in food flavourings.

**Furanones** Important flavour compounds of strawberries, pineapples and various other fruits; also present in roasted foods such as roasted coffee, roasted almonds and popcorn. Include 2,5-dimethyl-4-hydroxy-3(2H)-furanone (furaneol).

**Furans** Any of a group of unsaturated heterocyclic compounds that occur as colourless, volatile liquids and are composed of a ring of four carbon atoms and one oxygen atom. May also refer to the simplest of these compounds, C₄H₄O, which is used as an organic intermediate.

**Furazolidone** Synthetic antibiotic once widely used for the treatment of Salmonella infections in cattle, swine, sheep, poultry and farmed fish, and added to feeds as a growth promoter. Now banned for use in animals reared for food purposes in many countries due to the potential for residues exhibiting carcinogenicity to occur in foods derived from them.

**Furcellaran Gums** produced from the red alga Furcellaria lumbricalis, also known as Danish agar. Used as thickeners and gelling agents. Some similarities to carrageenans.

**Furcellaria** Genus of seaweeds widely distributed along rocky shores at lower intertidal zones. Some species, e.g. Furcellaria lumbricalis, are utilized as a source of furcellaran in the food industry.

**Furfural** Viscous, colourless volatile liquid aldehyde, which has a distinct aroma and is unstable in air, exposure to which results in polymerization to a reddish brown colour. Composed of a furan ring and aldehyde side chain, it is derived from the thermal breakdown of pentoses from cornstalks, corn cobs and bran distillation. Often used as a solvent. Alternative terms include fural and furaldehyde.

**Furocoumarins** Organic compounds containing coumarin and a furan ring. Also known as furanocoumarins. Produced in plants as chemical defence agents. Levels in some plant foods notably parsley, celery, parsley, citrus fruits and grapefruit juices, can cause concern due to toxicity problems. May cause dermatitis and can affect the bioavailability of some drugs.

**Furosine** Amino sugar generated during acid hydrolysis of fructosyl-lysine. May be a useful indicator of the extent of damage that occurs during the early stages of the Maillard reaction.

**Furfural** Mutagenic nitrofuran compound (2-(2-furyl)-3-(5-nitro-2-furyl)acrylamide). Historically widely used as a food additive in Japan, but was withdrawn after carcinogenicity testing led to concerns over its safety. Also known as AF-2.

**Fusaproliferin** Mycotoxin produced by Fusarium spp., especially F. subglutinans and F. proliferatum. May be produced, often in association with fumonisin B₁ and beauvericin, in Fusarium-infected cereals.

** Fusarenon X** Trichotheccene produced by Fusarium spp. during growth on foods.

**Fusaric acid** Mycotoxin produced by Fusarium spp. during growth on foods. Strongly mutagenic and possibly carcinogenic in humans.

**Fusarium** Genus of fungi which occur in soil and decaying organic matter. Some species may cause plant diseases, and the spoilage of stored fruits and vegetables. May also cause diseases in humans and animals through the production of mycotoxins on foods and feeds.

**Fusel oils** Colourless viscous liquids with an unpleasant aroma and flavour. Composed of a mixture of amyl alcohol with higher alcohols and traces of other components. Present in distilled spirits as by-products.
of **alcoholic fermentation**. More toxic than ethanol.

**Fusidium** Obsolete name for a genus of **fungi** whose species have been reclassified into other genera, including *Cylindrocarpon*.

**Fusion proteins** Proteins containing **amino acids** sequences from two distinct **proteins**, formed by expression of a recombinant gene in which two coding sequences have been joined together in-frame. Fusion of proteins with affinity tags can be used to facilitate purification, while fusion with signal peptides can be used to facilitate secretion of proteins from cells.

**Fuzzy control** Control processes based on the theory of fuzzy logic, an artificial intelligence concept used in **expert systems** for estimating the degree of certainty of conclusions.

**Fuzzy logic process control** A form of logic used in **process control** in which statements can be given fractional values rather than simply true or false.

**Fynbo cheese** Danish semi-hard **cheese** made from pasteurized **cow milk**.
Galactanases Common term for arabinogalactan endo-1,4-β-galactosidases (EC 3.2.1.89), enzymes that catalyse the endohydrolysis of 1,4-D-galactosidic linkages in arabinogalactans. Can be used for production of galactooligosaccharides by virtue of their transglycosylation activity.

Galactans Galactose polymers found in agar, carrageenans, pectins and hemicelluloses. Complete hydrolysis of galactans results in the production of galactose only, whilst incomplete hydrolysis generates galactooligosaccharides.

Galactitol Polyl comprising six carbon atoms, produced by isomerization of sorbitol. Has approximately 10% the sweetness of sucrose. Also known as dulcitol due to its presence in dulcite (Madagascan manna, *Melampyrum nemorosum*).

Galactolipids Glycolipids which contain galactose residues and/or N-acetylgalactosamine. Found in nervous tissue and plant membrane lipids. Include certain cerebrosides.

Galactomannans Polymers of D-galactose and D-mannose found in bacteria, yeasts and legumes, possibly as storage polysaccharides.

Galactooligosaccharides Oligosaccharides that consist mainly of galactose residues. Produced by action of β-galactosidases on lactose. Present naturally in human milk and thought to be the main carbon source for *Bifidobacterium* in the neonatal gastrointestinal tract. Added as prebiotics to infant formulas and probiotic foods, e.g. fermented milk and yoghurt. Have approximately 0.2 times the sweetness of sucrose and are useful in food processing as they have greater thermal stability and acid resistance than sucrose. For this reason, they have been included in jams and bread.

Galactosamine Derivative of galactose in which the hydroxyl group of the carbon-2 atom is replaced by an amino group. Found in glycolipids, mucopolysaccharides and chondroitin sulfate.

Galactose Monosaccharide with six carbon atoms which occurs naturally as a component of many complex plant-derived polysaccharides, such as pectins and gums. Constituent of lactose, from which it may be produced by hydrolysis. Has approximately 40% the sweetness of sucrose and is used in sweeteners.

Galactosidases Glycosidases in EC 3.2.1 comprising α-galactosidases, β-galactosidases and galactanases.

α-Galactosidases EC 3.2.1.22. Glycosidases which hydrolyse terminal, non-reducing α-D-galactose residues in α-D-galactosides, including galactose oligosaccharides, galactomannans and galactolipids. Can also hydrolyse α-D-fucosides. Useful for hydrolysis of raffinose oligosaccharides which are flatulence factors in legumes and their processed products, including soymilk. Also known as melibioses.

β-Galactosidases EC 3.2.1.23. Glycosidases which hydrolyse terminal non-reducing β-D-galactose residues in β-D-galactosides. Also catalyse transglycosylation reactions yielding galactooligosaccharides. Used for production of low lactose foods, where they hydrolyse lactose to glucose and galactose. These modified foods, mainly dairy products, are suitable for individuals who suffer from lactose intolerance. Lactose hydrolysates are readily soluble and can be used as syrups for the manufacture of baked goods and other foods. These enzymes are also useful for utilization of whey-containing wastes. Also known as lactases.

Galactosides Glycosides formed from mixing galactose with an alcohol; on hydrolysis, galactose is produced.

Galacturonic acid Member of the uronic acids derived from D-galactose by oxidation of the alcohol group of the carbon-6 atom to form a carboxyl group. Found in pectins, plant gums and bacterial cell walls.

Galangal Rhizomes from the zingiberaceous plant, *Alpinia galanga* or *A. officinarum* (lesser galangal). Similar to ginger, and used as a spice in South East Asia and some other regions in flavourings for products such as curries, vinegar and wines. Also reported to have medicinal properties.

Galgals Type of lemons produced by *Citrus pseudolimon*, which are indigenous to and cultivated on a commercial scale in India. Used in manufacture of
Gallic acid

Also known as 3,4,5-trihydroxybenzoic acid. This organic acid has antioxidant activity, and is commonly used as a standard when measuring levels of phenols in foods and beverages. Occurs naturally as a component of tannins, e.g. in tea. Gallic acid esters, such as octyl gallate and propyl gallate, are used as antioxidants in the food industry.

Gallocatechin gallate

One of the catechols formed by epimerization of epigallocatechin gallate, during heating, pasteurization or autoclaving of green tea or black tea. Found in relatively high amounts in bottled or canned tea beverages. Demonstrates hypcholesterolaemic activity.

Gallstones

Solid masses or stones that occur in the gallbladder or bile ducts. They form when components of the bile precipitate out of solution and form crystals. The most common type is composed mainly of cholesterol. Diet is believed to have a role in gallstone formation.

Game

The collective name for birds and animals which normally live in the wild and are hunted for sport or game meat. In many countries, game may only be killed by people possessing a Game Licence and a licence is also needed to sell game. Legislation may also specify close seasons when game must not be shot or open seasons when particular types of game may be shot. Game is regarded as a valuable asset on many farms. If wild game is managed carefully, it is possible to produce a regular crop of game birds and animals which can be culled to provide game meat. A high level of consumer demand for game meat has led to farming, including ranch-raising, of wild game; for example, red deer have been farmed successfully in Scotland, elands in Zimbabwe and reindeer in the north of Scandinavia. The majority of commercially available game meat is from farmed game.

Game birds

Heavy-bodied, ground-nesting birds which are farmed or hunted for their meat. They belong to the order Galliformes and include grouse, guinea fowl, partridges, pheasants and quails.

Game meat

The meat of wild or farmed game (game birds or game animals). Game meat has a characteristic flavour and dark red colour. The flavour and aroma of game meat may be very strong; to decrease these characteristics, game meat is often marinated before cooking. Game meat tends to have a low fat content, which is attractive to consumers, but can make it difficult to cook. Meat from game animals, such as wild boars and bears, may be infested with Trichinella spiralis larvae; such meat must be cooked thoroughly to avoid the risk of trichinosis.

Gamma irradiation

Exposure of foods to gamma rays, generated by radioactive decay of cobalt-60 (60Co) or caesium-137 (137Cs). Used for sterilization or preservation purposes. Irradiation delays ripening of fruits and vegetables, inhibits sprouting in bulbs and tubers, causes disinfestation of grain, cereal products, fresh and dried fruits and vegetables, and destroys bacteria in fresh meat. Despite initial concerns among consumers over the safety of irradiation and irradiated foods, over 40 countries have approved the process for food use.

Gamma rays

Penetrating electromagnetic radiation of shorter wavelength than X-rays. For food irradiation, sources used for generation of gamma rays include cobalt-60 (60Co) and caesium-137 (137Cs).

Gammon

The thigh and adjacent parts, including the hind leg, of a side of bacon, usually cured while still part of the swine carcass. Preparation involves brining of the meat as if it were to become bacon and then draining for about one week. Some gammon is cold-smoked before being sold, whilst other gammon is unsmoked and is also known as pickled pork. Gammon is usually sold uncooked, but cut into small portions or sliced as gammon steaks. It is commonly cooked by baking or pan frying, or is cooked in a casserole with vegetables or pulses.

Ganoderma

Edible fungi used in health foods and medicines, especially in China and Japan. Most common example is Ganoderma lucidum.

Garbanzo beans

Alternative name for chick peas.

Gardenia

Genus of flowering plants. Fruits of Gardenia jasminoides are used as a source of food colorants. The colorants are primarily composed of yellow carotenoids, crocin and its congeners, and iridoid glycosides such as geniposide.

Garlic

Pungent, edible bulbs of Allium sativum. One of the world's most widely used spices, used to flavour many different dishes. Each bulb comprises a number of cloves, which release a characteristic aroma when peeled and crushed. This aroma is due to the presence of allicin, which is believed to play a key role in the beneficial health effects reported for garlic. As well as

Pickles and as a source of fruit juices, peel, pectins and essential oils.

Gallic acid
being used fresh, much of the crop is further processed to yield garlic powder, garlic salt or garlic oils.

**Garlic oils** Highly pungent essential oils obtained from garlic. Used in spice mixes and other flavourings. Major constituent is allyl sulfide.

**Garnishes** Decorative and edible accompaniments to sweet or savoury dishes, usually added just before serving. May be placed on the plate beside the dish or applied to the surface of the food. Vary greatly in size and content, including sprigs of parsley or other herbs, salad vegetables, croutons, slices of fruit, whole fruits and chocolate shapes. Garnishes often indicate the main ingredient or flavour of a dish.

**Gas chromatography** Chromatography technique, usually abbreviated to GC, in which the sample is vaporized and injected into a carrier gas (mobile phase) that moves through a column, the inner surface of which is coated with a stationary phase. Sample components are separated on the basis of their affinity for the stationary phase, and identified by the time they are retained by the stationary phase. A range of detection techniques can be used in combination with gas chromatography, including mass spectroscopy (GC-MS).

**Gases** Substances which have no fixed shape, low density and viscosity and no fixed volume, but which will adopt the volume of the space available, irrespective of the amount present. Composed of widely separated molecules which may be easily compressed and has the ability to diffuse readily. Distinct from the solid and liquid states.

**Gas liquid chromatography** Chromatography technique in which the mobile phase is a gas and the stationary phase is a liquid adsorbed on a porous solid in a tube or on the inner surface of a capillary column. Usually abbreviated to GLC. Components of the sample are partitioned between the gas and liquid phases, the rate at which they are eluted from the column depending on their partition coefficients. They are identified by the time taken to reach the detector for the system.

**Gassericins** Bacteriocins produced by Lactobacillus gasseri.

**Gastric cancer** A form of cancer involving the uncontrolled growth of abnormal cells in the stomach. Several lifestyle factors have been associated with increased gastric cancer risk, including high intakes of salt and smoked foods, low intakes of fruits and vegetables, cigarette smoking and overweight and obesity. Infection with Helicobacter pylori is also a major risk factor for gastric cancer development.

**Gastritis** Inflammation of the stomach. Causes can include consumption of corrosives and irritants (such as alcoholic beverages) and infection with Helicobacter pylori.

**Gastroenteritis** Inflammation of the mucous membranes of the stomach and intestines. Major causes include a range of pathogens that may be ingested via contaminated foods and water supplies. These include species of Salmonella, Shigella, Campylobacter and Vibrio, and Escherichia coli, rotaviruses and small round structured viruses.

**Gastrointestinal tract** The organ commencing at the mouth and finishing at the anus, including the stomach and intestines, into which foods are taken and digested, and from which nutrients and non-nutrients are absorbed into the body, and waste is excreted.

**Gastropods** Common name for molluscs within the class Gastropoda; characterized by a single muscular foot. Includes snails (aquatic and marine), limpets and sea slugs.

**Gateaux** French word for cakes. Can refer to plain or fancy cakes, e.g. made from layers of sponge cakes filled and topped with fruits, jelly or cream.

**GATT** Abbreviation for General Agreement on Trade and Tariffs.

**Gauges** Instruments that measure and give a visual display of amounts, levels or contents.

**Gayal meat** Meat from gayals, which are a type of semi-domesticated oxen.

**Gayals** Large, semi-domesticated oxen found in India. Semi-domesticated form of the gaur (Bos gaurus) that is sometimes classified as Bos frontalis. Raised for their meat and milk. Bulls are crossed with English cattle breeds to produce good quality beef cattle.

**Gazelle meat** Meat from gazelles, which include several species of small, slender antelope, many of which belong to the genera Gazella of the family Bovidae. The meat is usually obtained from wild game animals and is appreciated for its tenderness.

**Gazelles** Any of several species of small, slender antelopes, many of which belong to the genus Gazella of the family Bovidae. Found wild in Africa, the Middle East and Asia. Source of gazelle meat.

**Gbure** Common name for Talinum triangulare, a leafy vegetable consumed in West and Central Africa. High in fibre and rich in essential amino acids.

**GC** Abbreviation for gas chromatography.

**GC-MS** Abbreviation for gas chromatography combined with mass spectroscopy.

**Geese** The common name for any of numerous domesticated or wild waterfowl belonging to the family Anatidae, in which they comprise several genera (e.g. Anser and Branta). Most domesticated geese are kept in small flocks under free-range conditions for production of goose eggs and goose meat. A male goose...
is called a gander, whilst the female is a goose and the sexually immature young (with down rather than feathers) is a gosling.

**Gelatin** Soluble protein extracted from animal collagen, bones or connective tissues using hot water and acid or alkaline treatment. Widely used in the food industry in gelling agents, e.g. in aspic, jellies, ice cream, yoghurt and canned meat, and can also act as emulsifiers or stabilizers, e.g. in marshmallows and confectionery fillings. Lacks the essential amino acid tryptophan, but is a source of several other amino acids. Alternatively spelled gelatine.

**Gelatinization** Process involving disruption of molecular order within starch granules as a result of heating in water. Occurs over a temperature range and is also affected by granule size. Alterations caused include irreversible swelling, loss of birefringence, leaching of amylose and reduced crystallinity. Prolonged heating of the starch granules will eventually lead to total disruption.

**Gelation** Process of gels formation by coagulation of sols or aggregation of particles. Formed in a variety of ways according to the type of material concerned. In the case of polymer molecules, gelation is caused by formation of intermolecular crosslinks during heating or cooling. Aggregation of particles may be induced by a variety of stimuli including changes in pH or ionic strength. Also called gelling.

**Gel electrophoresis** Electrophoresis technique in which separation is performed in a gel, usually comprising agarose or polyacrylamide.

**Gel filtration** Size exclusion chromatography technique in which separation is based on the hydrodynamic volume of molecules. Samples are applied to a column of gel, e.g. polyacrylamides, cross-linked dextrans or large polysaccharides, and components are separated on the basis of their ability to penetrate the pores of the gel beads while being washed through with an organic mobile phase. May be used to analyse the molecular weight distribution and polydispersity index of organic-soluble polymers.

**Gels** Solid or semi-solid jelly-like colloids, such as those formed when gelatin is mixed with hot water and allowed to cool. Products such as pectins and agar are well known for their gel-forming ability. Gels, including agar gels, are widely used as food stabilizers and thickeners.

**Gene cloning** Insertion of DNA sequences containing genes into vectors (e.g. plasmids or viruses) that can then be propagated in a host organism, thus producing multiple copies of the gene of interest.

**Gene disruption** Use of both in vitro and in vivo recombination to replace wild type genes or DNA sequences with a mutant version.

**Gene expression** The process by which proteins are produced from their coding genes by means of transcription followed by translation.

**Gene libraries** Collections of cloned DNA fragments in which the inserted sequences together represent entire genomes of organisms (genomic libraries). Alternatively, the cloned DNA may be composed of cDNA molecules formed from an mRNA template (cDNA libraries), thus representing only the expressed portions of genomes.

**Gene-nutrient interactions** Relationships between nutritional status and genotype and their impact on human physiology and health, e.g. certain nutrients may affect carcinogenesis but only in individuals with a genetic predisposition to cancer or a certain genetic polymorphism may impact on car-
cinogenesis, but only in individuals having a particular nutritional status. Also describes the molecular effects of nutrients on DNA and gene expression.

Gene probes Molecules that have been labelled with radioactive isotopes, fluorescent dyes or enzymes that bind selectively to specific genes, thus allowing identification or isolation. Also know as oligonucleotide probes.

General Agreement on Trade and Tariffs The General Agreement on Trade and Tariffs (GATT) was a treaty and international trade organization in existence from 1948 to 1995. GATT members worked to minimize tariffs, quotas, preferential trade agreements between countries, and other barriers to international trade. In 1995, GATT's functions were taken over by the World Trade Organization (WTO), an international body that administers trade laws and provides a forum for settling trade disputes among nations. GATT members sponsored eight specially organized rounds of trade negotiations. The last round of negotiations, called the Uruguay Round, began in 1986 and ended in 1994. At the end of the negotiations, the members of GATT, as well as representatives from seven other nations, signed a trade pact that will eventually cut tariffs overall by about one-third and reduce or eliminate other obstacles to trade. The pact also took steps toward opening trade in investments and services among member nations and strengthening protection for intellectual property. Throughout 1995, GATT and the WTO coexisted while GATT members sought their governments' approval for WTO membership. After the transition period, GATT ceased to exist. All of the 128 nations that were contracting parties to the 1994 GATT agreement eventually transferred membership to the WTO.

Genes Units of inheritance that occupy specific loci within nucleic acid molecules (e.g. chromosomes, plasmids). Consist of specific DNA sequences that code for functional polypeptides or RNA molecules (e.g. rRNA, tRNA). Eukaryotic genes often consist of coding units (exons) separated by one or more non-coding unit (introns).

Gene silencing Various genetic techniques used to suppress gene expression. Includes antisense technology and RNA interference technology. May also be induced by viral infection.

Genetically engineered foods Foods that have been modified or that have been prepared with agents, e.g. enzymes, or contain ingredients that have been modified using genetic techniques. Used to confer new properties such as enhanced nutritional values and prolonged shelf life. More commonly referred to as genetically modified foods or GM foods.

Genetically modified foods Commonly abbreviated to GM foods, but also referred to as genetically engineered foods. Foods and beverages that have been genetically modified or that have been prepared with agents (e.g. enzymes) or ingredients that have been modified using genetic techniques. Used to confer new properties such as resistance to herbicides or pests, enhanced nutritional values or extended shelf life. Regulations governing the cultivation and labelling of GM foods and feeds still varies widely between individual countries. Consumer acceptability of these products is also highly variable.

Genetically modified microorganisms Microorganisms that have been modified by genetic techniques to enhance their properties or confer upon them new properties. Abbreviated to GM microorganisms.

Genetically modified organisms Organisms that have been modified by genetic techniques to enhance their properties or confer upon them new properties. Abbreviated to GM organisms or GMO.

Genetic disorders Deleterious effects caused by alterations in the genetic material of organisms that may or may not be inherited in a Mendelian fashion.

Genetic engineering General term covering various genetic techniques for in vitro manipulation of genetic material. Can be used for construction of new genes or novel combinations of genes, usually for insertion into host cells, placing genes under the control of different regulatory systems or introducing specific mutations into DNA molecules.

Genetic fingerprinting Process by which different DNA samples are compared to determine if they are from the same individual, strain or species. Usually uses PCR to compare the characteristic polymorphic patterns of highly variable regions of genomic DNA, although a combination of RFLP and Southern blotting may also be used. Also known as DNA fingerprinting.

Genetic mapping Process by which the relative positions of genes on DNA molecules (usually chromosomes) and the distances between them are determined.

Genetics The study of heredity and variation, i.e. the patterns of inheritance of specific traits.

Genetic techniques Methods used in the study of genetics and for the manipulation of genetic material.

Genetic variants Organisms and cells that differ in phenotype due to differences in genotype, rather than to environmental factors.

Gene transfer General term for insertion of foreign genes into cells or organisms.
Geniposide  Iridoid glucoside which is found in the fruits of *Gardenia jasminoides* and is a constituent of gardenia yellow, a natural colorant used in a range of foods. Can be transformed into a blue pigment, which is also of potential use as a food colorant, by enzymic hydrolysis to genipin and reaction with amino acids.

Genistein  Yellow isoflavone which occurs in free or glucosidic form and has a weak oestrogenic effect. Found in soybeans, chick peas, lucerne and clover.

Genomes  The genetic material of an organism or cell, comprising the complete set of genes.

Genomics  The study of genomes.

Genotoxicity  Quality or degree of being capable of exerting a damaging effect on the DNA that forms genes.

Genotype  The genetic constitution of an organism or cell that determines the expression of specific traits.

Genotyping  Genetic techniques (e.g. repetitive DNA sequence analysis, RAPD, gene sequence analysis, PCR, PFGE and RFLP) used to determine and compare the genetic constitution of organisms and cells. May be used in strain identification of microorganisms to determine pathogenicity or to trace the source of outbreaks.

Gentamicin  One of the aminoglycoside antibiotics used to treat a range of bacterial infections in farm animals. Used especially in swine for treatment of colibacillosis and swine dysentery; also used for treatment of mastitis in cattle. Depletes relatively slowly from tissues, particularly kidneys. Relatively long withdrawal periods are required for animals intended for consumption.

Gentians  Plants of the genus Gentiana. Bitter compounds extracted from rhizomes and roots of these species are used in beverages, foods and medicines.

Gentiobiose  Disaccharide reducing sugar produced by reaction of two molecules of glucose in the presence of β-glucosidases. Systematic name is 6-O-β-D-glucopyranosyl-D-glucose.

Geobacillus  Genus of rod shaped, aerobic, thermophilic Gram positive bacteria of the family Bacillaceae. Widely distributed in nature. Species produce a range of thermostable enzymes. For example, *Geobacillus stearothermophilus* produces arabinose isomerases and xylen degrading enzymes, *G. thermovorans* produces pullulanases, esterases and lipases, *G. thermodenitrificans* produces α-amylases, *G. caldoxyloxylicus* produces α-N-arabinofuranosidases and *G. pallidus* produces xylan 1,4-β-xylosidases.

Geographical origin  The specific geographical location (e.g. town, region, country) from which foods or beverages originate. Can be used to establish the authenticity and quality of a product. Certain foods and beverages can only be produced in a defined geographical area, and labelling schemes and regulations have been implemented to indicate their authenticity, such as the Protected Designation of Origin scheme and other geographical indications established in EU legislation.

Geosmin  Heterocyclic volatile compound which naturally occurs in fresh water and imparts musty and earthy flavour and aroma taints to beverages such as drinking water and wines, as well as to freshwater fish.

Geotrichum  Genus of fungi of the family Dipodascaceae. Occur in soil, water, dairy products and grains. Species may be involved in the production of fermented foods, or may cause food spoilage. *Geotrichum candidum* imparts flavour and aroma to many types of cheese, and plays an important role in ripening of soft cheese; it also assists in the fermentation of cocoa. However, it can also cause spoilage of cream and butter, sour rot of citrus fruits, peaches and tomatoes, and watery soft rot of vegetables. *G. citri-aureus* also causes sour rot of citrus fruits. *G. klebahnii* produces polygalacturonases with pectin-releasing activity.

Geraniol  Colourless or pale yellow unsaturated monoterpen alcohol which has a rose-like aroma and occurs in geranium and rose essential oils. Used in flavourings.

Geranial  Volatile compound occurring as one of the natural flavour compounds in the essential oils of many herbs and spices. Extracted as a colourless liquid by fractional distillation of selected essential oils or prepared by acetylation of geraniol. Used in flavourings for foods and beverages.

Germination  Sprouting of a seed, spore or other reproductive body. Influenced by a number of factors, including temperature, light and oxygen supply. Used commercially in preparation of cereals for manufacture of alcoholic beverages, and in production of mushrooms.
Germination capacity

Ability of a seed to germinate.

Gesatop Alternative term for the herbicide simazine.

Gestagens Steroid hormones which induce pregestational effects in the uterus.

Ghee Product made from butter; originally produced in India but now more widespread. Butter is melted at a high temperature, during which moisture is evaporated. Proteins are then removed from the melted butter by centrifugation.

Gherkins West Indian gherkins are fruits produced by Cucumis anguria. Usually 4-5 cm long, and used mainly in pickles. In Europe, the term gherkins usually refers to small ridge cucumbers.

Ghrelin A peptide hormone produced by cells lining the stomach which stimulates appetite. Plasma levels increase prior to a meal and decrease afterwards. Ghrelin also encourages the secretion of growth hormone (somatotropin) from the anterior pituitary gland.

Giardia Genus of flagellate protozoan parasites of the family Hexamitidae. Alternates between two different forms: a hardy, dormant cyst that contaminates water and food, or by the faecal-oral route (through poor hygiene practices). Cysts can survive for weeks to months in cold water, and can therefore be present in contaminated wells, water and water systems; the cysts are resistant to conventional treatments such as chlorination and ozonation. Giardia lamblia, the causative agent of giardiasis in humans, attaches itself to the intestinal mucosa and feeds on mucous secretions.

Giardiasis Disease caused by infection with Giardia lamblia. Commonly transmitted through ingestion of food or water contaminated with cysts. Characterized by watery diarrhoea, abdominal cramps, nausea and flatulence. Infection may be asymptomatic.

Gibberellic acid Plant growth regulator belonging to the gibberellins group which may be obtained commercially by culture filtration of the fungus Gibberella fujikuroi.

Gibberellins Any of a group of plant growth regulators originally produced by Gibberella fujikuroi. Promotes processes such as stem elongation, germination and flowering. Often used to stimulate germination of dormant grain such as barley during malting.

Giblets Edible offal from the carcasses of poultry and game birds. Giblets include the livers, hearts, gizzards and necks of the birds; they are usually removed before the birds are cooked. Giblets, with the exception of livers, are often used to make gravy, stocks or soups.

Gigartina Genus of seaweeds found on rocky shores around the world. Some species are used as a source of carrageenans and nutraceuticals in the food industry.

Gin Spirits made by flavouring rectified ethanol with juniper and other plant ingredients, usually by re-distillation of the spirits with the flavourings.

Gingelly oils Alternative term for sesame oils.

Gingelly seeds Alternative term for sesame seeds.

Ginger Rhizomes from Zingiber officinale. Used fresh or dried as spices in a number of foods and beverages, including gingerbread and ginger beer. Pungency is due to the presence of gingerols. May also refer to related Curcuma spp. such as C. xanthorrhiza.

Ginger ale Ginger-flavoured sweetened carbonated beverages, often added to spirits such as whisky or brandy prior to consumption.

Ginger beer Effervescent ginger-flavoured beverages. Traditionally, these are slightly alcoholic and made by fermentation of a sugar medium containing ginger and other flavourings. Industrial production often does not involve fermentation, and the resultant product is usually alcohol-free and marketed as a soft drink.

Gingerbread Dark molasses-based cakes or biscuits flavoured with ground ginger and other spices. Often cut into shapes, decorated and glazed.

Gingerols Phenolic ketones which are the major pungent principles of fresh ginger.

Ginjoshu Type of sake.

Ginkgo nuts Seeds produced by Ginkgo biloba (maidenhair tree), a plant grown in Asia. Fresh nuts are soaked in hot water to loosen the skin. Also available dried and canned in brines. Used widely in Japanese cooking and in Chinese medicines.

Ginseng Root of the plant Panax ginseng, used for preparation of ginseng beverages. Widely considered to have health-promoting properties, possibly related to the presence of saponins (ginsenosides).

Ginseng beverages Beverages that contain ginseng as a major ingredient. Considered by some to be health beverages.

Ginseng saponins Alternative term for ginsenosides.

Ginsenosides Complex mixture of saponins which are believed to be the active components of ginseng, Panax ginseng, and are thought to be responsible for...
the reported health benefits associated with this plant. Also known as ginseng saponins.

**Girdling**  Removal of a strip of bark from the circumference of a tree, with the intention of improving growth or quality of fruits.

**Gizzards**  Muscular, thick-walled stomachs of birds, which lie between the proventriculus and the upper limit of the small intestine; poultry gizzards form a part of edible offal. In birds, the function of the gizzard is to grind food, typically with swallowed grit and small stones.

**Glass**  Brittle, usually transparent or translucent material used widely to make bottles and other containers. Manufactured by fusing sand (silica and silicates) with soda and lime. Also refers to individual drinking vessels made from glass.

**Glass bottles** Bottles made from glass which are commonly used as containers for beverages and other liquids. Available in a range of shapes, capacities and colour.

**Glass containers** Containers made from glass which may be used to store or package a range of foods. Include glass bottles, beakers, jars and pots.

**Glassine** Smooth, thin, glossy transparent or semi-transparent paper made primarily from chemical wood pulps. Has a high resistance to transmission of air and is grease resistant. To make it impervious to water vapour, some glassine is lacquered, laminated or waxed. Used for wrapping food.

**Glassiness** Optical properties relating to the extent to which a product appears to have the surface properties of glass, i.e. smoothness, uniformity, shininess and glossiness.

**Glass transition** Reversible sudden transition of an amorphous polymer from a glassy condition to a flexible condition when it is heated to a specific temperature range (glass transition temp.). Due to a change in the arrangement of the polymer molecules from a coiled and motionless state to one where they are free to move.

**Glass transition temp.** Temperature range at which the glass transition (change from a glassy to a flexible condition) of polymers takes place. Value varies according to the polymer and the range is relatively small.

**Glazes** Substances, such as milk, beaten eggs or thin jams, which are used to create a shiny appearance or provide protective coatings on foods. Also, smooth, glossy, glass-like materials fused onto the surface of pottery, where they form hard, impervious decorative coatings.

**Glazing** Application of a liquid, such as milk or beaten eggs, to hot or cold foods to produce a smooth, shiny coating after setting. For example, milk or beaten eggs can be brushed onto pastry before baking to add colour and shine.

**GLC** Abbreviation for gas liquid chromatography.

**Gliadins** Cereal proteins from the endosperm of wheat or rye. The elastic constituent of gluten.

**Gliocladium** Genus of mitosporic filamentous fungi of the order Hypocreales and class Sordariomycetes. Occur in soil and decaying plant material. Causes pink rot of plants, including palms, particularly in winter. Telomorphs of Gliocladium include Nectria, Hypocreanectria and Nectriopsis. Certain Gliocladium spp. can be used to control various fungal diseases in food crops.

**Gliotoxin** Mycotoxin produced by Trichoderma viride and species of Aspergillus, Gliocladium and Penicillium. Inhibits replication of certain viruses (e.g. polioviruses) and also exhibits antibacterial activity, antifungal activity and antitumour activity.

**Globe artichokes** Common name for Cynara scolymus. Plant has a large, thistle-like flower head with edible fleshy leaves and heart. Generally eaten cooked, either hot or cold, and can be canned. Small, immature flower heads may also be consumed, cooked and preserved in olive oils. Globe artichokes are high in fibre, low in fat and calories, and rich in vitamin A and vitamin C.

**Globins** Animal proteins that contain some arginine and tryptophan, are rich in histidine and are deficient in isoleucine. They often form the protein portion of conjugated proteins, e.g. the globins in haemoglobin or myoglobin.

**Globulins** Any of a class of spherical or globular shaped high molecular weight proteins which are relatively insoluble in water and soluble in dilute salt solutions. Found widely throughout nature; they include lactoglobulins, serum globulins and immunoglobulins. Subdivided into α-, β- and γ-globulins.

**γ-Globulins** A fraction of globulins obtained following separation of plasma globulins by SDS-PAGE. Occur in animal tissues and products derived from them, and include immunoglobulins.

**Gloss** Optical properties relating to the surface lustre or sheen on a product. Gloss is important to the attractiveness of specific products such as gelatin desserts and buttered vegetables.

**Glucagon** Polypeptide hormone secreted by pancreatic cells in response to a decrease in serum glucose. Acts by promoting the conversion of liver glycogen into glucose, thereby increasing the level of blood sugar, and has an opposite effect to that of insulin.

**Glucanases** General term for enzymes that hydrolyse glucans. Include glucan endo-1,3-β-
glucosidases, endo-1,3(4)-β-glucanases and licheninases.

β-Glucanases Alternative term for endo-1,3(4)-β-glucanases.

1,4-α-Glucan branching enzymes EC 2.4.1.18. Glycosyltransferases which transfer a segment of a 1,4-α-D-glucan chain to a primary hydroxyl group in a similar glucan chain. Convert amylloses into amylopectins in plants and produce glycogen in bacteria. Commonly referred to in plants as starch branching enzymes, and their activity is important for starch structure.

Glucan endo-1,3-β-D-glucosidases EC 3.2.1.39. Glycosidases which hydrolyse 1,3-β-D-glucosidic linkages in 1,3-β-D-glucans. Also known as laminarinas. Important in the malting and brewing industries, and potentially useful for production of functional oligosaccharides. May be involved in the ripening/softening of fruits and in plant defence.

Glucan 1,4-α-glucosidases EC 3.2.1.3. Also known as glucamylases, these enzymes hydrolyse terminal 1,4-linked α-D-glucose residues successively from non-reducing ends of chains, releasing β-D-glucose. Can also hydrolyse α-D-1,6-glucosidic linkages, although at a slower rate. Useful for degradation of starch (saccharification) for production of sugar syrups and for conversion of residual dextrans to fermentable sugars during production of low calorie beer.

4-α-Glucanotransferases EC 2.4.1.25. Glycosyltransferases which transfer a segment of a 1,4-α-D-glucan to a new position in an acceptor, which may be glucose or another 1,4-α-D-glucan. Involved in starch metabolism in plants. Applications include the synthesis of cycloamylose and modified starches, and, together with maltogenic amylases, these enzymes may also be useful for the synthesis of isomaltooligosaccharides, useful as low calorie sweeteners and prebiotics. Also known as disproportionating enzymes, dextrin glycosyltransferases, amylo-β-maltases and D-enzymes.

Glucans Soluble, indigestible polysaccharides composed predominantly of D-glucose residues and found in cereals such as oats, barley and rye.

β-Glucans Polysaccharides composed of D-glucose in either straight or branched chains with β-glycosidic linkages. Present in the bran of most cereals, particularly barley and oats, and in yeasts and mushrooms. Certain β-glucans exhibit potentially beneficial biological activities and are used as sources of soluble fibre in dietary supplements and functional foods.

Glucides Subclass of saccharides.

Glucitol Alternative term for sorbitol.

Glucoamylases Alternative term for glucan 1,4-α-glucosidases.

Glucobrassicin Alternative term for 3-indolylmethyl glucosinolate, one of the major glucosinolates found in vegetables of the genera Brassica and Raphanus.

Glucocorticoids Any of a group of corticosteroids secreted by the adrenal cortex that controls carbohydrate and protein metabolism by promoting glycogen deposition in the liver. Glucocorticoids have anti-inflammatory activity.

Glucokinases EC 2.7.1.2. Kinases which, along with hexokinases, catalyse the transfer of a phosphate group from ATP to D-glucose to form D-glucose 6-phosphate, the first reaction of glycolysis. Often measured to assess metabolism of carbohydrates. Also used as an alternative name for hexokinases (EC 2.7.1.1).

Glucomannans Viscous polysaccharides comprising glucose and mannose which occur naturally in the food reserves of some plants, such as konjac (elephant yams). Like galactomannans they form thermally reversible gels with xanthan.

Glucanacetobacter Genus of acetic acid bacteria of the family Acetobacteraceae, containing species previously included in the genus Acetobacter. Found in a wide variety of fruits and fruit nectars, where they can cause spoilage. Some species (e.g. Gluconacetobacter europaeus) are used in the manufacture of vinegar.

Gluconates Salts of gluconic acid. Used as acidulants or chelating agents in foods, beverages, food supplements, pharmaceuticals, etc. Also used as carriers for minerals in food fortification. Obtained by the fermentation of glucose.

Gluconic acid Organic acid which is soluble in water and alcohol and is formed by oxidation of glucose in which the CHO group has been converted to COOH. Predominant acid found in honeys.

Glucobacter Genus of Gram negative, aerobic, rod-shaped acetic acid bacteria of the family Acetobacteraceae. Occur in soil, plants, fruits, cider, beer, wines and flowers. Species are used in the production of vinegar, and may cause spoilage of beer. An important industrial microbial strain. Frequently used in biotechnological applications such as biotransformations, biotransformations and technology involving biosensors. Most of these processes make use of membrane-bound polyol dehydrogenases and dextran dextrinases.

Glucono-δ-lactone Lactone that forms gluconic acid when dissolved in water. Used as an acidulant
Glucooligosaccharides and hence to induce gelation in a range of foods, and as a leavening agent in bakery products. Also frequently used as an additive in cheese, meat and sausages.

Glucooligosaccharides Oligosaccharides with a range of structures based on glucose. Many are partly or totally resistant to digestive enzymes in the human gastrointestinal tract, but can be fermented by colonic microflora to produce short chain fatty acids. Used as dietary prebiotics either alone or in conjunction with probiotic bacteria to regulate gastrointestinal transit, improve the composition of the colonic microflora and provide various other health benefits, such as reduced risk of colorectal cancer. Dextranucrases from bacteria such as Leuconostoc mesenteroides can be used to prepare glucooligosaccharides.

Glucoraphanin One of the naturally occurring glucosinolates found in Cruciferae, e.g. broccoli, cabbages and cauliflowers. Metabolized to sulforaphane which has been attributed with antimicrobial activity and anticarcinogenicity. Young sprouts of broccoli and cauliflowers are particularly rich in glucoraphanin. Also called sulforaphane glucosinolate.

Glucosamine Crystalline amino derivative of glucose and the principal component of chitin, mucoproteins and mucopolysaccharides.

Glucose Monosaccharide with six carbon atoms. Free glucose isomerases catalyse the isomerization of glucose to fructose and used for large scale production of fructose high corn syrups and dextrans for use in a variety of foods and beverages.

Glucose oxidases EC entry for these enzymes has been deleted. Activity now attributed to xylose isomerases (EC 5.3.1.5) or, in the presence of arsenate, to glucose-6-phosphate isomerases (EC 5.3.1.9). The term glucose isomerases is still used widely, however. Catalyse the isomerization of glucose to fructose and used for large scale production of fructose high corn syrups and dextrans for use in a variety of foods and beverages.

Glucose 6-phosphate Primary metabolite of glucose in living cells. Formation of glucose-6-phosphate from glucose is the first reaction in glycolysis and is catalysed by hexokinases.

Glucose-1-phosphate adenylyltransferases EC 2.7.7.27. Also known as ADP-glucose pyrophosphorylases, these enzymes transfer a phosphate group from ATP to α-D-glucose 1-phosphate to form pyrophosphate and ADP-glucose. They are key enzymes in the starch biosynthetic pathway in plants.

Glucoseglycosides A range of glycosides found mainly in plants, the sugar component of which is glucose. These compounds may be useful as aroma precursors, pigments and surfactants, and may exhibit anti-oxidative activity. However, cyanogenic glucosides...
found in several plants are a potential source of cyanides and are therefore potentially toxic.

**Glucosinolases** Alternative term for thioglucosidases.

**Glucosinolates** Class of glucosides which are found in Brassica spp. (e.g. broccoli, cabbages, radishes). Degraded by thioglucosidases to produce mustard oils, accounting for the pungent flavour of these compounds. Thought to be anticarcinogens, which may increase the rate at which potential carcinogens are excreted and enhance apoptosis of cancerous cells. At high doses, may cause goitre in combination with a diet low in iodine.

**Glucosyltransferases** Members of subclass EC 2.4.1, the hexosyltransferase group of glycosyltransferases. Catalyse the transfer of glycosyl groups from a donor molecule to an acceptor. Can also be referred to as transglycosylases.

**Glucuronic acid** Uronic acid derived by oxidation of the carbon-6 atom to a carboxyl group. Potential toxins are conjugated with glucuronic acid in the liver to form glucuronides before being excreted. Glucuronic acid is also found in mucopolysaccharides.

**α-Glucuronidases** EC 3.2.1.139. Glycosidas which hydrolyse α-1,2-glycosidic bonds of the 4-Omethyl-D-glucuronic acid side chain of xylan. Act as part of an array of xylan degrading enzymes produced by a range of microorganisms. Such enzymes are useful in food processing procedures involving degradation of plant cell walls, e.g. extraction of juices and essential oils, or clarification of wines, and in production of modified xylans for use as bulking agents.

**β-Glucuronidases** EC 3.2.1.31. Glycosidas which present in intestinal bacteria and associated with the production of toxic aglycones and carcinogens. This process may be ameliorated by prebiotics or probiotic bacteria. Determination of β-glucuronidase activity may therefore be useful for evaluating dietary-mediated colorectal cancer risk. Also used analytically to identify some strains of Escherichia coli, and β-glucuronidase genes are commonly used as marker genes in transgenic plants.

**Glutamate decarboxylases** EC 4.1.1.15. Decarboxylases which are involved in synthesis of γ-aminobutyric acid (GABA), which is reported to have antihypertensive activity and is found in high amounts in foods such as red mould rice and tea. These enzymes are involved in acids resistance in bacteria and are produced by cheese starters during ripening of cheese.

**Glutamate dehydrogenases** Dehydrogenases which catalyse the conversion of glutamate to 2-oxoglutarate (α-ketoglutarate) and ammonia, using NAD+ (EC 1.4.1.2), NAD(P)+ (EC 1.4.1.3) or NADP+ (EC 1.4.1.4) as acceptors. Useful for determination of glutamic acid contents of foods. Production of these enzymes by lactic acid bacteria may be important for flavour development in certain dairy products, including cheese.

**Glutamate oxidases** Alternative term for L-glutamate oxidases.

**L-Glutamate oxidases** EC 1.4.3.11. Flavoprotein oxidases which convert L-glutamate to 2-oxoglutarate and ammonia. Used in biosensors for determination of L-glutamic acid levels in foods and, in combination with other enzymes, for detection of aspartame and aspartic acid. Have also been used for detection of the neurotoxin β-N-oxalyl-α,β-diaminopropionic acid in grass peas.

**Glutamates** Salts of glutamic acid used as flavourings, e.g. the flavour enhancer monosodium glutamate.

**Glutamic acid** Amino acid which is believed to play a part in the high-quality flavour of young fresh vegetables and in the enhancement of other flavours in general. Salts of glutamic acid (glutamates) are widely used as flavourings.

**Glutaminases** EC 3.5.1.2. Hydrolases which convert L-glutamine to L-glutamic acid and ammonia. Can be used to increase the glutamic acid content, and hence the sensory properties, of foods, e.g. soy sauces, protein hydrolysates used as flavourings and certain meat products.

**Glutamine** Non-essential amino acid which is a monoamido of glutamic acid. Abundant in plants such as beets, carrots and radishes and important in cell metabolism.

**γ-Glutamyl hydrolases** EC 3.4.19.9. Proteinases that hydrolyse γ-glutamyl bonds. Used in the analysis of folates in foods and beverages. Also known as conjugases and folate conjugases.

**γ-Glutamyltransferases** EC 2.3.2.2. Also known as glutamyl transpeptidases, these acyltransferases catalyse the hydrolysis and transpeptidation of γ-glutamyl compounds, such as glutathione. They can be used to increase levels of flavour compounds in foods, and have also been used as markers for the pasteurization of milk. Serum levels of this enzyme are used as biomarkers for diabetes and excessive consumption of alcoholic beverages.

**Glutathione** Tripeptide widely distributed in cells and composed of glutamic acid, cysteine and glycine residues. Functions as a redox agent and a coenzyme.
Glutathione transferases

for some enzymes. Also shows antioxidative activity in the protection of sulfhydryl groups in enzymes and other proteins.

Glutathione transferases EC 2.5.1.18. Commonly known as glutathione-S-transferases. Phase II detoxification enzymes with broad substrate specificity which catalyse the transfer to glutathione of any aliphatic, aromatic or heterocyclic group from an organic sulfite, nitrile or halide compound. Other donor groups include aliphatic epoxides and arene oxides. Can also catalyse some isomerization and reduction reactions. Induction of these enzymes by certain phytocchemicals, e.g. by green tea extracts and isothiocyanates from broccoli sprouts, has been demonstrated.

Glutelins Group of globulins present in the seeds of wheat, rice and barley. Soluble in dilute acids or alcalies and insoluble in water, they are a constituent of gluten.

Gluten Water insoluble protein complex found in the endosperm of wheat and rye and composed predominantly of gliadins and glutenin. When mixed with water, forms cohesive, elastic, cross-linked molecules. These confer elasticity to bread dough, allowing the dough to trap carbon dioxide during breadmaking and causing the bread to rise.

Gluten free bread Bread formulated to contain no gluten by excluding wheat and rye proteins to make it suitable for consumption by people suffering from coeliac disease.

Gluten free foods Foods formulated to contain no gluten by excluding wheat and rye proteins to make them suitable for consumption by people suffering from coeliac disease.

Glutenin Glutelin found in the endosperm of wheat and one of the major components of gluten.

Gluten low bread Bread made using low levels of wheat and rye proteins so that it is suitable for consumption by people with intolerance to gluten.

Gluten low foods Foods formulated to contain low levels of wheat and rye proteins so that they are suitable for consumption by people with intolerance to gluten.

Glycaemic index values Commonly abbreviated to GI values, these nutritional values provide a measure of the ability of dietary carbohydrates to raise blood glucose levels in comparison to a reference food (usually glucose or white bread). Carbohydrates that are rapidly digested and quickly release glucose into the bloodstream have high GI values, whereas low GI products release glucose more slowly and steadily. Health benefits have been attributed to consumption of a low GI diet, including body wt, management, reduction of the risk of cardiovascular diseases and improved control of diabetes. Used in the calculation of glycaemic load.

Glycaemic load An extension of the glycaemic index concept that also takes into consideration the amount of carbohydrates in a serving of food. It is based on the idea that a small quantity of foods with high glycaemic index values will have the same effect on blood glucose and insulin levels as a larger quantity of foods with low glycaemic index values. The concept is gaining credibility in the dietary management of a number of diseases, including diabetes, obesity and other conditions involving insulin resistance.

Glycans Alternative term for glucans.

Glycation Modification involving nonenzymic reaction of sugars with proteins (or sometimes lipids), as in the Maillard reaction. Results in alterations in physicochemical, biological and functional properties, such as foaming properties, emulsification properties or antioxidative activity, of proteins.

Glycerides Synonym for acylglycerols. Fatty acid esters of glycerol, such as monoglycerides, diglycerides and triglycerides. Major components of natural fats and oils (particularly as triglycerides); also used as emulsifiers.

Glycerin Synonym for glycerol; alternative spelling glycine.

Glycerine Synonym for glycerol; alternative spelling glycerin.

Glycerol One of the polyols, this clear, sweet-tasting, viscous, hygroscopic liquid can be produced by fat saponification and as a by-product of biodiesel production. Used in humectants to prevent sugar confectionery and other foods from drying out, as a solvent for flavourings and colorants, and as an emulsifier or a plasticizer. Also used to control crystallization and in the formulation of fat substitutes. Synonym for glycerol and glycine. Glycerol occurs naturally as a metabolic intermediate, serving as a precursor for triglycerides and phospholipids and as an energy source during glycolysis. It is also utilized as a low-cost carbon source for microorganisms cultivated for the production of higher-value fermentation products.

Glycerolipids Alternative term for glycolipids.

Glycerol monolaurate Alternative term for monolaurin.

Glycerol monostearate Synonym for glyceryl monostearate, an ester formed by reaction of stearic acid with glycerol. Used in food emulsifiers, and in the manufacture of products such as coffee whiteners and ice cream. Included as bakery additives in the manufacture of bread and other
bake products due to the anti-staling properties of the glyceride component.

Glyceraldehyde A form of alcoholysis or trans-esterification involving esters and glycerol. Includes the breakdown of triglycerides to form monoglycerides. Catalysed by lipases or chemical catalysts. Can be used to improve the health promoting properties of fats (e.g. glyceralysis of tuna oils to generate monoacylglycerols rich in PUFA).

Glycerol esterate Ester formed by reaction of stearic acid with glycerol. Used in food emulsifiers, and in the manufacture of products such as coffee whiteners and ice cream. Included as bakery additives in the manufacture of bread and other bakery products due to the anti-staling properties of the glyceride component. Also called glycerol monostearate.

Glycine Non-essential achiral amino acid, structurally the simplest of the amino acids. Used to retard the onset of rancidity in fats and as an ingredient in sweeteners, as well as being a nutrient. Gelatin is a particularly rich source of glycine.

Glycine betaine One of the soluble nitrogen compounds and a derivative of betaine occurring in a range of foods, especially sugar beets, spinach and molasses; also found in some shellfish, where it is important for flavour. An effective osmoprotectant, glycine betaine is also synthesized by microorganisms living at very high osmotic pressures. Accumulation of glycine betaine in some pathogens, e.g. Listeria monocytogenes, allows them to survive under conditions of extreme temperature, leading to food safety problems. The compound may also be added to increase thermal tolerance and osmotolerance in bacteria used in food manufacture.

Glycinin One of the main soy proteins. An 11S storage protein that, along with β-conglycinin (7S globulin), makes up approximately 70% of storage proteins in soybeans.

Glycine One of the isoflavones found in soybeans. According to some studies, demonstrates antiatherogenic activity, antiproliferative activity and cholesterol lowering activity, but may also act as a phytoestrogen with weak oestrogenic activity. Claimed to offer some protection against osteoporosis and various menopausal symptoms. Available as an ingredient of functional foods and in supplements. Bioavailability may vary between individuals and between men and women.

Glyoalkaloids Natural toxins which are synthesized by plants of the family Solanaceae, including potatoes. Consist of alkaloids with one or more sugar residues attached. Include α-solanine and α-chaconine.

Glycogen High molecular weight branched polysaccharide comprising D-glucopyranose residues (glucose in the ring conformation). Formed predominantly in muscle and liver tissues and is the main store of energy in animals and humans.

Glycolic acid Colourless, hygroscopic chemical intermediate of the conversion of glycine to ethanamine. Constituent of cane sugar juices and unripe grapes.

Glycolipids Compounds consisting of lipid moieties which are glycosidically linked to one or more saccharide residues. Includes cerebrosides and gangliosides. Also known as glycerolipids.

Glycols General term for diols, organic compounds with two alcohol groups. Include ethylene glycol and 1,2-propanediol (propylene glycol).

Glycolysis Series of reactions which take place in most living cells in which glucose is converted into pyruvic acid and then to lactic acid.

Glycocomacropeptides Low molecular weight whey proteins produced during cheesemaking when κ-casein is treated with chymosin. Show biological activity and are potential ingredients for functional foods.

Glycopeptides Compounds in which a carbohydrate is covalently linked to an oligopeptide composed of D- and/or L-amino acid residues.

Glycoproteins Conjugated proteins composed of polypeptide backbones to which carbohydrates are covalently attached. Present in ovalbumins, mucins and fish antifreeze proteins.

Glycosaminoglycans Long unbranched polysaccharides containing a repeating disaccharide unit consisting of an N-acetyl-hexosamine, such as glucosamine and a hexose or hexuronic acid, either or both of which may be sulfated. Can have gel-like properties, since their structure allows significant water sorption. Examples include hyaluronic acid and chondroitin. Important components of connective tissues such as cartilage from meat and fish. An integral component of proteoglycans. Synthesized by certain microorganisms and can affect the viscosity of fermented foods. Also known as mucopolysaccharides.

Glycosidases EC 3.2.1 Enzymes that hydrolyse O- or S-glycosyl compounds in carbohydrates such as starch, celluloses and pectins. Able to cleave short-chain oligosaccharides as well as polysaccharides with various structures. They are used in all areas of the food industry, but their major application is in starch processing. Some can also transfer glycosyl
residues to oligosaccharides, polysaccharides and other alcoholic receptors.

**Glycosides** Compounds occurring abundantly in plants in which a sugar is combined with a non-sugar entity (aglycone); this may be an alcohol, phenol or sterol, and replaces the hydroxyl group on the carbon-1 atom. Often found in fruit pigments, e.g. anthocyanins.

**Glycosylation** Form of modification in which saccharides are added to compounds such as proteins and lipids, in this case forming glycoproteins and glycolipids, respectively. Nonenzymic glycosylation (glycation) of proteins takes place during the Maillard reaction, leading to formation of Maillard reaction products that contribute to food flavour and colour. Other chemicals such as phenols, terpenoids and flavonoids also undergo glycosylation, and this can affect their aroma and other physicochemical properties, such as solubility.

**Glycosyltransferases** EC 2.4. Enzymes that catalyse the transfer of glycosyl groups to an acceptor. Usually, other carbohydrates act as acceptors, although inorganic phosphate can also be an acceptor, such as in the case of phosphorylases. Some of the enzymes in this group also catalyse hydrolysis, which can be regarded as the transfer of a glycosyl group to water. The subclass is subdivided further, according to the nature of the sugar residue being transferred, into hexosyltransferases (EC 2.4.1), pentosyltransferases (EC 2.4.2) and those transferring other glycosyl groups (EC 2.4.99).

**Glycyrrhizic acid** Glycoside extracted from liquorice (Glycyrrhiza) which has an intensely sweet flavour.

**Glycyrrhizin** Sweet-tasting glycoside derived from liquorice root. Used in high-intensity sweeteners for foods. Exhibits sweetness many times greater than that of sugar and maintains this sweetness under heating. Use in certain products is limited by its distinct liquorice flavour.

**Glyoxal** Dicarbonyl compound found as an aroma precursor/compound in wines. Also one of the Maillard reaction products in nonenzymic browning.

**Glyphosate** One of the most widely employed non-selective systemic herbicides. Used for control of deep-rooted perennial plants, annual and biennial grasses and broad-leaved weeds in a wide range of crops. Also used for pre-harvest drying of cereals and legumes and for control of sucking insects on fruit trees. Classified by WHO as unlikely to present acute hazard in normal use.

**GM foods** Abbreviation for genetically modified foods.

**GM microorganisms** Abbreviation for genetically modified microorganisms.

**GMO** Abbreviation for genetically modified organisms.

**GM organisms** Abbreviation for genetically modified organisms.

**GMP** Abbreviation for guanosine monophosphate.

**Gnathostoma** Genus of parasitic nematodes of the family Gnathostomatidae. Occur in the gastrointestinal tract of dogs, cats and wild animals, and are also found in fish, shellfish, meat and water. Ingestion of uncooked fish can cause infection in humans. Gnathostoma spinigerum is the causal agent of gnathostomiasis in humans.

**Gnathostomiasis** Disease in humans caused by infection with Gnathostoma spinigerum. Commonly transmitted by consuming raw or undercooked contaminated fish, shellfish or meat, or drinking contaminated water. Characterized by a skin condition (creeping eruption) in which migrating larvae create tunnels under the skin that develop into abscesses. The larvae may also migrate through the eye or brain causing severe damage.

**Gnocchi** Small dumplings made from a dough of potatoes and flour. Cooked in boiling water and served as a side dish or main course with a savoury sauce. Eggs, cheese or chopped spinach may also be added to the dough.

**Goa beans** Seeds produced by Psophocarpus tetragonolobus. Rich in protein. As well as the seeds, immature green pods, leaves and root tubers are eaten. Also known as winged beans and asparagus peas.

**Goat cheese** Cheese made from goat milk. Usually has a slightly harsh and piquant flavour and aroma.

**Goat meat** Meat from goats; also known as chevon, particularly in India. It resembles mutton, but includes very little intermuscular fat. During the dressing process, goat carcasses nearly always become tainted with the typical aroma of goat, which transfers from the goat skin. The most tender meat comes from young goats, also known as kids, capretto or cabrito; meat from older goats is tougher. Goat meat is widely consumed in North Africa and the Middle East. It is often produced from goats managed traditionally, as free-foraging herds; consequently, goat meat tends to be fairly lean.

**Goat milk** Milk produced by dairy goats. Similar in composition to cow milk, but with slightly higher...
Goitre  An enlargement of the thyroid gland. A common cause of endemic goitre is goitrogens—compounds found in foods (especially Brassica spp., peanuts, cassava and soybeans) that can cause goitre, particularly when dietary intake of iodine is low. Examples include certain glucosinolates which inhibit the synthesis of thyroid hormones and thiocyanates which inhibit uptake of iodide into the thyroid gland.

Goldenberries  Alternative term for cape gooseberries.

Gonyautoxins  Paralytic shellfish toxins which are sulfonated derivatives of saxitoxin and neosaxitoxin. Produced by Gonyaulax species (e.g. Gonyaulax catenella and G. tamarensis) and other red tide dinoflagellates. Responsible for paralytic shellfish poisoning in humans due to consumption of molluscan shellfish (clams, mussels, oysters and scallops) which filter feed on these dinoflagellates.

Good Manufacturing Practice  Part of quality assurance which ensures that products, including foods, are consistently produced to the quality standards appropriate to their intended use and as required by the marketing authorization or product specification. Often abbreviated to GMP. Concerned with both production and quality control. It contains the following ten principles: writing procedures; following written procedures; documenting for traceability; designing facilities and equipment; maintaining facilities and equipment; validating work; job competence; cleanliness; component control; and auditing for compliance.

Goose eggs  Eggs produced by geese. Consist of approximately 13.9% proteins and 13.3% fats, and weigh approximately 144 g. Have a high cholesterol content (more than 1200 mg/egg) and larger egg yolks than eggs produced by chickens. The richness of goose eggs means they are particularly well suited to use in desserts.

Goose livers  Livers from geese; part of edible offal. May be cooked using a variety of techniques including sautéing, grilling and frying. Also used to make pates or mousses. In France, the livers of geese that have undergone fattening by gavage are used to prepare foie gras. This has a richer flavour than that produced using duck livers.

Goose meat  Meat from geese. Goose meat is dark in colour and has a high fat content. Meat from young geese (goslings) is more tender and more expensive than meat from older birds. Wild goose meat has a much stronger flavour and is tougher than domesticated goose meat. In many European countries, goose meat is particularly popular at Christmas.

Gorgonzola cheese  Italian soft blue cheese made from cow milk. Mould is added to the cheese milk and after about 4 weeks of ripening spread of the mould is encouraged by piercing with thick needles. Ripening lasts 3 to 6 months and the finished cheese is

Goat milk cheese  Cheese made from goat milk. Usually has a slightly harsh and piquant flavour and aroma.

Goats  The common name given to a number of hardy, mainly domesticated ruminant mammals in the genus Capra. Goats are related closely to sheep. They are reared worldwide as a source of goat milk, goat meat, hair and hides. Different gender and age groups of goats are known as bucks or billys (adult entire males), does or ewes (adult females), goatlings (generally, sexually mature females to the end of their first pregnancy) and kids (generally, sexually immature animals which are less than one year old).

Goat yoghurt  Yoghurt made by fermenting goat milk.

Godulbaegi  Common name for Ixeris sonchifolia, used as a vegetable and component of kimchies in Korea. Also known as Korean lettuce.

Gofio  Powdered cereal product made by milling of toasted grain, including wheat, corn, barley, rye and mixtures of these cereals. Consumed widely in the Canary Islands, being served with milk at breakfast, mixed with soups, as an ingredient of main course dishes or in desserts, combined with honeys and almonds.

Goitre  An enlargement of the thyroid gland. A common cause of endemic goitre is iodine deficiency. Iodine is required for the synthesis of the thyroid hormones triiodothyronine and thyroxine, so when it is not available in the diet these hormones are not produced. In response, the pituitary gland releases thyroid stimulating hormone which causes hyperplasia of thyroid tissues. Prophylactic strategies include the use of iodized salt. May also be caused by other factors, including dietary goitrogens, hyperthyroidism, hypothyroidism or cancer.

Goitrogens  Compounds found in foods (especially Brassica spp., peanuts, cassava and soybeans) that can cause goitre, particularly when dietary intake of iodine is low. Examples include certain glucosinolates which inhibit the synthesis of thyroid hormones and thiocyanates which inhibit uptake of iodide into the thyroid gland.

Goldenberries  Alternative term for cape gooseberries.

Gorgonzola cheese  Italian soft blue cheese made from cow milk. Mould is added to the cheese milk and after about 4 weeks of ripening spread of the mould is encouraged by piercing with thick needles. Ripening lasts 3 to 6 months and the finished cheese is...
wrapped in foil to keep it moist. Flavour ranges from mild to sharp, depending on age.

Gossypol Yellow, potentially toxic phenolic substance composed of four benzene rings attaching to isopropyl, hydroxyl, aldehyde or ketone side chains. Occurs in some varieties of cottonseeds from which it is removed during the refining process for cottonseed oils.

Gouda cheese Dutch semi-hard cheese made from cow milk. Usually coated with yellow wax, mature cheese ripened for 18 months or more is coated with black wax.

Goulash A rich stew from Hungary. Usually made with meat and vegetables and highly seasoned with paprika.

Gourds Fruits of the family Cucurbitaceae containing mainly water, but a relatively good source of vitamin C and, in some cases, carotenes. Types include basil pears or bitter gourds, snake gourds, bottle gourds (grown mainly for the outer shell which is used as a container), wax gourds or ash gourds, and fig leaf or Malabar gourds. Eaten as a vegetable or used in pickles and curries.

Gourd seeds Seeds produced by plants belonging to certain members of the family Cucurbitaceae, which bear fruits that have a hard rind. Contain high quantities of oils and proteins. Potential sources of edible oils.

Gout A type of arthritis characterized by abnormally high levels of uric acid in the body as a result of overproduction or inadequate excretion by the kidneys. Over time, the uric acid forms crystals which are deposited in the joints, causing inflammation; this leads to characteristic symptoms including pain, swelling, redness and stiffness. While gout often affects the big toe, many other joints can be involved. A diet therapy approach may offer some benefit. Since uric acid is formed from the breakdown of purines, it may be advisable to limit foods rich in these compounds, such as offal, sea foods, beans, peas, etc. Alcoholic beverages are also thought to increase the risk of developing gout.

Gouter Light meal eaten in the afternoon in France, traditionally at the end of the school day. Usually includes some kind of bread with a sweet or savoury spread, and sometimes cake. Also called the fourth meal.

Gracilaria Genus of red seaweeds containing several species of high commercial importance, particularly as a source of agar, which has many uses in the food industry. Commercially cultivated in parts of Asia, South America and southern Africa.

Grading Establishing the degree or rank of an item within a scale. In the food industry, grading is the classification of a food by variables such as quality, size and colour.

Grain Collective name for seeds of cereals such as wheat, oats and corn.

Grain alcohols Spirits, commonly with a neutral flavour and aroma, made by distillation of fermented mashes derived from grain (commonly unmalted).

Grain amaranth Seeds produced by Amaranthus varieties cultivated as pseudocereal plants (also amaranth grain).

Grain borers Beetles regarded as pests of stored cereals and cereal products. Adult and larval forms of these insects are capable of boring holes in intact cereal grains and feeding on cereals and flour, while the larvae develop inside the grain. There are 2 major types, the lesser grain borer (Rhizopertha dominica) and the larger grain borer (Prostephanus truncates), which differ in size.

Graininess Consistency term relating to the extent to which a product is grainy, i.e. granular, sandy and gritty.

Gram negative bacteria Bacteria that, following staining with crystal violet, are decolorized by organic solvents (e.g. ethanol or acetone) but stain red with the counterstain (safranin) in the Gram stain procedure. Their cell walls are composed of a thin layer of peptidoglycans covered by an outer membrane of lipopolysaccharides.

Gram positive bacteria Bacteria that resist decolorization by organic solvents (e.g. ethanol or acetone) to retain their original purple crystal violet stain in the Gram stain procedure. Their cell walls are composed of a thick layer of peptidoglycans with attached teichoic acids.

Grams Alternative term for legumes.

Grana Padano cheese Italian hard grating cheese made from cow milk. Various types are made, including Grana Padano cheese. Most are aged for up to 4 years.

Granadillas Alternative term for passion fruits.

Grana Padano cheese Italian hard cheese made from unpasteurized cow milk. Similar to Parmesan cheese, with a hard, thick rind and a grainy, crumbly interior. Ripening lasts 12 to 48 months.

Granola Breakfast cereals composed of rolled oats mixed with dried fruits, brown sugar and nuts.

Granulated sugar Crystalline solid comprising at least 99.8% sucrose. Granulated sugar is produced by crystallization or graining of concentrated sugar
syrups and is the most pure form of sugar manufactured from sugar beets and sugar cane.

Granulation Processing of a food into small compact particles (granules). Granulators are often used in cane and beet sugar manufacture to remove unbound moisture from the sugar by driers and coolers. Moisture is removed in driers by blowing hot air through a stream of cascading sugar or through a bed of wet sugar.

Granules Small particles or grains. Starch exists as granules which are insoluble in cold water but form a viscous solution when heated. Some food ingredients and instant foods are provided in the form of dried granules, which are reconstituted with water before use or consumption.

Granulometry Technique for measuring particle or granule size distribution.

Grapefruit Citrus fruits (Citrus paradisi) formed as a hybrid of pomelos and sweet oranges. Cultivars may be white, pink or red fleshed and seedless or seeded. Contain less total sugar and vitamin C than some other citrus fruits and approximately 1% citric acid. Also contain the bitter compound naringin.

Grapefruit juices Fruit juices prepared from grapefruit (Citrus paradisi). Good source of vitamin C. Widely consumed as beverages, sometimes sweetened, due to their bitterness.

Grapefruit peel Outer skin of grapefruit. Used to make candied peel, as a garnish, or as an ingredient in bakery products and a range of dishes. Also used as a source of essential oils and pectins.

Grape jams Jams made from grapes, usually of specific varieties, e.g. Concord or Catawba.

Grape juice concentrates Grape juices which have been concentrated. May be diluted to produce reconstituted grape juices, or used in winemaking.

Grape juices Fruit juices extracted from grapes (Vitis spp., especially V. vinifera). May be drunk as beverages, or fermented to produce wines.

Grape marc By-products from wineries, comprising the pomaces remaining after grapes have been pressed and the musts separated.

Grape musts Grape juices, especially those to be fermented in winemaking.

Grape pomaces Residue, including grape skins and grape seeds, remaining after separation of musts from pressed grapes.

Grapes Seeded or seedless fruits produced by the genus Vitis, the most important species of which is V. vinifera. The majority are cultivated for production of wines, significant amounts also being grown as table grapes or for preparation of dried fruits (raisins, currants, sultanas); some are used to prepare grape juices. Contain 15-25% sugar as well as tartaric acid and malic acid, but little vitamin C. The skins of red and black varieties contain anthocyanins. Table grapes tend to have firmer flesh and lower acidity than winemaking grapes.

Grape seed oils Unsaturated oils extracted from grape seeds, large quantities of which are produced as by-products in winemaking, and the manufacture of grape juices and seedless raisins. Rich in palmitic acid, stearic acid, oleic acid and linoleic acid. Used in cooking.

Grape seeds Seeds or pips found in the centre of some types of grapes. Produced in large amounts as by-products of winemaking. Contain up to approximately 17% oil and 15% protein. Used as a source of grape seed oils and full-fat or defatted flour.

Grape skins Outer peel of grapes. Contain a number of flavonoids and phenols. Sometimes fermented along with the grape juices and grape seeds during winemaking to influence the flavour and colour of the finished product. Source of anthocyanins, which may be extracted and used as food colorants.

Grape spirits Spirits, such as brandy, derived from fermented musts based on grapes.

Grappa Italian spirits distilled from fermented musts of grape marc.

Grass carp Freshwater fish species (Ctenopharyngodon idella) distributed across eastern Europe and Asia. Flesh is not highly prized for flavour, but grass carp is extensively cultured as a food fish in some parts of Asia. Also known as white amur.

Grass peas Seeds produced by Lathyrus sativus. Eaten after boiling in water or used to make dhal. Flour is used to make chapattis, paste balls and curries. Rich in proteins and carbohydrates, but prolonged consumption can cause lathyrism, a neurological disease resulting in weakness or paralysis of the legs. Also known as chickling vetch.

GRAS status Designation awarded to food additives by the US Food and Drug Administration (FDA) to indicate that they are not considered to be a health risk for consumers. GRAS is an acronym for generally recognized/regarded as safe.

GRAS substances Food additives which have been granted GRAS status.

Grating Reduction of a piece of firm food, e.g. cheese or vegetables, to small shreds by rubbing on a coarse, serrated surface, usually a kitchen utensil called a grater.

Gravimetry Technique based on weighing of the sample. Examples of its use include weighing of a sample before and after heating to indicate the content of vola-
Gravity  In a broad sense, the gravitational force which acts on any object within the earth's gravitational field. Also, the attraction between two massive bodies. The force of gravity acting on a body is the weight of the body, and this is directly proportional to its mass. The centre of gravity of an object is the point at which the total weight acts. Specific gravity is a number equal to the ratio of a substance's weight to that of an equal volume of water.

Gravy  Sauces produced using fats and juices that exude from meat during cooking. A roux is produced from the meat fats and flour, then liquid (e.g. wines, cider, stocks) is added and the mixture is thickened by heating. Browning agents may also be added to colour the sauce if required.

Gravy granules  Instant foods in the form of free flowing granules that produce a ready to serve gravy when reconstituted with boiling water.

Gravy powders  Instant foods in the form of a powder from which a ready to serve gravy is produced on addition of boiling water.

Greasiness  Sensory properties relating to the extent to which a product is greasy, i.e. smeared or covered with grease, slippery or fatty, or is perceived to have a greasy quality in the mouth.

Great sturgeon  Alternative name for beluga.

Green beans  Type of common beans (Phaseolus vulgaris). Both pods and seeds are eaten. Also known as string beans, French beans and snap beans.

Green coffee  Coffee beans which have been fermented but not roasted.

Green fluorescent protein  Protein, commonly abbreviated to GFP. Originally isolated from jellyfish (Aequorea victoria), GFP produces green fluorescence with emission at approx. 509 nm when exposed to UV light of wavelength 395 nm. GFP or, more commonly, recombinant GFP, is used as a marker of cells, proteins and translation, which often involves transformation of cells with DNA encoding GFP or with DNA encoding fusion proteins comprising a protein of interest and GFP.

Greengages  Green plum-like fruits produced by Prunus italica or P. domestica. Eaten raw or cooked and used in jams and jellies. Relatively low content of vitamin C.

Green gram  Alternative term for mung beans.

Greenland halibut  Marine fish species (Reinhardtius hippoglossoides) of high commercial importance belonging to the family Pleuronectidae. Found in the Arctic, North Pacific and North Atlantic Oceans. Mar-
Groundnuts
Groundwater
Ground pork
Group of Grouper
Ground chicken
Growth promoters
Ground coffee
Coffee beans
which have been ground ready for use to prepare coffee beverages.
Groundfish
General name used for marine fish species which normally occur on or close to the sea bed, such as cod, flatfish, haddock, hake and pollock.
Ground meat
Alternative term for meat mince.
Groundnut oils
Pale yellow oils extracted from peanuts (Arachis hypogaea). Rich in palmitic acid, oleic acid and linoleic acid with good oxidative stability. Due to the desirable flavour, often used in cooking and as a substitute for olive oils and other edible oils. Also known as arachis oils or peanut oils.
Groundnuts
Alternative term for peanuts.
Ground pork
Alternative term for pork mince.
Ground turkey
Alternative term for turkey mince.
Groundwater
Water held in the soil or crevices in rocks, especially below the water table. May be treated and used as drinking water.
Grouper
Group of marine fish species of the genus Epinephelus belonging to the family Serranidae, some of which are of commercial importance. Widely distributed in the Atlantic and Pacific oceans. Marketed and consumed in a variety of ways.
Growth factors
Proteins involved in control of growth and differentiation of cells or organisms. Examples include epidermal growth factor, nerve growth factor, insulin-like growth factors and fibroblast growth factor. Levels of growth factors in serum can be affected by intake of specific foods such as soy products, with consequent effects on neoplastic transformation and bone metabolism.
Growth hormone
Alternative term for somatotropin.
Growth promoters
Organic compounds of plant and animal origin which stimulate growth. Plant growth promoters include a variety of plant growth regulators, such as auxins, gibberellins and cytokinins. Animal growth promoters include hormones, antibiotics and β-adrenergic agonists. Use of some animal growth promoters is banned in certain countries.
Growth stimulators
Alternative term for growth promoters.
Gruel
Thin, watery oatmeal porridge made by soaking oatmeal in water or milk before cooking. The solids can be removed before consumption.
Gruyere cheese
Swiss hard cheese made from unpasteurized cow milk. Rind is hard and dry with tiny holes. Texture is more dense and compact than that of Emmental cheese. Salted in brines for 8 days and usually ripened for 2 months at room temperature. Curing lasts for 3 to 10 months.
Guacamole
Dish made from mashed avocados mixed with lemon juices or lime juices (to prevent discoloration) and seasonings. Finely chopped vegetables are sometimes added. Eaten as side dishes, dips or sauces.
Guaiacol
Member of the phenols group. Guaiacol has an antiseptic or medicinal-type aroma and is present as one of the aroma compounds in beer, wines and whisky. Also occurs as a taint in fruit juices caused by bacterial spoilage, and is used as a substrate for analysis of peroxidases.
Guanidine
Strongly alkaline member of the organic nitrogen compounds, commonly used in the hydrochloride form for the denaturation of proteins. Synonyms include imino-urea and aminomethanamide.
Guanosine
Member of the nucleosides group, formed from guanine linked to a ribose molecule. Occurs as a component of nucleotides and nucleic acids. Often found as a mono- di- or tri-phosphate.
Guanosine monophosphate
Member of the nucleotides group, commonly abbreviated to GMP. Several chemical forms of GMP exist, including a cyclic form (cGMP) with a role in animal cell metabolism. Guanosine monophosphates, especially guanosine 5-monophosphate, are used in foods, particularly savoury foods, as flavour enhancers. GMP can be purified from yeast extracts or produced by fermentation of microorganisms. Also known as guanylic acid.
Guanylic acid
Alternative term for guanosine monophosphate.
Guarana
Paste made from seeds of the Brazilian plant Paullinia cupana. Contains methylxanthine alkaloids, and is used in flavourings and as a stimulant in soft drinks.
Guar beans
Seeds of Cyamopsis tetragonoloba. Immature pods are eaten as vegetables. Galactomannans are extracted from the seeds to make guar gums, which are used as stabilizers and thickeners in foods. Also known as cluster beans.
Guar gums

Guar gums are high viscosity gums isolated from ground endosperms of the legume Cyamopsis tetragonoloba, also known as guar beans or cluster beans. Composed of repeating (1→4)-β-D-mannopyranosyl units with branches of α-D-galactopyranosyl units linked via (1→6) linkages. Mannose:galactose ratio is 2:1. These gums are used as thickeners (thickening capacity is approximately 8-fold that of starch), stabilizers and emulsifiers in foods, e.g. in low fat foods and ice cream.

Guava purees

Smooth creamy preparation made from the flesh of guavas by sieving or reducing in a blender or liquidizer. Used as sauces or in preparation of products such as fruit juices, fruit nectars, bakery products, ice cream, yoghurt and jams.

Guava fruits

Produced by Psidium guajava. Variable in shape, with a yellow-green skin, and white to red flesh containing a great number of seeds. Good source of vitamin A and vitamin C (content of latter depends on cultivar and environment), and contains relatively high amounts of niacin and carotenes. Eaten fresh (sprinkled with lime juices) or canned; also used in various products, including preserves, jams and jellies, or made into guava juices or nectars.

Guinea fowl

The common name given to medium-sized, ground-dwelling African game birds of the sub-family Numidinae. Wild guinea fowl are hunted for their meat. In captivity, they are reared world wide to produce guinea fowl meat and guinea fowl eggs.

Guizotia

Genus of plants cultivated as an oilseed crop. The clear, edible oils produced from the seeds may be used in foods and are often used as substitutes for olive oils.

Gulabjamun

Popular Indian sweet prepared by addition of sugar or jaggery to khoa. Also called gulab-jamun.

Gum acacia

Dried exudates from African species of the genus Acacia, particularly varieties of A. senegal. Forms low viscosity aqueous solutions that are used as emulsifiers, thickeners, coatings for products such as jellies and chewing gums, and stabilizers for beer foams and flavourings. Synonym for gum arabic.

Gum arabic

Synonym for gum acacia.

Gum balls

Alternative term for chewing gums.

Gum confectionery

Collective terms for chewing gums and bubble gums and their products.

Gum ghatti

Moderate viscosity gums obtained as stem exudates from Anogeissus latifolia. Major components are arabinose, galactose, mannose, xylose and glucuronic acid in a ratio of 10:6:2:1:2. Used for the stabilization, emulsification, thickening and coating of foods and beverages.

Gum guaiac

Alcohol soluble gums obtained as a resin from Guajacum officinale or G. sanctum wood. Predominantly composed of α- and β-guaiaconic acids with guaiacic acid and vanillin. Primarily used as antioxidants.

Gum kondagou

Exudates of Cochlospermum gossypium, a tree native to India. Classified as a variety of karaya gums, although the gums do differ in composition, functional properties and physical properties. Used as a food additive and as a substitute for gum tragacanth.

Gums

High molecular weight polysaccharides that form viscous solutions or gels when dissolved or dispersed in a solvent, usually water. Obtained from plant exudates and seaweeds or produced as exopolysaccharides by bacteria. Gums have many applications in the food industry: low viscosity gums, e.g. gum arabic, are used as water binding agents for prevention of syneresis and as encapsulating agents for flavourings; medium viscosity gums, e.g. gum tragacanth and alginates, provide body and are useful emulsifying agents, e.g. in salad dressings; and high viscosity gums, e.g. guar gums and locust bean gums, are good thickeners and stabilizers and improve mouthfeel in reduced fat or low fat foods. Gel forming gums, e.g. carrageenan and gellan gums, are employed as gelling agents to produce semi-solid structures, e.g. in jellies or fruit fillings. They also improve freeze-thaw stability and thus are included as ingredients of ice cream and frozen desserts.

Gum talha

Product similar to gum arabic or gum acacia, but exudates are obtained from different species of the genus Acacia, including Acacia seyal and A. sieberana. Food uses include as emulsifiers, stabilizers and thickeners.

Gum tragacanth

Gums of medium viscosity obtained as exudates from Asiatic Astragalus spp. Used generally as thickeners, emulsifiers, stabilizers and texturizers in foods, and more specifically in sugarcraft to produce pastes from which floral decorations can be created for cakes.

Gur

Unrefined brown coloured sugar produced mainly in India by evaporation of sugar cane juices. Also known as jaggery.

Gurdani

Traditional Indian confectionery products made with Bengal gram meal which is deep fried.
Gurnard and coated with syrups produced by boiling sugar cane (jaggery).

Gurnard Any of a number of widely distributed marine fish species within the family Triglidae; also known as sea robins. Characterized by broad wing-like pectoral fins and long feelers under the front of the body. Generally, not highly valued as food fish, but many species are consumed, including Chelidonichthys gurnardus (grey gurnard), C. cuculus (red gurnard) and Trigla lucerna (yellow gurnard).

Gushing Phenomenon occurring in beer in which there is violent foaming when the bottles or barrels are opened. Associated with formation of calcium oxalate crystals in the beer and contamination of malting barley with Fusarium graminearum.

Guthion Alternative term for azinphos-methyl.

Gutting Removal of the internal organs of fish before cooking.

Gymnemic acid Member of the glycosides group which is present in the plant Gymnema sylvestre. Exhibits cariostatic activity and an inhibitory action on sweet taste perception.

Gyromitra Genus of fungi, one species of which (Gyromitra esculenta; false morel) was once considered safe for consumption when cooked. However, due to the toxicity of a constituent, gyromitrin, and its metabolites, eating the mushrooms cooked or raw can cause severe illness or death.

Gyromitrin Protoplasmic poison produced by certain species of false morel (Gyromitra esculenta and G. gigas). Ingestion causes a sudden onset of abdominal discomfort, severe headache, vomiting and sometimes diarrhoea. The liver is primarily affected, with disturbances to blood cells and the central nervous system.

Gyros A Greek meat product, consisting of spiced pork slices grilled on a vertically rotating spit, with a heat source at the side. Thin strips of cooked gyros are peeled from the continuously rotating spit. Often consumed in pita bread with salads and sauces.
**H**

H₂ Chemical symbol for elemental hydrogen gas.

HACCP Acronym for hazard analysis critical control point.

Haddock Marine fish species (*Melanogrammus aeglefinus*) from the cod family (Gadidae), distributed across the northeast Atlantic Ocean; an important commercial food fish. Has firm, white flesh with a mild flavour. Sold fresh, chilled as fillets, frozen, smoked (often called yellow fish) and canned. Also utilized for fish meal and animal feeds.

Haem Iron-containing compounds in which the iron is complexed in a porphyrin ring. Component of pigments such as haemoglobin, myoglobin and cytochromes. The iron atoms can bind oxygen in a reversible fashion or conduct electrons. Alternative spelling heme.

Haemagglutination Agglutination of erythrocytes by a variety of agents including haemagglutinins, lectins and viruses. The reaction is used as the basis for tests such as serological examinations and viral titration.

Haemagglutinins Substances that cause agglutination of erythrocytes (haemagglutination).

Haematin Member of the porphyrins group of pigments, containing an iron (III) ion and hydroxide counterion. Synonyms include ferriprotoporphyrin hydroxide and ferriprotoporphyrin IX hydroxide. Occurs as a precursor and breakdown product of haem in meat and meat products.

Haematococcus Genus of unicellular green microalgae of the family Haematococcaceae. Occur in rain water and freshwater rock pools. *Haematococcus pluvialis* is used in the commercial production of astaxanthin, which is used as an additive in feeds for salmonid fish and poultry to enhance their flesh colour.

Haemin Chlorinated form of haem derived from haemoglobin and related pigments. Present in raw and processed meat. Formation has been linked to increased lipid oxidation, and hence decreases in quality of fresh fish. Used in microbiological media as an iron source and to stimulate metabolism.

Haemocyanin Large oxygen carrier/storage protein found in the blood of molluscs and crustacea. Involved in the development of blackspot in prawns. Keyhole limpet haemocyanin is widely used as a carrier protein in the production of antibodies.

Haemoglobin Oxygen-carrying protein which is found in the blood of animals. Haem groups within the protein bind oxygen to form oxyhaemoglobin, which is carried to oxygen-depleted cells where the oxygen is released. Other inorganic compounds, including carbon dioxide, can also be bound by the haem groups. Alternative spelling hemoglobin.

Haemolysins Substances that destroy erythrocytes through damage or rupture of the cell membranes.

Haemolysis The lysis of erythrocytes, resulting in the release of haemoglobin into the surrounding fluid. May be caused by various haemolysins, such as toxic, antibodies or other immune factors, or by defects in the biological membranes of erythrocytes. Can lead to haemolytic anaemia.

Haemoproteins General term for haem-containing proteins, including haemoglobin, myoglobin, cytochromes, catalases and peroxidases.

Hafnia Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae. Occur in the gastrointestinal tract and faeces of humans and animals, and in water, dairy products, soil and sewage. *Hafnia alvei* may cause spoilage of refrigerated meat (especially vacuum packaged meat) and vegetable products, and can be an opportunistic pathogen of man.

Hagfish Marine fish species (*Myxine glutinosa*) of the family Myxinidae, similar in appearance to eels. Distributed worldwide in cold and temperate waters. Utilized primarily for its skin since the texture of its flesh is considered unacceptable by many people. However, the fish is eaten widely in Korea.

Haggis Scottish meat products, traditionally prepared by stuffing sheep stomachs with a mixture of seasoned sheep or calf offal (hearts, lungs and livers), suet, oatmeal, onions and seasonings. It is usually cooked by boiling or steaming.

Hairtail Marine fish species (*Trichiurus lepturus*) of high commercial importance belonging to the family Trichiuridae (suitlassfishes). Widely distributed in temperate and tropical waters throughout the world. Mar-
Hake  Any of a number of cod-like marine fish species within the genera Merluccius and Urophycis that occur in Atlantic and Pacific Oceans. Commercially important species include Merluccius merluccius (European hake), M. hubbsi (Atlantic hake) and Urophycis tenuis (white hake). Low fat white flesh has a distinctive flavour. Marketed fresh, frozen, smoked and in dried, salted and canned forms.

Halibut  A large marine flatfish species (Hippoglossus hippoglossus), which occurs in the northern Atlantic and Arctic Oceans. A highly valued food fish, which is marketed fresh, frozen, dried and canned; livers are an important source of fish oils. Has low fat, firm white flesh with a mild flavour. A Pacific halibut species (Hippoglossus stenolepis) also occurs. Cultured on a small-scale basis in some parts of north Europe.

Halomonas  Genus of aerobic, facultatively anaerobic, moderately halophilic, rod-shaped or pleomorphic Gram negative bacteria of the family Halomonadaceae. Occur in salt water environments and have been isolated from curing brines of meat products. Of biotechnological interest due to their use in biocatalysis, and their production of enzymes (e.g. proteinases), aroma compounds and exopolysaccharides of potential use in acidic foods. Some species are capable of denitrification, and have been used to remove nitrates from vegetables and vegetable juices during processing.

Halophiles  Organisms, especially plants and microorganisms, requiring an electrolyte, usually salt, for optimal growth, growing poorly or not at all in the absence or at low concentrations of the electrolyte. Characterised on the basis of amount of electrolyte required for growth as slight, moderate or extreme halophiles. Halophilic bacteria are found in marine and salty environments, and as contaminants of seafood, sometimes causing outbreaks of food poisoning. They include Vibrio, some Halomonas spp. and some lactic acid bacteria.

Halothane  General anaesthetic used to sedate or reduce stress symptoms in farm animals prior to handling or transport. Use in swine is discouraged, because genetically predisposed animals develop a potentially fatal condition known as malignant hyperthermia in response to the drug; often used specifically for assessing halothane sensitivity in swine.

Halothane sensitivity  Swine that react to halothane inhalation with malignant hyperthermia also show enhanced sensitivity to stress. Pork from these animals is likely to be affected by the pale soft exudative defect (PSE defect). Halothane sensitivity is one of many genetic disorders; halothane genotype (also known as porcine stress syndrome genotype) of swine may be nn (homozygous carrier), Nn (heterozygous carrier) or NN (homozygous normal). Assessment of halothane sensitivity has been used by the swine industry to rapidly and non-destructively identify stress susceptible animals; these animals are then excluded from breeding programmes with the aim of preventing further propagation of porcine stress syndrome and the PSE defect in breeding herds.

Halva  Aerated confectionery product made with crushed sesame seeds and honey. Also refers to a sweetened and flavoured traditional Indian sweet-
meat prepared from carrots, pumpkins or bananas. Also known as chalva or halawa.

**Halvarine** Low fat spreads which contain less than the normal level of fats found in margarines.

**Ham** Meat from the upper part (between the hip and hock) of swine hind-legs; usually it is cured. It may be cooked, raw, smoked or unsmoked, dried by mechanical means or by air drying, or stored in vacuum packaging. Common types include: whole leg ham on the bone; single-muscle ham; boiled ham; and baked ham. Some highly valued speciality hams are dry cured, including prosciutto crudo, jambon de Bayonne and serrano. However, more commonly, ham is cured by brining and then hung to dry before it is smoked, if applicable. There are many different styles of ham, often particular countries and regions within countries are well known for a particular style. Traditionally, the names of hams, for example Parma or Bayonne, refer to geographic localities and techniques developed there. Lean ham has a fairly low fat content, but even low salt ham has a high content of sodium.

**Hamanatto** Soy products prepared by fermenting whole soybeans with Aspergillus oryzae.

**Hamburgers** Round, flat patties of meat mince, cooked by grilling or frying. Hamburgers are typically prepared from meat mince with a 15-20% fat content. They are commonly eaten in bread rolls, served with lettuce, slices of tomatoes and onions, and tomato ketchups.

**Handling** Broad term referring to manipulation of goods during manufacture, distribution and storage, as well as control of live animals. Proper handling of sensitive foods, such as fruits and vegetables, frozen foods and refrigerated foods, is important from economic and hygienic perspectives. Robotic systems may be used for bulk handling of foods. Correct pre-slaughter handling of animals is important, as stress prior to slaughter can decrease meat quality.

**Hanseniaspora** Genus of fungi of the family Saccharomycodaceae whose anamorphs are Kloeckera spp. Occur on fruits and vegetables (e.g. grapes, tomatoes, strawberries and citrus fruits). A common genus of wild yeasts found in winemaking. Such wild yeasts can produce high quality, unique flavoured wines. However, certain species (e.g. Hanseniaspora uvarum and H. guilliermondii) may be responsible for spoilage of wines, grape juices and other fruit juices. Growth of Hanseniaspora in musts may be linked to the presence of sluggish fermentations.

**Hansenula** Obsolete genus of yeasts, the species of which have been reclassified into the Pichia genus.

**Happoshu** Japanese beer-like alcoholic beverage with a low malt content, typically <25%. Happoshu has a similar alcohol content to conventional beer, but the low malt content means a reduced price since the tax is governed by the amount of malt in the beverage.

**Hard cheese** Cheese with a high dry matter content. Usually aged for a number of years and pressed with weights during ripening to extract whey. An example is Parmigiano Reggiano cheese.

**Hardening** Making or becoming solid, firm and rigid. May be problematic or necessary e.g. common beans are susceptible to hardening during storage, giving problems for cooking, while the hardening stage is important in the manufacture of good quality ice cream. Hardening is also a stage in fats and oils processing, e.g. manufacture of margarines, usually referred to as hydrogenation and involving treatment with hydrogen.

**Hardness** One of the mechanical properties; describes the ability of solids to resist deformation. Relates to parameters such as strength, firmness, solidity, impenetrability, resistance, density, toughness, stiffness and rigidity. May also relate to water hardness, the extent to which water is perceived as being hard, i.e. containing high levels of minerals.

**Hard to cook defect** Irreversible condition that develops in legumes during storage at high temperature and under high humidity. Affected legumes absorb water during cooking but do not soften within a reasonable time.

**Hare meat** Meat from hares. Hare meat has a low content of fat, but domesticated hare meat has a higher fat content than wild hare meat. Collagen content is higher in wild hare meat. A simple visual test of fresh- ness of whole hare carcasses is examination for stiffness, impenetrability, resistance, toughness, and rigidity. May also relate to water hardness, the extent to which water is perceived as being hard, i.e. containing high levels of minerals.

**Hares** The common name given to a number of lagomorphs in the family Leporidae. Hares resemble and are closely related to rabbits. Wild hares are hunted and domesticated hares are farmed for their skins and hare meat.

**Haricot beans** Type of common beans (Phaseolus vulgaris). Mature haricot beans are used to prepare canned baked beans in tomato sauce.

**Harman** Harman (1-methyl-β-carboline) and the related compound norharman are pyridoindole derivatives formed during heating of tryptophan and tryptophan-rich proteins. Harman has been identified in cooked foods including fried and grilled meat and fish, and is known to display mutagenicity.
Hazard analysis critical control point

Hawthorn juices  Fruit juices prepared from
Havarti cheese  Danish semi-soft cheese made from
cow milk. A washed-rind cheese with irregular holes
Hawthorn fruits  Fruits produced by plants of the
genus Crataegus. Frequently used in preserves and jel-
lies. Fruits of some species have medicinal properties.
Also used in manufacture of juices.
Hawthorn juices  Fruit juices prepared from haw-
thorn fruits (Crataegus spp.).

Hazard analysis critical control point  Comprehensive systematic approach to identifying and mini-
mizing the occurrence of microbiological, physical and
chemical hazards, which can affect food safety and
quality during all stages of the food chain, including
processing operations and during subsequent stor-
age, distribution and retailing. Commonly abbrevi-
ated to HACCP.

Hazards analysis  Identification of areas within an
HACCP flow diagram, for the production of a food,
where unacceptable microbial, chemical or physical
health risks may occur.

Haze  Decreased visibility in the air or clarity of solu-
tions caused by suspended particles. In beer, haze can
develop as a result of chilling, when proteins are
precipitated. This can be prevented by chill proofing,
in which the proteins are absorbed or broken down by
enzymes.

Hazelnut oils  Clear nut oils extracted from hazel-
nuts, which are rich in oleic acid and have very little
aroma or flavour.

Hazelnuts  Nuts of the trees Corylus avellana and C.
maxima. Rich source of copper and vitamin E. Ker-
nels are eaten as dessert nuts and used in confection-
erity and other products. Also called cobnuts and fil-
berts.

HCB  Abbreviation for hexachlorobenzene.

HCH  Insecticide used for control of a wide range of
plant-eating and soil-dwelling insects on crops.
Also used for control of insect pests in food storage
facilities and as an ectoparasiticide in farm animals.
Classified by WHO as moderately hazardous (WHO
II). Also known as BHC, hexachloran and lindane.

HCL  Chemical formula for hydrochloric acid.

HDPE  Commonly used abbreviation for high density
polyethylene.

Headspace analysis  Technique for analysis of
volatile compounds in samples not suitable for di-
rect injection into a gas chromatograph. Samples are
heated in a closed chamber and the surrounding at-
mosphere is swept with a stream of inert gas, compo-
ents of the sample being collected for analysis by
GC-MS.

Health beverages  Beverages formulated with in-
gredients claimed to enhance the health of the con-
sumer and/or protect against diseases.

Health claims  Claims made by manufacturers about
the health benefits of their products. They form a part
of the consumer information, which is provided on
food labelling. Due to consumer concerns about
health, addition of health claims to labelling provides
manufacturers with a powerful tool for marketing
foods. Increasingly, regulations and legislation are be-
ing introduced to ensure that health claims are the re-
sult of appropriate scientific trials and are clear, mea-
surable and distinct from nutrition claims.

Health foods  Loosely defined term usually taken to
encompass foods perceived as healthy by the con-
sumer, such as organic foods, natural foods,
whole grain cereal products, royal jelly and energy
foods.

Health hazards  Microbial, chemical or physical ele-
ments which may cause injury to health.

Healthy eating  Consumption of a well-balanced diet
that includes a wide variety of foods and provides an
optimal supply of nutrients. Can promote health and
wellbeing and protect against the development of a
range of diseases.

Hearts  Hollow muscular organs composed of cardiac
muscle; animal hearts are a part of edible offal. They
are often inexpensive because they lack popularity, al-
though in some cultures they are considered to be deli-
cacies. Lamb and calf hearts are tender and have a very
delicate flavour. They are generally cooked by saute-
ing or grilling until they are medium rare, or are
cooked slowly using moist heat. Cattle and swine
hearts are generally too tough to be cooked by sauteing
or grilling, but become very tender if cooked slowly
using moist heat.

Heat distribution  The extent to which heat energy is
transmitted throughout an item during thermal proc-
cessing. Non-uniform distribution of heat during proc-
cessing can lead to non-uniform destruction of target
microorganisms, which could compromise product
safety. Heat distribution studies are therefore crucial to
ensuring effective heat treatment of the product.
Heaters  Devices used for raising the temperature by heating.

Heat exchangers  Devices that transfer heat between fluids on either side of a barrier without bringing them into direct contact. In many engineering applications, heat exchangers are used to increase the temperature of one fluid while cooling the other. Boilers, evaporators, superheaters, condensers and coolers may all be considered heat exchangers. Heat exchangers are manufactured with various flow arrangements and designs. The simplest is the concentric tube or double-pipe heat exchanger, in which one pipe is placed inside another; the fluids run in parallel flow and heat is transferred through the wall of the inner tube. A heat exchanger can also be operated in counterflow. The most common type is the shell-and-tube design, which utilizes a bundle of tubes through which one of the fluids flows; the tubes are enclosed in a shell in which the other fluid flows. Here, the free fluid flows approximately perpendicular to the tubes containing the other fluid, in a cross-flow exchange.

Heating  Treatment of an item to make it hot or warm, most commonly by conduction, convection or radiation. Used to modify the properties of a material.

Heat resistance  Thermophysical properties relating to the ability of materials, especially microorganisms, to withstand various temperatures of applied heat. Acquired heat resistance of bacteria such as Listeria can cause food safety problems.

Heat shock proteins  Proteins that are synthesized by an organism in response to the stress of a sudden rise in temperature. May be necessary for survival of the organism at high temperatures. May be produced in response to other stresses, e.g. exposure to UV radiation. Also called stress proteins and heat stress proteins.

Heat stability  Thermophysical properties relating to the ability of materials to maintain stability when subjected to various temperatures of applied heat. If food ingredients or additives are heat stable, it is possible for them to be used successfully in products which have to be thermally processed. Synonymous with thermal stability.


Heat transfer  Exchange of heat energy between a system and its surrounding environment, resulting from a temperature difference between the two. The energy exchange occurs by thermal conduction, mechanical convection, or electromagnetic radiation.

Heat treatment  Alternative term for heating.

Heavy metals  Collective term for metals of high atomic mass. Includes the minerals mercury, cadmium, chromium, lead, nickel and arsenic. Common pollutants of land and water, generally as a result of industrial activity, and are consequently present as contaminants in plant and animal foods, where, if present in excess, they may cause toxicity problems. Maximum permitted levels have been defined for heavy metals in specified food groups to ensure food safety.

Heifers  Young, usually sexually mature female cattle, especially those that have not borne a calf, or have borne only one calf. The term is generally used until the end of an animal's first lactation.

Helianthinin  Multi-subunit 11S protein which is the major storage protein in sunflower seeds (Helianthus annuus). Dissociates to its monomer (2S) form via a trimeric (7S) intermediate.

Helicobacter  Genus of motile, microaerophilic, spiral-shaped Gram negative bacteria of the family Helicobacteraceae. Can be found in the intestinal tract of mammals, including humans. Able to thrive in the acidic mammalian stomach by production of large quantities of urease. Helicobacter pylori is a human gastric pathogen, and is suspected of being the causative agent of surface gastritis and peptic ulcers in the duodenum, and of being associated with some forms of stomach cancer. Believed to be transmitted orally, either by ingestion of faecally contaminated food or water, or by oral-oral contact.

Helminthosporium  Genus of filamentous fungi of the phylum Ascomycota. Species include both saprophytes and those parasitic to cereal crops (e.g. rice, oats, barley and corn) and fruits (e.g. apples and pears).

Helminths  Parasitic worms which include flukes, tapeworms and nematodes, especially those found in the intestines of vertebrates.

Hemicellulases  Glycosidases that hydrolyse the hemicelluloses of plants (which include polymers of hexoses (glucose, rhamnose or mannose) and pentoses (xylose and arabinose), as well as plant mucins). These enzymes have numerous applications in the food industry, including processing of fruit juices, fruits and vegetables, winemaking, brewing, breadmaking and extraction of vegetable oils.

Hemicelluloses  Polysaccharides tightly associated with lignin in cell walls of all plants and some seaweeds. Composition of hemicelluloses differs between plants and is influenced by environmental factors, and plant growth and maturation. Predominant sugars present are: D-xylose, D-glucose, D-galactose, D-mannose, L-arabinose, D-glucuronic acid, D-galacturonic acid, L-rhamnose, L-fucose and 4-O-methyl-D-glucuronic acid.
acid. Hemicelluloses are produced as waste from processing of cereals and other crops. Hemicelluloses or hemicellulose hydrolysates (mixtures of oligosaccharides and saccharides produced by enzymic, acid or alkali hydrolysis) are used as substrates for microbial fermentations. They are also a source of dietary fibre.

**Hemp** Common name for Cannabis sativa, parts of which are used in the food industry. Hemp seeds are used as the source of edible oils, and in the same way as cereals in foods, while flowers and inflorescences are used in making beer-type beverages.

**Hemp seeds** Seeds from the plant Cannabis sativa which contain approximately 30% oils. These edible oils may be of potential use in functional foods. Seeds are often used in food supplements and in the same way as cereals in foods, and are a source of thiamin.

**Hen meat** Meat from female chickens. Often, hen meat is derived from spent hens, which have completed a period of egg laying. Spent hen meat is commonly used as an ingredient in chicken sausages and in restructured meat products, such as chicken nuggets.

**Hens** The common name given to mature female birds of several species, particularly to chickens and other domestic fowl (usually >18 months old, having completed their first laying period).

**Hepatitis** Inflammation of the liver which can be a result of infections or non-infectious pathology. Certain causes of infection, such as hepatitis A viruses, can be borne in foods and water supplies.

**Hepatitis A viruses** Hepatitis viruses transmitted through contaminated foods and water and by person-to-person contact. Common vehicles include untreated drinking water and ice, and ready to eat foods. Food- and waterborne transmission is most common in developing countries.

**Hepatitis E viruses** Hepatitis viruses mainly transmitted through contaminated drinking water, although foodborne transmission can also occur. Outbreaks often occur after contamination of water supplies by sewage, e.g. after heavy rainfall.

**Hepatitis viruses** Viruses labelled A to E, of the Hepatovirus genus and Picornaviridae family, that cause inflammation of the liver (hepatitis). Hepatitis A and E viruses can be transmitted through faecal contamination of food or water.

**Hepatotoxicity** Quality or property of having a poisonous or destructive effect on liver cells.

**Hepatotoxins** Toxins that act specifically or primarily on the liver.

**Herpessviruses** Enveloped DNA viruses of the family Herpesviridae. Occur in humans and cold-blooded vertebrates and invertebrates. Usually transmitted through contact.

**Heptachlor** Non-systemic organochlorine insecticide used for control of termites, ants and soil-dwelling insects in a wide range of crops. Classified by WHO as moderately hazardous (WHO II).

**Heptachlor epoxide** Primary degradation product of the insecticide heptachlor. Occurs more commonly in animal tissues than does the parent compound.

**Heptadecanoic acid** Carboxylic acid with 17 carbon atoms, member of the saturated fatty acids, with a melting point of 59-61°C. Synonyms include margaric acid, mararic acid and n-heptadecylic acid. Occurs as a free fatty acid and lipid component of animal fats and vegetable fats.

**Heptanoic acid** Member of the saturated fatty acids with seven carbon atoms. Important in the flavour and aroma of many foods and beverages, including beer, wines, tea, fruits and cereal products.

**2-Heptanone** A methyl ketone and one of the important flavour compounds in foods, especially cheese and other dairy products.

**Heptenal** Aldehyde identified in a variety of foods. Several isomers exist and have been associated with fishy or boiled potato-like aroma.

**Herbal beverages** Beverages in which herbal material is a significant source of flavour and/or active ingredients.

**Herbal tea** Alternative term for herb tea.

**Herbicides** Chemical substances used to kill or inhibit growth of unwanted plants, such as around crops. Most are applied as sprays and have either a systemic or contact effect. Examples of herbicides commonly applied to crops include atrazine, diuron, glyphosate and propanam. Residues remaining in foods and the environment can represent a health hazard.

**Herbs** General term for flowering plants, parts of which are used predominantly as flavourings rather than as foods.

**Herb tea** Tea-type infusion beverages prepared from dry plant material other than tea leaves (Camellia sinensis).

**Hericium erinaceus** Species of edible fungi used for medicinal purposes in China. Thought to have antioxidative activity, hypolipaemic activity and hypoglycaemic activity.

**Heritability** The capacity to be transmitted from one generation to another. The hereditary or genotypic variance expressed as a percentage of the total variance in the feature examined.

**Cannabis sativa** Common name for hemp, species of the plant Cannabis sativa, and include cannabis, cannabinoids, hemp seeds and hemp oil.
Hexachlorobiphenyl

Flavanone glucoside found in Hesperidin

Herring

Generally refers to the marine fish species Clupea harengus, an abundant fish caught in huge numbers in the North Atlantic and North Pacific Oceans. May also be used as a general name for several small pelagic marine fish species within the family Clupeidae. A wide range of herring products are marketed, including kippers (smoked herring) and salted, cured, dried and canned herring.

Hesperidin

One of the flavonones. Abundant in citrus fruits and citrus juices as the glycoside form hesperidin. Has antioxidative activity and anti-inflammatory activity.

Hesperin

Flavanone glucoside found in citrus fruits, the aglycone component being hesperetin.

Heterocyclic amines

Amines with a cyclic molecular structure containing atoms of at least two different elements in the ring or rings. Formed particularly in meat and fish during grilling or frying. Some are of concern because of their mutagenicity or carcinogenicity.

Heterocyclic aromatic amines

Heterocyclic amines containing ring structures with conjugated double bonds and delocalized electrons. Formed particularly in meat and fish during grilling or frying. Some are of concern because of their mutagenicity or carcinogenicity.

Heterocyclic compounds

Organic compounds having a closed chain or ring which contains more than one type of atom. Commonly include nitrogen, sulfur or oxygen atoms in place of carbon atoms. Examples include aniline, heterocyclic amines, lactones and pyrazines.

Hexachloran

Alternative term for the insecticide HCH.

Hexachlorobenzene

Selective organochlorine fungicide which has been used in fumigants for control of common bunt and dwarf bunt in wheat. A persistent organic pollutant which has been subject to the Stockholm Convention on Persistent Organic Pollutants and banned in various countries. Risk of bioaccumulation and toxicity are particularly high in aquatic species. A suspected carcinogen and classified by WHO as extremely hazardous (WHO Ia). Commonly abbreviated to HCB.

Hexachlorobiphenyl

One of the polychlorinated biphenyls (PCB) used for a variety of industrial purposes, including manufacture of capacitors, transformers, plasticizers, adhesives, pesticide extenders, paints and water-proofing compounds. Although use has been discontinued since 1977, it is very persistent in the environment. Associated with the yusho food poisoning incident (caused by ingestion of rice oils contaminated with PCB on the Japanese island of Kyushu in 1968).

Hexachlorophene

Organochlorine compound, 2,2'-methylenebis(3,4,6-trichlorophenol), with disinfectant activity.

Hexadecanoic acid

Straight chain, C16 member of the saturated fatty acids, synonym, palmitic acid. A major component of animal fats and vegetable fats. Synthetic precursor of several unsaturated fatty acids.

Hexadecenoic acid

A C16, straight chain member of the monounsaturated fatty acids containing one double bond. Most common forms include the 9Z-isomer (synonym, palmitoleic acid) and the 11Z-isomer, but 3E-, 6E-, 6Z- and 9E-isomers are also found. Occurs as a component of animal fats and vegetable fats.

Hexanal

Member of the aldehydes group of aroma compounds, synonym caproaldehyde. Imparts a green, fruity aroma in many foods, but also occurs as a fatty acid oxidation product in lipid-containing foods where it is associated with rancidity.

Hexane

Non-polar alkane hydrocarbon with the molecular formula CH₃(CH₄)₂CH₃. Widely used for extraction of fats and oils, and also used analytically as an inert solvent.

Hexanoic acid

Synonym for caproic acid or capronic acid. A C6 member of the carboxylic acids (fatty acids) family of aliphatic compounds. Contributes to the flavour and aroma of many foods, including cheese.

Hexanol

A C6 alcohol which occurs as a flavour and aroma component in many foods and beverages.

Hexenal

C6 aldehyde with one double bond. Several isomers are found in foods, including trans-2-hexenal and cis-3-hexenal. Associated with green, fresh aroma characters and occurs in many fruits and other foods and beverages.

Hexokinases

EC 2.7.1.1. Kinases that catalyse the transfer of a phosphate group from ATP to d-hexoses to form d-hexose 6-phosphates. Glucose, mannose, fructose, sorbitol and glucosamine can act as acceptors. Hexokinases are ubiquitous in nature, catalysing the first step of glycolysis. Used in a variety of analytical applications including measurement of glucose, fructose, mannose, ATP and creatine kinases. Since they allow for measurement of glucose in the
Hexosamines Amino sugars comprising six carbon atoms. Examples include glucosamine and galactosamine.

Hexoses General term for sugars comprising six carbon atoms, e.g. glucose, mannose, galactose, fructose, sorbose and tagatose.

Hexyl acetate One of the aroma compounds. This ester makes a major contribution to the flavour of various fruits, particularly pears, apples and strawberries, as well as cider and wines. Widely used in flavourings, providing fruity and green notes. Demonstrates antibacterial activity against food pathogens such as Salmonella Enteritidis, suggesting a potential application in natural preservatives.

Hexylamine One of the biogenic amines, identified in milk, cheese and sake.

4-Hexylresorcinol One of the phenols, this inhibitor of catechol oxidases is used to control enzymic browning of fruits, and melanosis in shrimps and other crustacea.

Hg Chemical symbol for mercury.

Hickory nuts Nuts produced by trees of the genus Carya, the most popular of which are pecan nuts, produced by C. pecan. Common hickory nuts are small with a very hard shell and are produced by the shagbark hickory tree (C. ovata); these are used in bakery products, often as a substitute for pecan nuts.

Hickory smoke Natural flavourings produced by extraction of condensed smoke produced by burning of wood from hickory trees (Carya spp.).

High amylose corn starch Starch manufactured from hybrid corn plants that have been selected for the high amyloses.amylopectins ratio of their starch. Amylose content in high amylose corn starch is usually ≥55%. Due to the high amylose content, the starch produces firm gels on heating.

High calorie foods Any foods that have a high calorie content in relation to bulk, such as peanut butter or chocolate syrup. Also includes dietary foods and energy foods which have been specifically manufactured to have increased calorific values. These are designed for weight gain and may be targeted at individuals with specific nutritional requirements, e.g. athletes, invalids, low birth-weight infants. Lightweight, calorie-dense foods are also used as space flight foods and military rations.

High density lipoproteins Plasma lipoproteins that transport cholesterol from body tissues (including arterial walls) to the liver where it can be metabolized and eventually excreted. High concentrations are thought to be associated with decreased risk of cardiovascular diseases since they accelerate the clearance of cholesterol from the blood, thus reducing the risk of cholesterol deposition in arterial walls which leads to atherosclerosis. Conversely, low levels are associated with increased risk of cardiovascular diseases. Often abbreviated to HDL.

High density polyethylene Polyethylene of high-density grade. Used as a packaging material in many food and beverage applications. Commonly abbreviated to HDPE.

High fat diet A diet that has a high content of fats in comparison to a standard or typical diet. The type of fat consumed is of particular importance for health owing to the different roles fats play in the body. In general, a diet high in saturated fats is associated with an increased risk of developing cardiovascular diseases, while a diet high in ω-3 fatty acids is associated with a reduced risk.

High gravity brewing Brewing process in which worts of higher than normal concentration are fermented, and the resulting high-concentration beer is diluted to normal beer strength.

High performance liquid chromatography Column chromatography technique with a liquid mobile phase in which high column inlet pressure, narrow bore columns and small particle size stationary phases are used to achieve rapid separation. Usually abbreviated to HPLC. Can be applied to separation of a wider range of compounds than is possible with gas chromatography. Also called high pressure liquid chromatography.

High pressure liquid chromatography Alternative term for high performance liquid chromatography.

High pressure processing Nonthermal preservation technique used to inactivate vegetative microorganisms in foods by isostatic pressure pasteurization (1000-9000 atmospheres). High pressure processing affects only noncovalent bonds, enabling phase transitions, permeabilization of biological membranes, denaturation of proteins, gelatinization of proteins and starch, increasing reaction rates, and compacting of materials. Bacterial spores are considerably more resistant to high pressure processing than vegetative or germinating cells.

High protein diet A diet that has a high content of proteins in comparison to a standard or typical diet. An example is the Atkins diet, which is one diet therapy approach for body wt. loss or maintenance that is based on the principle of severely restricting carbohydrates intake.

Hilsa Fish species (Tenualosa ilisha) from the herring family that is distributed around the northern part of
the Indian Ocean. Migrates into river systems during part of its life cycle. Popular food fish in India. Marketed fresh or as a dried/salted product. Sometimes spelt hilsah.

**Hilsah** Alternative spelling for hilsa.

**Himegai** Japanese name given to mussels.

**Hiochi bacteria** Japanese term for *Lactobacillus* spp. which can grow at alcohol concentrations greater than 15% and cause spoilage, particularly of sake.

**Hippuric acid** Member of the organic acids, synonyms include N-benzoyl glycine, benzoylamino acetic acid and benzamido acetic acid. Contributes to the flavour of several dairy products, including cheese, yoghurt and kefir. Often converted to benzoic acid during microbial fermentation.

**Hispanico cheese** Spanish semi-hard cheese made from raw or pasteurized cow milk, or a mixture of cow and ewe milk.

**Histamine** One of the biogenic amines, synonym 2-(4-imidazolyl)ethyl amine. Formed by decarboxylation of histidine. Present naturally in a wide range of foods, including yeast extracts, cheese, red wines and fish. Histamine poisoning (scombroid poisoning) has occurred after consumption of fish (commonly mackerel, tuna and bonito) due to the presence of high levels of histamine as a result of microbial spoilage. Histamine is potentially toxic at high levels, and is not destroyed during cooking. Symptoms of histamine toxicity include violent headaches, flushing, rashes, sweating, cramps and diarrhoea.

**Histidine** One of the non-essential amino acids, occurring in animal and plant proteins. Precursor of histamine.

**Histidine decarboxylases** EC 4.1.1.22. Decarboxylases which convert L-histidine to histamine. Production of histamine in foods and beverages by bacteria can result in spoilage and may represent a serious health problem.

**Histochemistry** Study of chemical components of cells and their distribution by means of chemical reactions. Methods used include microscopy, radiography and chromatography.

**Histology** Study of the microstructure of cells.

**Histones** Group of low molecular weight, basic nuclear proteins found in eukaryotes, which are involved in packaging of nuclear DNA into chromatin. Histones are commonly rich in lysine or arginine residues.

**Hizikia** Genus of seaweeds including the edible species *Hizikia fusiforme*; a dried form of this seaweed is used as a food ingredient in Japan and other parts of Asia.

**H₂O₂** Chemical formula for hydrogen peroxide.
cells. The cells are used to store honeys, and insect eggs and larvae.

**Honeydew honey** Honeys produced from honeydew, a sweet substance secreted by plant lice usually onto trees, e.g. beech honeydew, which is gathered by honeybees. Honeydew honeys are considered to be of inferior quality to honeys produced from nectar.

**Honeydew melons** Melons (*Cucumis melo*) which when ripe have a creamy skin colour and pale green, juicy, sweet flesh. Tend to be large and have a long shelf life. A source of vitamin C, potassium and some trace minerals.

**Honeys** Natural syrups produced by honeybees predominantly from nectar but also from honeydew and fruit juices. Honey consists of approximately 20% (w/w) water and 80% sugars, mostly fructose and glucose. Honeys also contain the flavour compounds and aroma compounds present in the nectar or fruit juices collected, composition of which is dependent on its botanical origin, and it is these minor components that give honeys their individual flavour. Honeys are collected from honeycombs, where they are stored, and may be used directly as both foods and sweeteners.

**Hop essential oils** Essential oils prepared from hops (*Humulus lupulus*). Major components present are the bitter acids humulones and lupulones, and a terpenoid, humulene. The highest concentrations of flavour compounds are contained in the lupulin glands of hop leaves, thus lupulin essential oil is used as a concentrated source of hop flavour for beer brewing.

**Hop extracts** Extracts of the active ingredients (α-acids, β-acids, resins, essential oils) of hops. Used in brewing.

**Hop pellets** Hops which have been comminuted and compressed into pellets. Used in brewing.

**Hoppers** Large containers for grain, typically those that taper downwards and discharge their contents through valve-like openings at the base. In general, used as temporary receptacles for grain.

**Hopping** Process used in brewing. It is the addition of hops to fermenting worts to impart flavour and bitterness. Hops may also be added to the finished beer (dry hopping) to enhance hop flavour.

**Hops** Dry cones of the hop plant (*Humulus lupulus*). Used as flavourings and bittersing agents in beer.

**Hop substitutes** Substances used in place of hops to impart flavour and bitterness in beer. Required particularly in situations where climatic and economic considerations prohibit the use of conventional brewing materials, e.g. in Nigeria where malted or unmalted sorghum has been used instead of malted barley to produce lager. Materials which have been used successfully as hop substitutes include seeds from *Garcinia kola* and extracts from bitter leaf (*Vernonia amygdalina*).

**Horchata** Spanish beverages made from aqueous extracts of *chufa nuts* (*Cyperus esculentus* tubers).

**Hordein** Prolamin found in barley.

**Hordenine** One of the biogenic amines. Found in germinated barley, sorghum and millet, and in malt and beer.

**Hordeum** High molecular weight complex of anthocyanins and polyphenols formed during ethanolic fermentation of uncooked barley bran. Exist as purple pigments at low pH values.

**Hordothionins** Antifungal proteins which occur in barley kernels.

**Hormones** Organic compounds which, in higher animals, are synthesized in minute quantities by the organs of the endocrine system and transported in the bloodstream to their target tissues which they stimulate. In plants, production is limited to specific locations and the compounds elicit their effects locally. The term also refers to regulatory compounds in lower animals and to synthetic growth promoters. Feeding hormones to animals can increase their productivity, but may lead to the accumulation of residues in foods obtained from them. This practice is therefore banned in some countries.

**Horse beans** Type of faba beans (*Vicia faba*).

**Horse gram** Seeds produced by *Dolichos biflorus*, used as a pulse crop in India, where it is also known as kulthi. In Burma, dry seeds are processed in a similar manner to soybeans to make fermented sausages.

**Horse mackerel** Name given to a number of marine fish species from the mackerel family (*Carangidae*) within the genera *Trachurus* and *Decapterus*. Important species include *Trachurus trachurus* (Atlantic horse mackerel), *T. japonicus* (Pacific horse mackerel) and *Decapterus macarellus*. Marketed fresh and frozen, dried-salted, smoked and canned. Also known as jack mackerel and scad.

**Horse meat** Meat from horses. Horse carcasses have a high dressing out percentage. Other benefits of horse meat include rapid ageing post-slaughter, good tenderness, low contents of fats (with high proportion of unsaturated fatty acids) and cholesterol, and high contents of proteins and iron. When freshly cut, horse meat is dark red or bluish in colour, but, after several hours, it develops a rusty colour. Aroma of the meat is sweet. It is not marbled with fat. Often, the intermuscular fat resembles beef fat, but some horse meat has yellow, soft and greasy fat. Large amounts of horse meat are eaten in continental Europe.
Hot dogs

of

Hot boning

Cutting

that are served to patients in

Horticultural products

Fruits produced by various members of the Capsicum genus. Vary in size, shape and colour, but always with numerous seeds. Very pungent, due to the presence of capsaicin in the seeds and veins. Include chillies. Rich in vitamin A and vitamin C; good source of vitamin E, potassium and folic acid. Used as a dried powder in many dishes, such as starch jelly. Sun dried leaves are also used to prepare traditional beverages, e.g. hsian tsao tea. Leaf extracts exhibit antioxidative activity and antimitagenicity.

Horse milk

Milk produced by horses. Also called mare milk.

Horseradish Common name for Armoracia rusticana, vegetables of the Brassicaceae family. Spices of horseradish root have a pungent flavour and are used as flavourings, e.g. of horseradish sauce, a traditional accompaniment to roast beef in the UK. Distillates from horseradish root possess antimicrobial activity. Source of horseradish peroxidases.

Horses Herbivorous, solid-hoofed, quadruped mammals belonging to the Equidae family; there are several species, including Equus caballus. Both domesticated and wild horses are used for the production of horse meat.

Horticultural products Products of horticulture, such as fruits, vegetables and flowers.

Horticulture Cultivation of fruits and vegetables for human consumption, and of flowers and other plants for ornamental purposes. Practiced on a small scale as a pastime (gardening) or on a larger, commercial scale (also market gardening).

Hospital meals Meals that are served to patients in hospitals. They are formulated to provide the nutrients that patients need for recovery.

Hot boning Cutting of meat (muscle) from animal carcasses that have first been conditioned at 16°C for varying time periods post mortem.

Hot dogs Hot frankfurters served in long, soft bread rolls, with added mustard, tomato ketchups or other condiments. Hot dogs are particularly popular in the USA.

Hot peppers Fruits produced by various members of the Capsicum genus. Vary in size, shape and colour, but always with numerous seeds. Very pungent, due to the presence of capsaicin in the seeds and veins. Include chillies. Rich in vitamin A and vitamin C; good source of vitamin E, potassium and folic acid. Used as a dried powder in many dishes, such as stews, and to make hot sauces.

Hotrienol Member of the terpenoids, synonym 3,7-dimethyl-1,5,7-octatrien-3-ol. Aroma constituent present in several plants, including elderflowers.

Hot water dips Treatment used to protect fruits and vegetables from conditions such as chilling injury, pests infestation and decay during cold storage.

HPLC Abbreviation for high performance liquid chromatography.

HPTLC Abbreviation for high performance thin layer chromatography. Separation procedure with several advantages over conventional thin layer chromatography, including rapid analysis time, reduced costs per unit sample, simpler sample preparation, greater resolving power per unit distance, ability to run several samples in a single analysis, and, in some cases, the ability to view the same chromatograms with several wavelengths of light to give more complete profiles. Frequently used to analyse components of plant foods, such as herbs, spices, essential oils and coffee beans. Also used to detect acrylamide in drinking water.

H₂S Chemical formula for hydrogen sulfide.

Hsian-tsao Common name for Mesona procumbens, a perennial plant that grows in the foothills of Taiwan. Used in Taiwan to prepare certain foods and beverages. Alkali extraction of the leaves yields a gum (ionic heteroglycan) which is used in making desserts, e.g. starch jelly. Sun dried leaves are also used to prepare traditional beverages, e.g. hsian tsao tea. Leaf extracts exhibit antioxidative activity and antimitagenicity.

H₂SO₄ Chemical formula for sulfuric acid.

HTST pasteurization High temperature, short time (HTST) pasteurization treatment used widely in the food industry, but particularly applied to liquid foods such as raw milk and fruit juices to reduce substantially the total bacterial count for improved shelf life and to eliminate any pathogens. For milk, heat treatment is accomplished using plate heat exchangers. Cold raw milk held in a cool storage tank is pumped into pasteurizers, where it is heated to a temperature of at least 72°C. The milk, at pasteurization temperature and under pressure, flows through the holding tube where it is held for at least 16 seconds. At the end of the tube is an accurate temperature-sensing device that checks if any of the heated milk has not reached the pasteurization temp. If any milk has not, a diversion device is activated, and the product is made to flow back through the heat exchanger. Properly heated milk continues to flow through the system and is cooled to 4°C or less. Cold, pasteurized milk passes through a vacuum breaker then on to a storage tank filler for packaging.

HTST processing Alternative term for HTST pasteurization.

Huckleberries Berries produced by plants of the genus Gaylusacia, commonly G. baccata. Resemble blueberries in appearance, but have harder seeds inside, a thicker skin and slightly more astringent fla-
Humilacche

Parasitic fungus (*Ustilago maydis*) that infects ears of corn, causing kernels to swell and darken. It is an edible fungus and was originally consumed only in Mexico, though huililacche is now considered as a delicacy internationally. Flavour is a cross between those of *corn* and *mushrooms*. Sold canned and frozen, it may be used in any dish which calls for cooked mushrooms. Also known as corn smut, maize mushroom and cuiitlacoche.

Hulling Removal of the *hulls* from *fruits* or *seeds* prior to consumption. Also called *dehulling* or *husking*. Also, removal of leaves from the tops of *strawberries* prior to consumption.

Hulls The outer (usually fibrous) coverings of some *fruits* or *seeds*, that are removed by *hulling* prior to consumption. Also known as husks or shells.

Hulupones Oxidation products of *β-acids* found in *hops* and hop products.

Human genetic disorders Genetic disorders that occur in the human population. Includes diseases caused by gross chromosomal abnormalities or mutations in individual chromosomal genes or *mitochondrial* DNA. Also includes more complicated disorders such as cardiovascular diseases, cancer, obesity and diabetes which can result from interactions between mutations in a number of genes and environmental factors, including diet.

Human immunodeficiency viruses Retroviruses also known as HIV which are responsible for the disease acquired immunodeficiency syndrome (AIDS) in humans. There is concern over the risk of virus transmission to infants from infected mothers during breast feeding.

Humanized milk Milk in which the nutrients composition is adjusted to that of human milk as far as possible, making it suitable for feeding to infants.

Human metabolism Chemical reactions that occur in the cells of humans by which nutrients (e.g. from foods) are used for energy production or tissue growth. It involves two major processes: catabolism and anabolism. Catabolism involves the breakdown of nutrients into smaller units, with the release of energy. Anabolism is concerned with the construction of larger, more complex molecules from smaller units to create cellular material and tissues; this process requires energy.

Human milk Milk produced by women during human lactation. Composition differs considerably from that of cow milk. Although fat contents of human and cow milks are similar, fatty acids composition varies. Human milk contains less protein than cow milk; proportions of individual *proteins* and *amino acids* also differ. Contents of *lactose*, *oligosaccharides* and some *vitamins*, and activities of some *enzymes* are higher in human than in cow milk, while human milk contains a lower amount of *minerals* in total. Also called breast milk or mothers’ milk.

Human milk substitutes Preparations for feeding to infants and young children as a replacement for human milk, designed to meet their specific nutritional requirements. Also called *infant milk formulas*. May be based on cow milk or soymilk.

Human physiology The science of the physical, biochemical and mechanical functions of the human body, its organ systems and its individual cells.

Humectants Ingredients added to increase or maintain the water activity of foods. Examples of humectants include, *gums*, which possess water binding activity, and *NaCl, glycerol and sucrose*, which increase water activity by altering the osmotic pressure of foods.

Humic acids Complex organic acids of polyphenolic structure formed in soils and peat which can form adsorption complexes with minerals. Present in many natural water sources, requiring removal during purification for *drinking water* production.

Humicola Genus of fungi of the class Hyphomycetes. Species may produce various enzymes, e.g. *cellulases* (*Humicola insolens*), *lipases* (*H. lanuginosa*) and *acid proteinases* (*H. lutea*).

Humidification Process whereby the level of moisture in the air is increased. By circulating air of higher humidity, the moisture content of hygroscopic products can be increased. This process, known as conditioning, is applied to some grain prior to *milling* or other processing.

Humidity Moisture content of the atmosphere. Relative humidity (abbreviated to RH) is the moisture content of the air at a given temperature as a percentage of the level required to cause saturation at that temperature.

Humous Dish made from *chick peas* pureed with garlic, lemon juices and olive oils or sesame oils. It may also contain *tahini*. Served as *dips*, often accompanied by *pita bread*, or *sauces*. Alternative spellings include hummus, hoummos and homous.

Humulene Sesquiterpene aroma compounds present in essential oils of *hops*.

Humulinc acid Intermediate product in isomerization of *humulones* to *isohumulones* during boiling of hopped *worts* or manufacture of isomerized hop extracts.

Humulones Fractions of the *α-acids* group of *bitter compounds* in *hops* and hop products. Important *bitter compounds* in hops and *beer*.
Hunger A physiological need to eat. Hunger is also an extreme form of appetite that occurs as a consequence of food deprivation.

Hurdle technology Food processing technique employing a combination of preservation procedures or hurdles to inhibit growth of microorganisms in the product. These include manipulation of factors such as temperature, water activity and acidity, as well as processes such as gas packaging and high pressure processing. The aim is to interfere with several different mechanisms within microorganisms simultaneously. This multi-targeted approach allows effective use of mild techniques.

Hurum Expanded waxy rice product consumed especially in India. Preparation involves soaking, parboiling and flaking of waxy rice, addition of fat and expansion in sand.

Husbandry The breeding, care and cultivation of crops and animals. It may also include the management and conservation of plant or animal resources.

Husking Removal of the husks from fruits or seeds prior to consumption. Also called dehulling or hulling. Also relates to the removal of husks from the tops of strawberries prior to consumption.

Husks The outer (usually fibrous) coverings of some fruits or seeds, that are removed by husking prior to consumption. Alternatively, the circle of leaves on the tops of strawberries where they were attached to the plants. Also known as hulls or shells.

Hyacinth beans Alternative term for lablab beans.

Hyaluronic acid Non-sulfated polysaccharide and one of the glycosaminoglycans. Present in microorganisms and in animals, where it is distributed widely throughout connective, epithelial and neural tissues. Obtained from microbial sources and meat processing wastes. Used in health foods, particularly those for skin and joint health, and also in medicines and cosmetics. Synonyms include hyaluronate or hyaluronan.

Hybridization Formation of double-stranded nucleic acid molecules by base-pairing between complementary single-stranded molecules. Used to detect specific sequences and for determining the degree of sequence identity, and can be carried out in solution or with one component immobilized on a suitable matrix (e.g. nitrocellulose). Hybrids can be detected by EM or by labelling one of the components, e.g. fluorescently or radioactively. Hybridization can also be performed in situ using fluorescently-labelled DNA molecules (fluorescence in situ hybridization) to localize genes to specific chromosomes.

Hybrids The offspring of two parents differing in at least one genetic characteristic (trait). Also, heteroduplex DNA or DNA-RNA molecules.

Hydnocarpus Genus of tree, the seeds of which are used to obtain an oil which contains palmitic acid and small quantities of phytosterols.

Hydnum Edible fungi, the most commonly consumed species being Hydnum repandum (Dentinum repandum). Best eaten cooked as it is bitter when raw.

Hydration The degree to which a food contains water or the process by which water is added to a food to increase its moisture content. Addition of water in this way to dried foods, in order to restore them to their original state, is called rehydration or reconstitution.

Hydration status Level of hydration (relating to the balance of fluid and electrolytes) in the body. Approximately 50-70% of body wt. is made up of water, which varies depending on age and gender. Fluid balance is affected by the amount of water obtained from foods, beverages and metabolism, and the amount lost in the urine, faeces, skin and lungs. Insufficient intake or excessive loss (e.g. due to diarrhoea, vomiting, burns or increased physical activity) of fluids can lead to dehydration. Proper hydration is particularly important for athletes and is associated with enhanced exercise performance. A variety of sports drinks are available which aim to restore fluid and electrolyte balance during increased physical activity.

Hydrocarbons Any organic compounds that contain only carbon and hydrogen.

Hydrochloric acid Solution of hydrogen chloride gas in water, chemical formula HCl. Strong mineral acid widely used in the food industry as a processing aid.

Hydrochlorofluorocarbons Organic compounds (abbreviated to HCFC) consisting of carbon, hydrogen, chlorine and fluorine. HCFC are effective refrigerants and are less destructive to the ozone layer than chlorofluorocarbons (CFC). They replaced CFC when they were banned, but are now being phased out themselves, as specified by the amended Montreal Protocol.

Hydrocolloids High molecular weight polymers of animal, plant or microbial origin that form viscous solutions or gels on addition of water, e.g. gums and gelatin.

Hydrocooling Precooling method for heat sensitive products, such as certain fruits and vegetables. During hydrocooling, fruits and vegetables are cooled by direct contact with flowing cold water, which absorbs heat directly from the produce. Hydrocooling allows the grower to harvest produce at optimum maturity with greater assurance that it will reach the consumer
Hydrogen azide

Hydrogenation

Hydrogenated fats

Hydrocyanic acid

Hydrogen cyanide

Hydrocyanic acid

Hydrolysis

Hydrocyclones

Hydrofluorocarbons

Hydrogen

Hydrogenated fats

Hydrogenation

Hydrogen azide

Hydrogen cyanide

Hydrolysis

Hydrolysis

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Hydrolysis
or **alkalies**, acting at specific points within the molecules. Types of hydrolysis include **proteolysis**, in which **proteins** are broken down to component **peptides** or **amino acids**, **lipolysis**, in which **lipids** are broken down into constituent **fatty acids**, and **saponification**, in which lipids are hydrolysed in the presence of alkalies to form soaps.

**Hydrometry** Measurement of specific gravity of a liquid or strength of **alcoholic beverages**. Usually performed using a sealed graduated tube weighted at one end, which sinks in the liquid to a depth that indicates the specific gravity.

**Hydroperoxide lyases** Lyases involved in production of **flavour compounds** in higher plants. Cleave 9- and 13-hydroperoxides of **linoleic acid** and **linolenic acid** into volatile C6- or C9-aldehydes and C12- or C9-oxoacids, respectively. The C6- and C9- **volatile compounds** are useful for production of natural food **flavourings**.

**Hydroperoxides** Organic compounds in which one hydrogen atom of a hydrocarbon is replaced by an -O-OH group. Lipid hydroperoxides are formed by **lipooxygenases** during oxidation of lipids and these are further degraded enzymically or thermally to produce acids and aldehydes which can be associated either with **flavour** and **aroma** development or with decreases in lipid quality in **fats** and **oils**.

**Hydrophobicity** State in which a substance has low affinity for water. Extent to which molecules are insoluble in water.

**Hydroponics** Cultivation of plants in a nutrient solution rather than soil.

**Hydroquinone** Member of the **phenols** group of aromatic compounds with **antioxidative activity**. Synonyms include 1,4-benzenediol, p-dihydroxybenzene and quinol. Occurs naturally in several foods and beverages, including **fruits**, **vegetables**, **grain**, **coffee**, **tea** and **beer**. Can also include any member of the aromatic p-diols derivable from p-quinones or any compound with a quinol nucleus.

**Hydrothermal processing** Application of heat and moisture treatments, such as steam infusion processes used for **cooking**, **puffing** or **flaking** of foods.

**Hydroxides** Compounds containing hydroxyl (OH-) groups. Examples include the salts **sodium hydroxide** and **calcium hydroxide**, which are also known as **alkalies**. Widely used in the food industry in processing and **cleaning** applications.

**Hydroxybenzoic acid** Crystalline derivative of **benzoic acid** containing one hydroxyl group per molecule. **Esters** of p-hydroxybenzoic acid (parabens) are used as **food preservatives** and artificial **flavourings**.

**Hydroxybenzoic acid esters** Esters of alcohols (usually methanol, ethanol or propanol) and p-hydroxybenzoic acid. Uses include as **preservatives** in foods and cosmetics. Also known as **parabens**, e.g. methylparaben and ethylparaben. In 2004, **propylparaben** was excluded from the list of permitted food additives in the EU, due to concerns over possible **oestrogenic activity**.

**3-Hydroxy-2-butanoic acid** One of the short chain fatty acids, with four carbon atoms. Synonym, hydroxybutanoic acid. Not widely identified as a lipid component of foods, but does occur in an esterified form as an aroma compound in **sake** and **cheese**. 3-Hydroxybutyric acid has been used as a marker for fertile incubated **eggs** in which the embryo has died, and which are not permitted to be used in foods.

**Hydroxycinnamic acid** One of the aromatic **phenols** widely distributed in plant foods including **fruits** and **cereals**, and plant-derived **beverages** including **fruit juices**, **wines**, **whisky** and **sake**. Three isomers exist, including 4-hydroxycinnamic acid (synonym **coumaric acid**). Also more widely used as a general term to describe hydroxy-substituted forms of **cinnamic acid**, including **ferulic acid** (4-hydroxy-3-methoxycinnamic acid) and **caffeic acid** (3,4-dihydroxycinnamic acid).

**Hydroxydicarboxylic acid** One of the aromatic **phenols** composed of two carboxyl groups, the most common naturally occurring form being **caffeic acid**.

**Hydroxylation** A form of **modification** in which hydroxy (OH-) groups are added to molecules. Can be used to alter or improve the functional properties of food **proteins** and to convert **aroma compounds** into different variants.

**5-(Hydroxymethyl)-2-furaldehyde** A **tricarboxylic acid**, molecular formula C6H8O8. Found mainly in **fruits** belonging to the genus **Garcinia**. Putative antiobesity agent and therefore used in **health foods** targeting obesity.

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**Hydroxymethylfurfural** Member of the heterocyclic **organic compounds** composed of a furan ring with aldehyde and hydroxymethyl substituents. Found as a natural component in **honeys** and as a thermal breakdown product of **sugars** in heat-treated products such as **UHT milk**.
Hydroxyproline

and pasteurized fruit juices. Often determined chemically as a marker of nonenzymic browning.

Hydroxyproline  Member of the amino acids with eight possible structural isomers, of which only the L-isomers are known to occur naturally. Found in several animal proteins including collagen and gelatin, and in extensin, a plant protein.

3-Hydroxypropionaldehyde  Member of the aldehydes and has the chemical formula C\textsubscript{3}H\textsubscript{6}O. Produced by Lactobacillus reuteri and is also known as reuterin. Exhibits antimicrobial activity against Gram positive bacteria, Gram negative bacteria, Saccharomyces cerevisiae and other microorganisms. Can be used as a preservative of fermented foods inoculated with L. reuteri. Precursor of acrolein.

Hydroxyproplylation  A form of modification often used to alter the structure, rheological properties and functional properties of food starch.

Hydroxypropylcellulose  Non-ionic ether of cellulose that forms a viscous liquid when solubilized in water. Uses in foods include as emulsifiers, stabilizers, encapsulating agents and thickeners.

Hydroxypropylmethylcellulose  One of the celluloses used as food additives (E464). Can be added to foods as thickeners, stabilizers, emulsifiers and as a dietary fibre. Compared to cellulose, shows improved solubility in water.

Hydroxystearic acid  A C18 member of the fatty acids family of aliphatic compounds, synonym hydroxystearamic acid. Produced in microbial biosynthetic conversions of oleic acid as an intermediate in the formation of lactones.

5-Hydroxytryptamine  Chemical name for serotonin. A biogenic amine which may occur in foods. In the body, functions as a neurotransmitter, and is toxic at excessive concentrations.

Hydroxytyrosol  One of the phenols with high antioxidative activity and attributed with health benefits including a cardioprotective effect. Synonym 3,4-dihydroxyphenylethanol, and molecular formula C\textsubscript{8}H\textsubscript{10}O\textsubscript{3}. Found mainly in olives and can be recovered from wastes and effluents generated during extraction of olive oils.

Hygiene  Science of health and its preservation, or a practice or condition that is conducive to the preservation of health.

Hygienic quality  Extent to which something is clean and sanitary (i.e. free from pathogens and filth).

Hygrometers  Instruments used to measure the humidity of the atmosphere.

Hygromycins  A group of aminoglycoside antibiotics produced by Streptomyces hygroscopicus. Hygromycin B is used to control parasitic worm infections in swine and poultry. It also kills bacteria, fungi and higher eukaryotic cells by inhibiting protein synthesis. Exhibits relatively poor antibacterial activity, but is effective as one of the aminoglycosides.

Hygroscopic properties  Extent to which a substance absorbs moisture from the atmosphere without dissolving in the moisture. Highly hygroscopic substances, e.g. silica gels, can be used as desiccants.

Hyperactivity  Abnormally heightened excitability. A symptom of a range of conditions including ADHD (attention deficit hyperactivity disorder), a psychiatric disorder characterized by inattention, restlessness and impulsiveness. Links have been proposed between ADHD and consumption of refined sugar and food additives, particularly colorants. The UK Food Standards Agency has suggested that parents may choose to avoid giving foods and beverages containing sunset yellow FCF, quinoline yellow, carmoisine, allura red, tartrazine and ponceau 4R to children showing signs of ADHD.

Hypercholesterolaemia  Condition in which abnormally high levels of cholesterol are present in the blood. A high cholesterol level is a known risk factor for coronary heart diseases and stroke. Blood cholesterol levels may be controlled by diet or functional foods containing cholesterol-lowering constituents, such as stanol esters.

Hyperlipaemia  Group of diseases characterized by elevated levels of plasma lipids, such as cholesterol or triacylglycerols. Dietary factors that have been proposed to reduce hyperlipaemia include a favourable dietary profile of fatty acids, increased dietary fibre content, consumption of soy proteins and isoflavones, and use of functional foods, such as spreads enriched with phytosterols, and probiotic foods.

Hypermarkets  Very large self-service shops selling foods and household goods, and sometimes clothing.

Hypertension  Prevalent disease in which blood pressure is elevated. In the majority of cases the cause is unknown; a rare cause is excessive consumption of liquorice rich in glycyrrhizic acid. High blood pressure is a risk factor for other diseases such as cardiovascular diseases and has been shown to be improved by reduction in body mass index. The association between hypertension and consumption of salt is controversial.

Hyphae  Genus of palms. Fruits of some species are eaten or made into beverages.

Hypoallergenic foods  Foods that exhibit reduced or no allergenic activity, which makes them particularly suitable for consumption by individuals with aller-
Hypochlorites to certain food components. Several methods show potential for the preparation of hypoallergenic foods, including selective breeding of crops that contain a reduced quantity of certain allergenic proteins, genetic engineering of crops to remove allergenic components, and degradation or denaturation of allergens through enzymic proteolysis or thermal processing. Hypoallergenic foods may also be produced by substituting allergenic ingredients with non-allergenic ingredients. Examples include gluten free foods and low lactose foods.

Hypochlorites Salts of hypochlorous acid (HClO), such as sodium hypochlorite. Widely used as disinfectants.

Hypcholesterolaemic activity Ability of a food, nutrient or diet to produce hypocholesterolemia, a state wherein blood cholesterol level is abnormally low, or to lower high cholesterol levels (as in hypercholesterolaemia) to within the normal range. Reduction of blood cholesterol levels are associated with reduced risk of cardiovascular diseases. Dietary components possessing hypcholesterolaemic activity include dietary fibre, some plant proteins, some fatty acids, phytosterols and probiotic bacteria. Included as a specific type of hypolipaemic activity. Alternative spelling hypocholesterolemic activity.

Hypoglycaemic activity Ability to reduce blood glucose levels. Foods and food components possessing hypoglycaemic activity may have use for prevention, management or treatment of certain conditions that are characterized by elevated blood glucose levels, such as diabetes mellitus.

Hypolipaemic activity Ability of a food, nutrient or diet to reduce the fasting and/or postprandial levels of plasma lipids, including cholesterol and triacylglycerols. Reductions in certain plasma lipid parameters, such as fasting levels of total cholesterol and cholesterol within low density lipoproteins (LDL), and postprandial triacylglycerol concentrations, are associated with reduced risk for cardiovascular diseases. Dietary components demonstrating hypolipaemic activity include certain fatty acids, phytosterols and phytosterol-enriched margarines, probiotic bacteria and dietary fibre fractions.

Hypoxanthine Member of the purines group, synonym 6-hydroxypurine. Combines with ribose to form inosine, one of the ribonucleosides. Produced as a breakdown product from adenine nucleotides, and is often determined as a marker of freshness in fish. Used in combination with xanthine oxidases in a chemical assay for free radical scavenging activity.

Hyssop Spices from Hyssopus officinalis. Hyssop has a warm, camphor-like aroma and a warm, sweet and slightly burning flavour.
IAA  Abbreviation for indol-3-ylacetic acid.

Iberian ham  A variety of high-quality, dry cured ham, traditionally produced in the Iberian peninsula (Spain and Portugal). These hams are usually produced from Iberian or Iberian x Duroc swine. Traditionally the hams are subjected to long periods of ageing, during which intense enzymic action helps to develop their distinctive flavour. Increasingly, however, shorter curing periods are being used to reduce costs; this practice results in reduced flavour intensity of the product. Iberian ham of a superior quality is produced from swine fed on acorn-based feeds.

Ice  Solid form of water, used for numerous food processing applications, including chilling and glazing of foods (e.g. fish). Small pieces of ice, e.g. ice cubes or crushed ice, may be added to beverages to cool them, while flavoured ice is consumed in the form of ice lollies and water ices. Ice crystal characteristics play an important role in determining the quality of frozen foods.

Ice cream  Frozen dairy product with creamy, smooth and crystalline consistency. In addition to milk and dairy products (such as cream, milk powders, butter and sweetened condensed milk), also contains sugar, flavourings and additives (such as emulsifiers and stabilizers). The ingredient mix is processed in an ice cream freezer where it is frozen by contact with the refrigerated wall, blades scraping the mixture from the walls while whipping air into the ice cream. The soft-serve ice cream produced can be hardened further by placing in a suitable freezing apparatus.

Ice cream bars  Confectionery snack products containing ice cream covered with chocolate or other coatings. May be stick novelties, wafer products or cone products.

Ice cream cones  Thin, slightly sweetened wafers baked on a waffle iron and curled before cooling to form a cone shape. Used to hold one or more scoops of ice cream.

Ice cream mixes  Commercial products used in manufacture of ice cream. Contain all the main components of the final product, including milk, cream, sugar, flavourings and emulsifiers.

Ice cream wafers  Thin, slightly sweetened, waffle-textured wafers that are usually triangular or rectangular and served as an accompaniment to ice cream or used to make an ice cream sandwich.

Iced coffee  Chilled coffee beverages.

Iced tea  Chilled tea beverages.

Ice lollies  Portions of ice cream, flavoured water ices or coated ice cream products. Generally served on a stick.

Ice milk  Low-fat ice cream.

Ice nucleation activity  Promotion of the formation of ice crystals. Agents displaying ice nucleation activity include small particles, such as food particles, and large molecules, such as ice nucleating proteins.

Ices  Term sometimes used for ice cream.

Ice wines  Sweet dessert wines prepared from winemaking grapes which have been allowed to freeze, traditionally on the vine. The grapes are hand picked and pressed while still frozen, producing highly concentrated grape musts which are rich in acids, sugars and aroma compounds. Produced mainly in Germany (where this wine is known as eiswein) and Canada, but also in a range of other countries.

Icings  Toppings, usually for cakes and biscuits. Basic formulations for icings consist of icing sugar mixed with water. Other ingredients that may be used include butter/margarines, egg whites and colorants.

Icing sugar  Powdered granulated sugar used as an ingredient of fondants and icings that require sweetness and a smooth texture. Anticaking agents, usually starch or tricalcium phosphate, are commonly added to icing sugar.

ICP-AES  Abbreviation for inductively coupled plasma atomic emission spectroscopy.

ICP-MS  Abbreviation for inductively coupled plasma mass spectroscopy.

ICP-OES  Abbreviation for inductively coupled plasma optical emission spectroscopy.

IDF  Abbreviation for International Dairy Federation.
Idiazabal cheese  Spanish hard cheese made from unpasteurized ewe milk. Has a compact but not crumby texture and characteristic smoky flavour.

L-Iditol 2-dehydrogenases EC 1.1.1.14. Dehydrogenases which catalyse the interconversion of L-iditol and L-sorbose, although they can also act on D-glucitol (giving D-fructose) and other closely related sugar alcohols. Useful in the analysis of sorbitol. Also known as sorbitol dehydrogenases.

Idli  A steamed, naturally fermented cake-type product widely consumed as a breakfast food or snack in India. Prepared by fermenting a slurry of ground rice and legumes (usually black gram dhal) and steaming the resulting batters to give products with a soft, sponge-like texture and good digestibility.

Ika shiokara  Traditional Japanese sea foods, consisting of squid flesh fermented with squid liver contents and salt.

Illipe butter  Naturally occurring vegetable fat derived from nuts of various species of the genus Shorea (illipe nuts). Shows similar fatty acids composition and melting profile to cocoa butter and is thus used in cocoa butter substitutes.

Illipe nuts  Nuts produced by various species of the genus Shorea, which yield fats (illipe butter) with similar properties to cocoa butter.

Image analysis  Analysis of a sample on the basis of its structure, as determined by non-destructive techniques such as microscopy. Parameters of interest in the image can be both classified and quantified using the human eye or computer programs.

Image processing  Technique that can be used with image analysis in which the image of the sample is processed in some way to make it easier to perform further interpretation. Thus, the image quality is improved but no analysis or quantification is performed.

Imaging  Analytical techniques used to produce images of objects or substances which will allow their structure to be studied. Includes magnetic resonance imaging and thermal imaging.

Imazalil  Systemic fungicide which inhibits ergosterol biosynthesis. Used to control a wide range of fungal diseases on fruits and vegetables. Particularly active against fungal strains resistant to benzimidazole. Also used as a seed dressing for control of fungal diseases affecting cereals. Classified by WHO as moderately hazardous (WHO II).

Immobilization  Process of absorption, by soaking up a liquid.

Imidacloprid  Widely employed systemic insecticide. A chlorinated analogue of nicotine used for control of chewing and sucking insects (e.g. aphids, thrips, some beetles and soil-dwelling insects) in cereals, fruits and vegetables. Classified by WHO as moderately hazardous (WHO II).

Imidan  Alternative term for the insecticide phosmet.

Imidazoles  Heterocyclic compounds containing a 5-membered imidazole ring with two nitrogen atoms. These organic nitrogen compounds are present in histidine, histamine and imidazole alkaloids, and imidazole, a weak base, has been used in the extraction of fats, proteins and polysaccharides for chemical analysis.

Imitation cheese  Product with the appearance and sensory properties of cheese, but which is different from genuine cheese in composition. May be based on soybeans rather than milk.

Imitation crab meat  Product resembling flesh from crab legs which is actually derived from flesh of marine fish (usually a mild-flavoured fish such as pollock). The fish is processed by rolling ‘sheets’ of fish and adding colorants to give the required appearance; crab sticks or flaked imitation crab meat are commonly produced. The resulting product is lower in cholesterol than real crab meat.

Imitation cream  Product with the appearance and sensory properties of cream, but which differs from genuine cream in composition. Usually prepared with vegetable proteins and vegetable fats as substitutes for milk-based components. Also called non-dairy cream.

Imitation dairy products  Substitutes for dairy products, with vegetable-based components (often soy products) usually replacing all or part of the milk constituents. Products have the appearance and sensory properties of dairy products, but differ in composition. Nutritional properties of the imitation products may not match those of the dairy products they are intended to replace. Commonly produced types include imitation cheese, imitation milk and imitation cream.

Imitation foods  Alternative term for simulated foods.

Immersion freezing  The preservation of foods by immersion in very cold liquids such as liquid nitrogen. This process is particularly useful for cooked foods such as meats; their surface temperature is rapidly reduced to slow or stop cooking, which causes steam emission to cease and moisture to be retained.

Immobization  Process by which microbial, plant and animal cells, and macromolecules (e.g. enzymes) are attached to solid surfaces or entrapped within gels. They can then be used in applications such as bioconversions and biotransformations, affinity chromatography and biosensors.
Immunoelectrophoresis Immunochemical analysis

Immunological techniques

Immobilized cells Microbial, plant and animal cells that have been attached to solid surfaces or entrapped within gels. Can be used in bioconversions not possible with isolated enzymes and in biosensors. Entrapment is the most commonly used method for immobilization; gels used include agar, alginites, carrageenans, polyacrylamides and polyurethane.

Immobile enzymes Enzymes that have been attached to solid surfaces or entrapped within gels. Immobilization methods include covalent attachment or ionic binding to solid carriers or supports (e.g. cellloses, synthetic polymers and DEAE-cellulose), cross-linking with bifunctional reagents, encapsulation (e.g. in liposomes) and entrapment within gels. Immobilized enzymes often offer a number of advantages over free enzymes, such as ease of reuse and increased stability.

Immune response Reaction of the body to foreign substances (antigens). Antibodies produced by lymphocytes in response to the antigens can destroy the antigens directly or label them in a way that makes them susceptible to attack by white blood cells. White blood cells specific to the antigens (T-cells) may also be produced. Synonymous with immunological response.

Immunofluorescence Immunological techniques in which antibodies labelled with a fluorescent dye are used to detect antigens in the samples.

Immunogenicity Extent to which a substance can cause an immune response. Affected by a number of factors, including nature of the substance, dose and previous exposure of the host.

Immunoglobulin A One of the 5 major classes of immunoglobulins, commonly abbreviated to IgA. Produced predominantly against ingested antigens, and found in external secretions of mammals, such as saliva, sweat and tears. Also present in colostrum, providing a valuable source of immunity for suckling animals and infants. Provides local immunity against infection in the gut or respiratory tract, preventing attachment of microorganisms to epithelial cells.

Immunoglobulin E One of the five major classes of immunoglobulins; commonly abbreviated to IgE. Helps to protect against parasitic infections. On binding antigens, IgE molecules trigger histamine release from circulating leukocytes. Following sensitization, however, these antibodies can also be involved in the pathogenesis of certain food allergies, known as type I hypersensitivity reactions, which include anaphylaxis.

Immunoglobulin G The most abundant of the major classes of immunoglobulins in the bloodstream; commonly abbreviated to IgG. Produced by B lymphocytes following previous exposure to a given antigen.

Immunoglobulins Proteins (commonly abbreviated to Ig) also known as antibodies, which are produced by white blood cells in response to foreign antigens. Capable of binding the antigens as part of the body's immune response. There are 5 main classes of immunoglobulins (IgG, IgE, IgM, IgA and IgD), each of which has distinct roles in the immune system.

Immunoglobulin Y One of the biologically active substances found in hen egg yolks. This class of immunoglobulins exhibits antibacterial activity against a wide range of bacteria. Uses include as a therapeutic agent, in immunological techniques and potentially in food preservatives.

Immunological effects Influence of exposure to a substance on a body's immune system.

Immunological response Alternative term for immune response.

Immunological techniques Analytical techniques in which antigens are detected using specific antibodies. Include agglutination tests, ELISA, radioimmunoassay, immunoelectrophoresis and immunodiffusion.
Immunology Science concerned with the way in which the body reacts to foreign substances. Includes immunity, components of the immune system and diagnosis of disease.

Immunomagnetic separation Immunological techniques in which a substance is separated from a sample using magnetic beads coated with specific antibodies. After allowing interaction of the beads with the analyte of interest, they are removed from the sample using a magnetic particle separator. Often used as an enrichment stage in isolation and detection of microorganisms.

Immunomodulation Process of influencing the functioning of a body's immune system.

Immunotherapy A form of therapy that may be used to treat allergies, such as those to foods, pollen and mites. The idea is to stimulate the immune system with gradually increasing doses of the allergens to which the person is allergic. This will have the effect of reducing the immune response to these substances when encountered in the future (hyposensitization).

IMP Abbreviation for inosine monophosphate.

Impala Swift-running, medium-sized, graceful antelopes (Aepyceros melampus). Impala are hunted for their meat.

Impedance Opposition to the flow of current in an electrical circuit.

Impellers Devices for driving an item forwards, employed in food processing.

Impingement drying Drying technique originally used for paper and textiles but more recently applied to foods. Gas jets are arranged in such a way that the gas, e.g. superheated steam or hot air, impinges perpendicularly on the food to be dried. The gas is directed at high velocity, removing moisture from the surface of the food. Processing time is reduced compared with that required for other types of drying.

Imports Goods or services that are produced abroad but purchased for use in the domestic economy.

Improvers Additives that improve the quality of the final product. Used predominantly in the bakery industry. Includes flour improvers which enhance the breadmaking properties of flour.

Incaparina Low cost protein-rich food supplements introduced by the Institute of Nutrition of Central America and Panama (INCAP) to combat protein deficiency diseases in infants and others at risk from malnutrition. The original formulation is based on cottonseed meal and corn and has a nutritional value similar to that of milk. Other formulations have been developed based on soybeans and low-cost local vegetables.

Indian mackerel Marine fish species (Rastrelliger kanagurta) from the mackerel family (Scombridae) which is mainly found in the Indo-west Pacific region. Marketed fresh, frozen, canned, dried-salted and smoked; also made into fish sauces.

Indian mustard Annual plant (Brassica juncea), related to rapeseed, grown for its seeds which are a source of vegetable oils.

Indian shad Marine fish species (Tenualosa ilisha) of the family Clupeidae and of minor commercial importance. Found in the Indian Ocean. Marketed fresh or dried-salted. Also known as hilsa shad.

Indigo carmine Disodium salt of 5,5’-ingotin disulfonic acid. One of a number of artificial colorants used in foods, this one providing deep blue colour. It has low solubility in water but is heat stable. Added to foods including bakery products, snack foods and confectionery. Banned in Norway. Also known as indigotine.

Indigotide Alternative term for indigo carmine.

Indole acetic acid Alternative term for indol-3-ylacetic acid.

Indole-3-carbolin One of the organic nitrogen compounds found in Brassica vegetables, such as cabbages, Brussels sprouts, kale, broccoli and pak choi. Produced by breakdown of glucobrassicin, one of the glucosinolates. Demonstrates antitumour activity, anticarcinogenicity and cardio-protective effects in animal studies, but human studies are inconclusive. Its major metabolite is 3,3'-diindolylmethane, which also demonstrates anticarcinogenicity and anti-inflammatory activity. Commercially available as a food supplement.

Indoles Group of nitrogen-containing heterocyclic compounds based on the 2,3-benzopyrrole (indole) skeleton. Indole-containing organic compounds include tryptophan, skatole, indole alkaloids, indol-3-ylacetic acid and indole-3-carbolin, a glucobrassicin derivative isolated from cruciferous vegetables with possible anticarcinogenicity. Indole has an animal-like aroma and has been identified as a volatile constituent in several foods and beverages.

Indol-3-ylacetic acid One of the auxins group of plant growth regulators, with the synonym indole acetic acid and the abbreviation IAA. Controls plant growth and differentiation, thereby affecting the yield and quality of fruits and vegetables.

Induction heating Heating, e.g. of foods, by production of an electric or magnetic state by the proximity (without contact) of an electrified or magnetized body.

Inductively coupled plasma atomic emission spectroscopy An inductively coupled plasma spectroscopy technique that can be used to detect
Infant foods

Liquid foods for infants used as a substitute for human milk. Usually abbreviated to ICP-AES. Samples are nebulized and passed through a tube in an inert gas atmosphere. The tube is heated by radiofrequency radiation to produce a plasma with extremely high temperature. When the sample flows into the plasma, atoms are excited and emit energy at characteristic wavelengths, which is usually detected by photographic emission detectors or photoelectric transducers.

Inductively coupled plasma optical emission spectroscopy

Mass spectroscopy technique utilizing inductively coupled plasma. Usually abbreviated to ICP-OES. Samples (dissolved solids or liquids) are nebulized and superheated to degrade the sample into its constituent elements and generate a plasma (i.e. a gaseous mixture of the mineral atoms in an excited state). Atoms in the plasma emit a wavelength characteristic to a particular mineral. Radiation in the optical range, i.e. ultraviolet, visible or infrared is detected. For quantitative analysis, the intensity of the radiation of a particular wavelength is measured since it is proportional to the amount of the mineral in the sample.

Infant foods

Foods designed to meet the nutritional needs of infants, such as infant formulas and weaning foods. A wide range of processed infant foods is available in industrialized countries, including rusks, pureed ready meals, fruit drinks and cereal-based dishes. Foods are typically fortified with minerals and vitamins, and designed to be low in sugar and salt.

Infant formulas

Liquid foods for infants used as a substitute for human milk. Usually take the form of modified cow milk products (milk infant formulas), which aim to mimic the composition of human milk. Formulas may also be based on milk from other species, soymilk or other products in order to meet the nutritional needs of infants suffering from intolerance to cow milk.

Infant milk formulas

Preparations for feeding to infants and young children, intended to satisfy their specific nutritional requirements. May be based on cow milk or soymilk. Also called human milk substitutes.
**Ink jet printers** Non-impact printers in which the print image is formed by minute jets of ink. The jets of ink pass through an electrical field and this directs droplets of ink precisely onto the surface. Uses include production of high quality print food labels.

**Ink jet technology** Printing technology that involves spraying droplets of ink through computer-controlled nozzles. Ink jet printers are usually employed for production of high quality print food labels.

**Inn breweries** Small-scale breweries, integrated with pubs, inns or restaurants where the beer is served.

**Inorganic acids** Acids which do not contain the carboxylic acid moiety common to organic acids. Includes the mineral acids hydrochloric acid, nitric acid, phosphoric acid and sulfuric acid.

**Inorganic compounds** Chemical compounds that do not contain C-H bonds.

**Inosine** Ribonucleoside formed from hypoxanthine (6-hydroxyxypurine) linked to a ribose molecule. Unlike other ribonucleosides, does not occur as a component of nucleic acids, but is used in synthetic oligonucleotide probes. Often found in foods as the ribonucleotide inosine monophosphate (IMP), which is associated with umami flavour. Inosine levels can be used as indicators of fish freshness.

**Inosine monophosphate** Member of the ribonucleotides, commonly abbreviated to IMP. Occurs as a flavour compound in foods and is particularly associated with umami flavour. Content in meat and fish is used as a freshness indicator.

**Inositol** Common name for the cyclitol myo-inositol.

**Polyols** which occur widely in foods as the free form, as inositol phosphates or as a component of phosphatidylinositol. Participates in cell signalling as a part of a membrane secondary messenger system and can also act as antinutritional factors.

**Inositol phosphates** Antinutritional factors found in foods, especially cereals and legumes, which can compromise the absorption of minerals from the gastrointestinal tract. May be present in a range of forms, from bisphosphates up to hexaphosphates (also known as phytates). To improve the nutritional values of foods, both exogenous and endogenous phytases can be utilized to hydrolyse the higher inositol phosphates into lower phosphates, which generally have lower capacities to bind minerals.

**Injera** Flexible, spongy, pancake-like, unleavened flat bread prepared from spontaneously fermented millet flour dough.

**Injera Insoluble fibre** Dietary fibre that does not dissolve in water and so passes through the gastrointestinal tract largely intact. Includes celluloses, hemicelluloses and lignin. Insoluble fibre absorbs water in the colon, resulting in a larger and softer stool. This helps to promote regular bowel movement and, in turn, prevent constipation and reduce the risk of diverticulosis. It may also reduce the risk of colorectal cancer, possibly by speeding up the movement of potential carcinogens through the intestine. Good sources include cereals, vegetables and beans.

**Insect foods** Insects that are eaten as foods in many parts of the world, including China, Japan and rural areas of Africa and South America, where they can serve as a valuable and readily available source of proteins and minerals. Types of insect consumed include grasshoppers, crickets, locusts, bees and ants. Most species are roasted, fried or boiled prior to consumption, although a few are eaten live. Insect foods are generally regarded as taboo in the western world, although some insect products are available as novelty foods.

**Insecticides** Chemical substances used to kill insects. Used primarily to control pests that infest crops or to eliminate potential disease-carrying insects in specific areas. Classified into several groups, the most important of which are carbanate insecticides, fumigant insecticides, organochlorine insecticides, organophosphorus insecticides and pyrethroid insecticides. Residues persisting in foods and the environment can represent health hazards.

**Insects** Members of the class Insecta, such as flies, ants and beetles. May generally refer to any other arthropods which resemble insects, such as spiders. Typically have a segmented body with an external chitinous covering, three pairs of legs, and, in most groups, two pairs of wings. Some species may be consumed as insect foods, while others may act as pests of crops and stored foods.

**Insertion sequences** Small, simple transposons (mobile units of DNA) usually ranging in size from 700 to 1500 base pairs. Possess short repeated nucleotide sequences at either end and carry no genetic information other than that required for their transposition. When inserted into bacterial DNA, insertion sequences (often abbreviated to IS) inactivate the gene, but activity is restored upon removal. IS transfer events are important mediators of genetic polymorphisms in both prokaryotes and eukaryotes, and have been widely studied in both pathogens and beneficial microorganisms within the food industry.

**Insoluble fibre** Dietary fibre that does not dissolve in water and so passes through the gastrointestinal tract largely intact. Includes celluloses, hemicelluloses and lignin. Insoluble fibre absorbs water in the colon, resulting in a larger and softer stool. This helps to promote regular bowel movement and, in turn, prevent constipation and reduce the risk of diverticulosis. It may also reduce the risk of colorectal cancer, possibly by speeding up the movement of potential carcinogens through the intestine. Good sources include cereals, vegetables and beans.
**Instant beverages**  Dried beverages formulated and processed in a manner giving rapid solubility in water or other liquids.

**Instant cocoa Beverage mixes** containing cocoa powders that are usually reconstituted with hot milk or water to make cocoa beverages.

**Instant coffee** Dried (generally freeze dried) coffee extracts processed to a form which dissolves rapidly in water.

**Instant foods Processed foods** that have undergone instantization, so that they can be easily and rapidly reconstituted by bringing them into contact with a liquid such as milk or water. Common instant foods include gravy granules, instant noodles, milk powders, instant coffee and tea powders.

**Instantization** Processing of dried foods in a way that facilitates preparation or reconstitution of the final product. Common techniques used in instantization include agglomeration of particles and lecithination.

**Instant noodles Noodles** that have been pre-cooked and reconstitute rapidly when hot water is added to them.

**Instant soups** Dried soup mixes that are designed to rehydrate rapidly upon addition of water. Often prepared by freeze drying. Typically sold as convenience snack foods/beverages in single serving sachets.

**Instant tea** Dried (generally freeze dried) tea extracts processed to a form which dissolves rapidly in water.

**Insulin** One of the mammalian endocrine hormones. This polypeptide is synthesized in the pancreas in response to elevated blood glucose levels. Deficiencies in secretion of insulin or physiological responses to insulin occur in type I (insulin-dependent) and type II (non-insulin dependent) diabetes mellitus, respectively. Diet can be used to control type II diabetes, and information regarding postprandial blood insulin and glucose responses to foods (their insulinemic and glycaemic index values) is useful in dietary control of this disease.

**Insulin-like growth factors** Polypeptides that are structurally similar to insulin. Two such polypeptides have been isolated: insulin-like growth factors (IGF) 1 and 2. IGF-1 is mainly secreted by the liver and is important for the regulation of normal physiology, mediating the effects of somatotropin. IGF-2 is almost exclusively expressed in embryonic and neonatal tissues and is essential for the development and function of organs such as the brain, liver and kidney.

**Insulin resistance** Condition in which fat, muscle and liver cells fail to respond correctly to insulin, resulting in reduced entry of glucose into the cells. The pancreas responds by producing more insulin in an effort to increase absorption into the cells and control blood glucose levels. When the cells do not respond appropriately to the high insulin levels, glucose builds up in the blood (hyperglycaemia). Insulin resistance may precede the development of type 2 diabetes and is often a factor in obesity and the metabolic syndrome.

**Integrated pest management** Approach to control of pests on crops that uses a combination of physical, chemical and biological pest control tactics in an attempt to reduce reliance on chemical pesticides, and hence minimize harmful residues in crops and pollution of the environment. Pest control tactics employed include biological control, use of conventional plant breeding or genetic engineering to improve crop resistance to pests, use of agricultural practices that lessen the degree of pest damage (e.g. mixed cropping, time of planting), and selective use of insecticides or other chemical agents (e.g. insect growth regulators).

**Integrins** Mammalian cell surface proteins that play a role in signal transduction and binding between cells and the extracellular matrix, e.g. in the epithelial cells of the gastrointestinal tract. Consist of 2 transmembrane glycoprotein subunits. Some food pathogens (e.g. rotaviruses) bind to integrins during the infection process, promoting their infectivity. Integrins may also be involved in the development of food allergies in susceptible individuals. Integrin degradation in pork tissue is believed to contribute to post-mortem drip loss, and integrins may influence meat toughness.

**Intelligent packaging** Packaging that senses changing external or internal conditions, and can then communicate these to the customer or end user. The packaging can potentially carry out different intelligent functions (e.g. tracing, sensing, recording, detecting, communicating and applying scientific logic) then facilitate decision making to achieve specific effects (e.g. enhancing food safety or quality, extending shelf life, providing information or warning of potential problems).

**Interesterification** The process by which fatty acyl residues are interchanged between triglycerides in a mixture of lipids. Can be catalysed by lipases, and may be used to modify the composition and properties of fats and oils.

**Interfacial properties** Physical properties relating to the interaction between molecules at an interface.

**Interfacial tension** Attractive force between molecules at an interface.
Interferometry Analytical techniques based on differences in refractive index between the sample under investigation and a standard. Measurements are made on an interferometer, an optical instrument in which a beam of light is split and subsequently re-united after traversing different paths, producing interference.

Intermediate moisture foods Semi-moist foods, which do not require refrigeration and can be eaten without further preparation. Foods are preserved by limiting water activity to a level unable to support microbial growth, e.g. by addition of humectants. Examples include dried fruits, beef jerky and semi-dried sausages.

Intermediate moisture pet foods Pet foods with a moisture content intermediate between those of dried pet foods and canned pet foods. Include soft-moist foods (moisture content 23 to 40%), which are soft in texture, easy to chew, contain similar ingredients to dried pet foods and are often made from extruded kibble or pellets. Also include specialized, usually meat-based products, with a moisture content of 45 to 55%, which are similar to canned pet foods in many ways, but are shelf-stable.

Intermittent warming Warming of commodities, such as fruits and vegetables, to room temperature at intervals during storage to prevent chilling injury symptoms from developing. Chilling injury is a problem in most crops of tropical or subtropical origin. Symptoms of chilling injury, such as pitting, discoloration, internal breakdown and decay, can result in large postharvest losses during marketing. Intermittent warming may, however, cause undesirable softening, increase decay, and cause condensation to form on the product.

International Dairy Federation Organization comprising 53 member countries throughout the world which aims to form a centre for collection and dissemination of information for the dairy sector, and to serve as a link between the dairy sector and organizations representing other sectors. Each member country has a national International Dairy Federation (IDF) committee representing the dairy sector in that country, covering the full range of dairy activities. As well as organizing events at which experts can report progress covering the full range of dairy activities. As well as a committee representing the dairy sector in that country, has a national International Dairy Federation (IDF) which serves as a link between the dairy sector and organizations representing other sectors. Each member country serves as a link between the dairy sector and organizations representing other sectors. Each member country.

International Organization for Standardization The world's largest developer and publisher of International Standards. A non-governmental organization comprising a network of the national standards institutes of some 157 countries, with a central office in Geneva, Switzerland, that coordinates the system and publishes finished standards. Commonly abbreviated to ISO.

Intestines The portion of the gastrointestinal tract which extends from the lower opening of the stomach to the cloaca or anus. Intestines of slaughtered animals form a part of edible offal; after cleaning they may be used as casings for the production of meat products, e.g. sausages.

Intimins Virulence factors (adhesins) produced by enteropathogenic and enterohaemorrhagic Escherichia coli species, which assist in the adherence of bacteria to intestinal cells. This mediation molecule is secreted by the type III system along with the host receptor for intimin (Tir - translocated intimin receptor). Tir is embedded in the target cell's plasma membrane, so facilitating bacterial attachment to the host. The translocated Tir triggers additional host signalling events and actin nucleation, which are essential for lesion formation.

Intolerance Group of diseases in which there is inability to digest a particular dietary constituent properly, often resulting in malabsorption syndromes. Examples include lactose intolerance, resulting from lack of a gastrointestinal tract brush border enzyme, and coeliac disease, in which an immune response to wheat gluten results in histopathological changes to the intestinal mucosa. Exclusion of the relevant component from the diet can result in elimination of the symptoms of the disease, and also, in cases such as coeliac disease, reversal of intestinal pathology.

Intramuscular fat Fat bound between muscle fibre bundles in meat. Important factor influencing meat quality. Responsible for marbling of meats such as beef and pork. Enhances flavour, tenderness, juiciness and palatability. Amounts present are strongly influenced by genotype. Animal feeding regimes can be used to alter its fatty acids composition.

Introns Sequences of nucleotides interrupting the coding sequences of genes. These are transcribed into RNA but are removed by splicing before translation of the RNA into the protein product. The remaining sequences, which together code for the product, are called exons.

Inulases Alternative term for inulinas.

Inulases II Alternative term for Inulin fructotransferases (DFA-III-forming).

Inulin Polysaccharide composed mainly of fructofuranose residues (fructose in the ring conformation) although it also contains a glucopyranose residue. Inulin occurs naturally in some plants, e.g. Jerusalem
**Inulinases** and chicory, where it replaces starch as an energy store.

**Inulinases** EC 3.2.1.7. **Glycosidases** which catalyse the endohydrolysis of 2,1-β-D-fructosidic linkages in inulin, a linear, β-2,1-linked polymer of fructose which serves as an energy reserve in some plants. Intermediary products are **fructooligosaccharides** and the end product is fructose. Fructose has a high degree of sweetness and is important in *dietetic foods* and *beverages*. Fructooligosaccharides are useful functional ingredients in *prebiotic foods*. Enzymic hydrolysis of inulin using inulinases offers an alternative to the standard procedure for production of fructose which uses *starch* as the source material.

**Inulin fructotransferases (depolymerizing)** Former accepted name for **inulin fructotransferases (DFA-III-forming)**.

**Inulin fructotransferases (DFA-III-forming)** EC 4.2.2.18 (formerly EC 2.4.1.93; **inulin fructotransferases (depolymerizing)**). **Lyases** which remove the terminal disaccharide from inulin resulting in formation of a shorter inulin chain and α-D-fructofuranose β-D-fructofuranose 1,2':2,3'-dianhydride (DFA III), a non-digestible saccharide shown to enhance absorption of certain minerals, including calcium. EC 4.2.2.17, inulin fructotransferase (DFA-I-forming), catalyses a similar reaction but produces α-D-fructofuranose β-D-fructofuranose 1,2':2,1'-dianhydride (DFA I). Both DFA I and DFA III are non-digestible and have approximately 50% the sweetness of sucrose, thus, they have been suggested to have potential as low-caloric sweeteners.

**Invasins** Virulence factors produced by some bacteria which aid invasion of intestinal epithelial cells. Entry of invasin into cells is mediated by binding several β-1 chain **integrins**. Interaction of invasin with multiple integrins establishes tight adherence and receptor clustering, thus providing a signal for internalization. Producers include *Yersinia enterocolitica*, *Y. pseudotuberculosis* and some *Aeromonas* spp.

**Invertases** Alternative term for **β-fructofuranosidases**.

**Invert sugar** Syrups with a fine crystal structure that contain equal amounts of glucose and fructose. Manufactured from sucrose by acid hydrolysis or the reaction of **β-fructofuranosidases** (invertases), a process called inversion. Inversion can be full or partial. Known as ‘invert’ as the mixture of glucose and fructose inverts the plane of polarized light compared to pure sucrose. The fine crystal structure allows manufacture of smoother products, such as **fondants**. Invert sugar is sweeter than white sugar, and has a lower water activity, which imparts more powerful preservation qualities. Commercial liquid invert sugars are prepared as different mixtures of sucrose and invert sugar, and are used to retard the crystallization of sugar and to retain moisture in packaged foods, particularly bakery products.

**Iodates** Salts containing an IO₃ anion. Include potassium iodate oxidizing agents, which are added to wheat dough during *baking*. Iodates are also added to table salt (NaCl; sodium chloride) and infant formulas for iodine *fortification* of the diet.

**Iodides** Salts that contain an I anion or other compounds containing iodine with an oxidation state of -1. Potassium iodide (KI) is added to table salt (NaCl; sodium chloride) and infant formulas for iodine *fortification* of the diet.

**Iodine** One of the halogens, chemical symbol I. Occurs naturally in the diatomic form I₂, and is a bluish-black solid which sublimes to form a bluish irritant gas. An essential dietary mineral which is accumulated in the thyroid gland and used to synthesize the thyroid hormones, including thyroxine, which are important for normal growth and development. Foods particularly rich in iodine include **seaweeds** and marine fish. Low dietary intakes of iodine can cause hypothyroidism and associated iodine deficiency diseases such as *goitre*. *Fortification* of the diet with iodine in the form of iodates or iodides is common.

**Iodine values** Measure of the unsaturation of fats or oils, based on the amount of iodine absorbed in a given time. Also known as iodine number.

**Iodized salt** Ordinary salt (NaCl) fortified with inorganic iodides or iodates, commonly potassium iodide. Iodate is preferred in humid regions, owing to its greater stability. Used to prevent iodine deficiency diseases, such as *goitre*. Although these disorders are preventable by use of iodized salt, they continue to occur due to socioeconomic, cultural and political limitations of adequate iodine supplementation programmes.

**Iodometry** Redox analysis technique based on reaction with iodine/iodides. Strong reducing agents are determined by titration with iodine while strong oxidizing agents react with iodide to form iodine. Iodine is titrated with a standard solution of thiosulfate, using a starch solution as an indicator.

**Iodophors** Complexes of iodine and certain high molecular weight surfactants (e.g. polyvinylpyrrolidone and quaternary ammonium compounds). Used in the food industry as disinfectants and detergents.

**Ion chromatography** Chromatography technique allowing simultaneous determination of anions and cations in a sample by using a sequence of a cation
Ion exchange Reversible process in which substitution of ions for others of the same charge occurs. Solution containing ions is passed through a molecular network containing groups that can be ionized. Ions in the solution attach to the network, releasing free or mobile ions from the network. The reaction is classified according to the nature of the substituent groups in the network, i.e. cation exchange or anion exchange. Substances acting as ion exchangers or ion exchange resins include aluminosilicates, cross-linked polymers and celluloses. This process is the basis of separation by ion exchange chromatography.

Ion exchange chromatography Chromatography technique in which separation is carried out on ion exchange resins. Ions from the sample solution that pass into the exchangers are displaced by varying the pH, concentration or ionic strength of the eluting liquid, usually using a gradient. Separation is based on anion exchange or cation exchange depending on the type of resin used.

Ionic strength Parameter which is a function of the charge and concentration of ions in a solution.

Ionization Process by which a neutral substance becomes charged, forming ions. The conversion is due to the addition or removal of electrons induced by various means, including heating, chemical reaction, exposure to ionizing radiation or passage of an electric current.

Ionol Alternative term for the antioxidant butylated hydroxytoluene.

Ionones Volatile aroma compounds found particularly in fruits, wines and tea. One of the major ionones, β-ionone, has a violet-like aroma.

Ions Electrically charged atoms or groups of atoms. Positively charged cations result from the loss of electrons and negatively charged anions from their acquisition.

Ion selective electrodes Electrodes used to determine concentrations of specific ions, including metal ions and salts, e.g. nitrates, in aqueous solutions.

Loobai Fruits produced by Myrica nagi. Kernels are eaten traditionally in China and the surrounding area.

Ipomeamarone One of the toxic phytoalexins formed in sweet potatoes as a result of mechanical injury or fungal infection.

Iprodione Contact dicarboximide fungicide with protective and curative action; used for control of a wide range of fungal diseases on fruits, vegetables, cereals and oilseeds. Sometimes used as a postharvest dip or as a seed treatment. Classified by WHO as unlikely to present acute hazard in normal use. Also known as rovral.

IR Abbreviation for infrared.

IR analysis Alternative term for IR spectroscopy.

IR drying A drying technique that uses infrared radiation (IR radiation) to bring about heat transfer. Process time is shorter than when convective heating is used, energy costs are lower and the impact upon the structure of the product is reduced. IR drying may be used for the preservation of various foods, particularly fruits, vegetables and grains.

Iridaea Genus of red seaweeds occurring on rocky shores around many parts of the world. Commercially important species of carrageenans used to make thickeners, gels and stabilizers for the food industry. Some species are cultivated commercially.

IR irradiation Application of infrared radiation (IR radiation) to products such as foods. Uses include in microbial decontamination, thermal processing and drying procedures, and for extending shelf life. Alternative term for infrared irradiation.

Iron Group 8 metal, chemical symbol Fe. Forms salts in either the ferric (iron(III)) or ferrous (iron(II)) oxidation states. One of the essential minerals, iron is required to synthesize ferritin, lactoferrin, haemoglobin, cytochromes and other haemoproteins. Good dietary sources of iron include meat and meat products, cereals and green vegetables. Bioavailability of iron in the diet is influenced by the presence of other chemicals such as calcium and phytates. Iron deficiency in the diet can lead to anaemia, and to prevent this, compounds such as ferrous sulfate, ferrous glycinate and sodium iron EDTA are used for fortification purposes.

Irpen Genus of fungi of the class Agaricomycetes. Occur on felled timber and living trees. Used in the production of a variety of enzymes, such as lactases and cellulases. Proteinases produced by Irpen lacteus are used as milk clotting enzymes in cheesemaking.

Irradiated foods Foods subjected to irradiation to delay ripening or sprouting, improve shelf life and eliminate harmful bacteria, insects and other pests. Types of food that can be successfully irradiated include poultry meat and red meat, fruits, vegetables and cereals. Regulations vary between countries as to which (if any) foods may be irradiated. Irradiated spices and herbs are currently the only irradiated foods licensed for sale in the UK.

IR radiation Electromagnetic infrared radiation having a wavelength just greater than that of red light.
but less than that of **microwaves**, emitted particularly by heated objects.

**Irradiation** Application of various forms of **radiation**. In food **processing**, this can be exposure of items to low doses of high-frequency energy from **gamma rays**, X-rays or accelerated electrons with the aim of delaying **ripening** or **sprouting**, extending **shelf life**, destroying **microorganisms** or eliminating **pests**. These rays contain sufficient energy to break chemical bonds and ionize molecules that lie in their path. The two most common sources of high-energy radiation used in the food industry are **cobalt-60** ($^{60}$Co) and **cesium-137** ($^{137}$Cs). For the same level of energy, gamma rays have a greater penetrating power into foods than high-speed electrons. The unit of absorbed dose of radiation by a material is denoted as the **gray** (Gy), one gray being equal to **absorption** of one joule of energy by one kilogram of food.

**Irrigation** Artificial supply of water to land by such means as ditches and pipes for the purpose of nourishing plants.

**Irritable bowel syndrome** One of a range of **diseases** affecting the **gastrointestinal tract**. Characterized most commonly by bloating, abdominal pain, cramping, constipation and/or **diarrhoea**. Possible contributory factors include infection, **stress** and **diet**. In the latter case, identification and elimination of foods contributing to disease symptoms may offer a **diet therapy** approach to managing the condition.

**IR spectroscopy** Absorption patterns resulting from **IR spectroscopy** analysis of samples. Serve to analyse the composition of samples, and identify impurities.

**IR spectroscopy** Spectroscopy technique in which samples are identified on the basis of absorption of light of **infrared** (IR) wavelength.

**Iru** Traditional Nigerian fat- and protein-rich **fermented foods** made from **African locust beans**. Seeds are cooked, fermented and formed into balls, which can be used to flavour **soups** and stews. The fermented products can be stored for long periods and are a good source of **linoleic acid** and **vitamin B₂**. Similar to **dawadawa**, a product made in West and Central Africa.

**Ishiru** Traditional Japanese **fish sauces** usually made from **squid livers** (ika-ishiru) or sardine (iwashi-ishiru). Production involves a long natural **fermentation** period. Used as **seasonings** in a range of **dishes**.

**Isinglass** A type of gelatin made from the inner lining of swim bladders of **fish**, originally **sturgeon**, but also **cod**, **hake** and others. Used for the **clarification** of **wines** and **beer**. Also termed fish glue.

**ISO** Abbreviation for **International Organization for Standardization**.

**Iso-α-acids** Bitter compounds formed from **hops**-derived **α-acids** during boiling of **worts** or preparation of isomerized **hop extracts**. Important bitter compounds in **beer**.

**Isoamyl acetate** Esters with banana-like aroma. One of the natural **aroma compounds** found as a result of yeast fermentation in **beer**, **sake** and **wines**, and also occurs naturally in **fruits** such as **apples** and **bananas**. Widely used as added **flavour compounds** in **processed foods**. Can be produced in microbial fermentations and also enzyme **bioconversions**.

**Isoamyl alcohol** One of the aliphatic **alcohols**, with a characteristic **aroma** and pungent **flavour**. **Synonyms** include isopentanol, **methyl butanol** and **isopentyl alcohol**. Used as an **esterification** substrate for production of isoaamyl **esters**. Also identified as one of the **aroma compounds** present in **wines**, **cider** and **beer** as a result of yeast fermentation.

**Isoamylases** EC 3.2.1.68. **Amylases** which hydrolyse 1,6-α-D-glucosidic branch linkages in **glycogen**, **amylopectins** and their β-limit **dextrins**. 1,6-Linkages are hydrolysed only if at branch points. Although both are also known as debranching enzymes, isoamylases are distinguished from **pullulanases** (EC 3.2.1.41) by their inability to attack **pullulan** and their limited action on α-limit dextrins. Isoamylases are widely distributed in nature, and used industrially to produce **modified starches**.

**Isoascorbic acid** Isomer of l-**ascorbic acid**. Exhibits **antioxidative activity** and **antimicrobial activity** and thus has uses in food **preservatives**. Added to processed **fruits** to prevent **browning** and to **meat** and **meat products** to stabilize **colour** and **flavour**. Also called **erythorbic acid** and γ-lactone.

**Isobutanol** One of the aliphatic **alcohols**, with a mild alcoholic, sweet odour. **Synonyms** include **isobutyl alcohol** and **methyl propanol**. One of the **aroma compounds** produced during **fermentation** in **alcoholic beverages** including **wines**, **beer** and **cider**.

**Isobutyl alcohol** One of the aliphatic **alcohols**, with a mild alcoholic, sweet **aroma**. **Synonyms** include **isobutanol** and **methyl propanol**. One of the **aroma compounds** produced during **fermentation** in **alcoholic beverages** including **wines**, **beer** and **cider**.

**Isobutyric acid** One of the short-chain **fatty acids**, with four carbon atoms. Has a pungent **aroma** and has
been identified in carob, wines and beer. Synonymous with 2-methylpropanoic acid.

Isocaproic acid  Member of the short-chain fatty acids. Identified as one of the aroma compounds present in meat and fish. Synonymous with 4-methylvaleric acid and 4-methylpentanoic acid.

Isocitric acid  Member of the tricarboxylic acid cycle. Found in many fruits and vegetables. Synthesized in response to damage or wounding.

Isocitrate dehydrogenases  Dehydrogenases which catalyse the conversion of isocitrate to 2-oxoglutarate and carbon dioxide, using either NAD⁺ (EC 1.1.1.41) or NADP⁺ (EC 1.1.1.42) as the acceptor molecule. Isoenzyme profiles of isocitrate dehydrogenases can be used in species identification in meat and cultivar differentiation in fruits and vegetables. Other applications of the enzyme include determination of isocitrate levels in fruit juices and vegetable juices.

Isoleucine  One of the essential amino acids. A common protein constituent and free amino acid in many foods.

Isomaltooligosaccharides  Oligosaccharides which provide a major dietary source of isoflavones, including daidzein and genistein, which display activity as phytoestrogens.

Isomaltulose  Subclass of the flavonoids, sharing a basic structure of two benzyl rings joined by a three carbon bridge which may or may not be closed into a pyran ring. Isoflavones differ from flavones in that the benzyl B ring is joined at position 3 instead of position 2. These phytochemicals are more restricted in occurrence than other flavonoids, but can be found in several legumes, including soybeans, lentils, peas and mung beans. Soybeans and soy products provide a major dietary source of isoflavones, including daidzein and genistein, which display activity as phytoestrogens.

Isoflavonoids  A subclass of the flavonoids which includes isoflavones.

Isoglucosides  Fructose sweetener prepared from starch. Starch is dispersed in water and hydrolysed to produce glucose syrups, and the glucose is then isomerized to fructose via a reaction catalysed by glucose isomerases. When produced from corn starch, isoglucose preparations are known as fructose high corn syrups.

Isomerones  Components of the hops-derived iso-a-acids fraction in worts and beer. Formed by isomerization of humulones during boiling of worts or preparation of isomerized hop extracts. Important bitter compounds in beer.

Isosaltulose  Disaccharide with the systematic name (of BENEO-Palatinit) for a range of sugar substitutes consisting of disaccharide alcohols derived from sucrose. Has approximately half the sweetness and calorific value of sucrose, a low glycemic index value, low hygroscopicity, good solubility and high heat resistance. It is also noncariogenic. Used in manufacture of hard sugar confectionery, chewing gums, chocolate products, ice cream, preserves and bakers confectionery.

Isomaltooligosaccharides  Oligosaccharides produced via hydrolysis of starch or dextran or synthesized from sucrose. Used in the form of syrups as low calorie sweeteners. Effective in stimulating the growth of Bifidobacterium spp. and also beneficial in preventing dental caries, improving intestinal function and enhancing immune response in humans. Used as ingredients in some functional foods.

Isomaltose  Isomer of maltose with 2 molecules of glucose linked by an α-1,6-glycosidic bond rather than an α-1,4- bond as in maltose.
Isomerases EC 5. Enzymes that catalyse geometric or structural changes within a molecule to form a single product. Reactions do not involve a net change in the concentrations of compounds other than the substrate and product. Subdivided into racemases and epimerases (EC 5.1), cis-trans-isomerases (EC 5.2), intramolecular oxidoreductases (EC 5.3), intramolecular transferases (mutases; EC 5.4), intramolecular lyases (EC 5.5) and other isomerases (EC 5.99).

Isomerization Reaction in which the structure of a molecule is altered so that it is converted into one of its isomers.

Isomers Series of compounds that have the same molecular formula but which differ in structure (structural isomers) or orientation (stereoisomers).

Isoniazid Common name for isonicotinic acid hydrazide, one of the antibiotics used for treatment of tuberculosis in humans and animals. Administered in combination with other antimicrobial compounds as antibiotics resistance develops readily in bacteria. Use in food animals is prohibited as residues in animal foods have the potential to compromise human health.

Isopentyl alcohol Synonym for isoamyl alcohol. Flammable, colourless liquid. Contributes to the characteristic alcoholic aroma of yeast-fermented alcoholic beverages.

Isoprene Branched five-carbon chain hydrocarbon that forms a recognizable structural component of isoprenoids, terpenoids and other compounds derived from isopentenylpyrophosphate, the biosynthetic isoprene unit. Synonym 2-methyl-1,3-butadiene.

Isoprenoids Organic compounds based on the isoprene hydrocarbon structural unit. Include a large range of chemicals, such as carotenoids, steroids, terpenoids and tocopherols. Many substances contain both isoprenoid and non-isoprenoid components.

Isorhamnetin One of the flavonoids. Metabolite of quercetin. Also known as 3-methyl-quercetin. Food sources include onions, Brassica vegetables, Ginkgo biloba and sea buckthorn fruits. Demonstrates antitumour activity, antihypertensive activity and antioxidative activity. Isorhamnetin glucosides offer protection against chemically induced hepatotoxicity in animal studies.

Isospora Genus of protozoan parasites of the family Eimeriidae and class Coccidia. Occur in the intestines of birds, amphibians, reptiles and mammals, including man. Can cause intestinal disease in humans after ingestion of contaminated water or foods, such as undercooked beef or pork. Isosporiasis is a human intestinal disease that may occur due to ingestion of food or water contaminated with Isospora belli.

Isozymes Alternative term for isoenzymes.

Izvara Bulgarian product made from cow milk coagulated with rennets and fermented with 1-5% butter starters.
Jaboticaba Purple, grape-like fruits produced by trees of the genus Myrciaria, particularly M. cauliflora, but also M. jaboticaba, M. tenella and M. trunciflora. Eaten fresh or used to make fruit juices, jams and alcoholic beverages.

Jackals Nocturnal, wolf-like mammals of the family Canidae that are native to Africa, Asia and south east Europe. There are three species: the golden jackal (Canis aureus); the side-striped jackal (C. adustus); and the black-backed jackal (C. mesomelas). Jackals are known as scavengers, but also hunt and may prey upon poultry and other livestock. They are killed in some regions for their meat.

Jack fruits Seeds of Canavalia ensiformis. Mature seeds must be boiled in water before consumption because of the presence of toxic constituents. Immature seeds and pods are also eaten. When roasted, seeds are used as coffee substitutes. The source of concanavalin A.

Jack beans Seeds of Canavalia ensiformis. Mature seeds must be boiled in water before consumption because of the presence of toxic constituents. Immature seeds and pods are also eaten. When roasted, seeds are used as coffee substitutes. The source of concanavalin A.

Jack mackerel Alternative term for horse mackerel.

Jaggery Unrefined brown coloured sugar produced mainly in India by evaporation of sugar cane juices. Also known as gur.

Jak fruits Fruits produced by Artocarpus heterophyllus (A. integrifolia) and related to breadfruit and figs. One of the largest cultivated fruits, weighing usually up to 20 kg. When ripe, jak fruits are eaten raw, while flesh and seeds of green fruits are eaten cooked, commonly in curries. Also known as jack fruits.

Jalapeno peppers Small smooth-skinned chillies originating in Mexico. Usually about 5 cm long and 1.5 cm in diameter. Colour varies from dark green to bright red when ripe. Range in spiciness from hot to very hot, but the extremely hot veins and seeds are easy to remove. Available fresh, canned or dried. Used to add spiciness to Mexican dishes, sauces and other dishes, or served stuffed and deep fried. Smoked jalapenos are known as chipotles. Also used in jalapeno cornbread.

Jams Conserves made by boiling whole fruits with sugar to form fruit pulps. Called jelly in the USA.

Japanese apricots Small yellow fruits produced by the ornamental tree Armeniaca mume (Prunus mume). Eaten raw or used to make fruit juices and pickles. Also known as ume or mei.

Japanese chestnuts Large fruits produced by Castanea crenata. The flesh is creamy and sweet, but the outer peel is difficult to remove.

Japanese flounders Marine flatfish species (Paralichthys olivaceus) from the flounder family (Paralichthyidae), which occurs in the western Pacific Ocean. Highly prized as a food fish in Japan. Usually marketed fresh. Also known as hirame and bastard halibut.

Japanese pears Oriental pears produced by Pyrus serotina or P. pyrifolia. Also referred to by many other names, including Asian pears. Chinese pears and sand pears.

Japanese pepper Common name for Xanthoxylum piperitum or sansho. The leaves are used in seasonings or as spicy vegetables in Japanese cooking.

Japanese plums Large, yellow to red fruits produced by Prunus salicina. Alternatively, another name for loquats, small yellow fruits produced by Eriobotrya japonica.

Japanese radishes Oriental type of Raphanus sativus with long, mild flavoured roots of up to 20 kg in weight. Traditionally used in soups and sauces or cooked with meat. Sold in the UK as mouli or rettich. Also known as daikon.

Jarlsberg cheese Norwegian hard cheese made from cow milk. It has a similar consistency, texture and hole formation to Emmental cheese, but a more nut-like and sweeter flavour. The cheese is golden yellow in colour, and contains holes of various sizes. It is used as a table, dessert or sandwich cheese.

Jasmine Natural flavourings with warm, spicy characteristics derived from flowers and leaves of jasmine (Jasminus spp.). Predominant flavour compounds and aroma compounds include jasmonates, jasmones, benzyl acetate, indol and eugenol.

Jasmonic acid Jasmonic acid and methyl jasmonate, collectively referred to as jasmonates, are naturally occurring plant growth regulators involved in various aspects of plant development and re-
sponges to biotic and abiotic stresses. Used to regulate the yield and quality of **fruits** and **vegetables**.

**Jellied milk** Milk to which is added **sugar**, **flavourings**, thickening agents and **gelling agents**. Also known as jellified milk.

**Jellies** Small, soft **sweets**, usually fruit flavoured, of gelatinous **texture**, made in various shapes and often coated with **sugar**. The singular term, **jelly**, is used to refer to jam-like products, usually clear, that are made from strained **fruits** containing **pectins** which are boiled with **sugar**. Also refers to soft, semi-transparent foods prepared from **gelatin** which are sweetened, flavoured, cooled in a mould and eaten as **desserts**.

**Jelly** In the UK, a term applied to fruit-flavoured sweetened **desserts** set with **gelatin** (**table jellies**) and also to clear **jams** made from boiled, sweetened **fruit juices**. In the USA and Canada, the term is synonymous with any type of jam. Also used for savoury products with a jelly like consistency and set with gelatin, e.g. calf’s foot jelly.

**Jelly babies** **Jelly confectionery** products formed into stylized shapes resembling babies.

**Jelly confectionery** Collective term for **confectionery** products made with **jelly**.

**Jelly figs** **Fruits** produced by *Ficus awkeotsang*. Seeds are used in Taiwan to make jelly **cakes** and jelly **desserts**. Also used in manufacture of **soft drinks**.

**Jellyfish** Common name used for any free-swimming marine and freshwater invertebrates from the phylum Cnidaria. Some species are consumed in dried form.

**Jelly rolls** US term for **swiss rolls**, thin sponge **cakes** which are covered on one side with **jams** and rolled into cylinders.

**Jeotgal** Traditional Korean salted and fermented sea food **sauses** prepared from waste tissues of **fish** or **shellfish**, such as the internal organs of **whelks**, a by-product of their processing.

**Jerky** **Meat products** prepared by drying long, narrow strips of **meat**, commonly **beef**. Also known as jerked meat. Worldwide, various types of jerky are produced. For example, in South Africa, a spicy version of jerky, known as **biltong**, is produced, often using **game meat**, and in the Caribbean, strips of meat are soaked in a spicy marinade and then dried to produce a version of jerky known as tasajo. The chewy strips of dried meat do not require refrigeration and, thus, are popular **snacks**. The major disadvantage of jerky prepared from **red meat** is that it has high contents of salt and fat; in comparison, turkey jerky is a healthier alternative.

**Jerusalem artichokes** Stem tubers of *Helianthus tuberosus*. White to yellow or red to blue in **colour**; irregular and knobly in shape. Consumed boiled or baked. Rich source of **inulin**.

**Jessenia** Genus of **palms**, the most common species being *Jessenia batana*. Seeds are a source of **palm oils**; the sweet pericarp is also eaten.

**Jicama** Common name for the tropical legume *Pachyrhizus erosus* or *P. tuberosus*. Young pods are eaten as **vegetables**, but the mature **seeds** are poisonous. Large, turnip-like **tubers** are thinly sliced and eaten raw, cooked in stews and **soups** or pickled. Tubers are used as substitutes for **water chestnuts** or **yams**. Source of a **starch** similar to **arrowroot**. Also known as *yam beans* and Mexican potatoes.

**Jobs tears** Edible seed kernel from the wild grass *Coix lacryma-jobi* used as **cereals** in parts of East Asia and the Philippines. Also known as adlay.

**Jointing Cutting** of animal **carcasses** into joints.

**Jojoba oils** **Liquid wax esters** of long chain **fatty acids** (e.g. **eicosenoic acid** and **erucic acid**) with long chain **alcohols** (e.g. eiconsanol and doicosanol) derived from **jojoba seeds** (*Simmondsia chinensis*). Show high **oxidative stability**. Scarcey digestible, they are mainly employed in non-food applications, such as cosmetic and hair care products, but also have been used as **food additives** and in **coatings** for **fruits**.

**Jojoba seeds** Seeds produced by the plant *Simmondsia chinensis*, native to southern western USA and north-ern Mexico, which are the source of **jojoba oils**. Similar in **colour** and shape to **coffee beans**, and rich in **tocopherols**. Contain **simmondsin**, a cyanide-containing glycoside produced as a by-product in the manufacture of jojoba oils which has potential as an **appetite suppressant**.

**Jowar** Indian name for **sorghum** (*Sorghum vulgare*). Also known as great millet, kaffir corn and guinea corn.

**Juiciness** Sensory properties relating to the extent to which products, such as **fruits**, **vegetables** and **meat**, are juicy or succulent. In fruits and vegetables this property is dependent upon the amount of sap released during cell fracture. In meat it is dependent upon **lipids content** and **moisture retention**.

**Jujubes** **Fruits** produced by *Zizyphus jujuba* or *Z. mauritiana*. Similar to **dates** in **appearance** and **flavour**. Relatively high **sugar** content. Eaten in a number of ways, including fresh, dried, boiled with rice, smoked, pickled, stewed and baked. Also called ber **fruits** and Chinese dates.

**Juniper Berries** from the common juniper tree, *Juniperus communis*, that are used when ripe as **spices**.
Junket

Their pungent, bitter flavour is released by crushing. Also used to flavour gin.

Junket Desserts prepared from sweetened and flavoured curd.

Jute

Rough fibre made from the inner bark of tropical plants belonging to the genus Corchorus, especially *C. olitorius* (in India) and *C. capsularis* (in China). Jute fibre is used to make jute board, a strong flexible cardboard often used to make shipping cartons. Also woven into sacking, and used for making wrapping paper and twine.

Jute seeds

Seeds from either of two Asian plants, *Corchorus capsularis* or *C. olitorius* which may be used as oilseeds.
Kachkaval cheese  Hard cheese popular in the Balkan countries, sometimes made from raw ewe milk. Kachkaval has a smooth dry rind and an amber-coloured interior with a moderately firm texture and no holes. Flavour is piquant and slightly salty. Alternative spelling is Kashkaval cheese.

Kaempferol  Member of the flavonoids group. Present in a range of foods including many fruits and vegetables. Displays antioxidative activity. Synonymous with 3,5,7,4'-tetrahydroxyflavone.

Kanamycin  Aminoglycoside antibiotic active against many pathogens. Used for treatment of a variety of infectious conditions in food animals including cattle, sheep, swine, chickens and rabbits. maximum residue limits (MRL) are specified for meat, livers, kidneys, fats and milk from treated livestock.

Kangaroo meat  Meat from kangaroos, herbivorous marsupials belonging to the genus Macropus. Kangaroo carcasses have high lean and low fat contents; the proportion of high-value meat in kangaroo carcasses is greater than in sheep carcasses. The usual meat cuts available are fillet, loin and rump (the prime roasting and grilling cuts), topside, tail and chopped meat. As kangaroo meat oxidizes rapidly on contact with air, the majority is sold sealed, either vacuum packed or under plastic film. Kangaroo meat is dark in colour, has a distinctive texture and flavour, and contains predominantly polyunsaturated fats. In addition to its nutritional benefits, kangaroo meat is associated with a low incidence of pathogens and a low potential for transmission of zoonoses.

Kangaroos  Large, herbivorous marsupials belonging to the genus Macropus of the Macropodidae family; there are several species. In Australia, three species of kangaroo are harvested commercially for kangaroo meat production, namely the red kangaroo (M. rufus), the eastern grey kangaroo (M. giganteus) and the western grey kangaroo (M. fuliginosus).

Kanji  Alternative spelling for kanjang.

Kanjang  Korean style soy sauces produced by fermentation of meju (soy pastes). Alternative spelling is kanjan.

Kanji  Traditional Indian beverage made from black carrots. Peculiar to the northern plains of India, black carrots are black on the outside but a rich red colour under the skin. The carrots are parboiled in water with salt and other flavourings such as ground mustard seeds and chilli powder. The mixture is then left to ferment in the sun, resulting in a sour and spiced red drink which is consumed as an accompaniment to meals.

Kapok oils  Yellow-green oils obtained from seeds of the kapok tree (family Malvaceae) which contain cyclopropene acids. These oils have a mild flavour and aroma, but quickly develop rancidity upon air.
Kapot seeds  By-products of kapok fibre production; used for extraction of kapok oils.

Karaya gums  Exudates of Sterculia urens, a tree that is native to India; hence, the gums are also known as Indian tragacanth. Used as food thickeners, stabilizers, emulsifiers and texturizing agents.

Kareish cheese  Egyptian brine-ripened cheese made from cow or buffalo raw milk. Slightly acidic and salty flavour.

Kashar cheese  Turkish semi hard or hard cheese generally made from raw ewe milk, alone or mixed with raw goat milk. Similar to Kachkaval cheese which is popular throughout Balkan countries.

Kasseler  Cured pork products prepared from the loin of swine. Kasseler is cured and drained, and is then smoked and cooked again in a process similar to that used in ham production. It is a more delicate product than ham, and cannot tolerate being tumbled or massaged in order to increase take up of additional water.

Kasseri cheese  Greek pasta filata type cheese made from ewe milk or a mixture of ewe milk and goat milk. Traditionally made from raw milk, as processing procedures are considered to inhibit harmful microorganisms. Mindless, but with a white crust. Interior is pale yellow in colour with a springy texture. Flavour is salty and buttery, with an underlying sweetness. Kasseri cheese is used as an alternative to mozzarella cheese in local dishes.

Kateme  Common name for the West African shrub Thaumatococcus daniellii which produces intensely sweet fruits. These fruits are the source of the protein sweetener thaumatin. Also know as sweet prayer.

Katsuobushi  Japanese name for fish products consisting of dried flesh of skipjack tuna (bonito) which has been fermented and smoked, and then shaped into a stick-like form. Shavings from the dried block arey used as condiments and form the basis of dashi stock (a broth that forms the basis of many Japanese soups).

Katyk  Fermented product prepared from cream of ewe milk.

Kava  A plant (Piper methysticum; kava kava) and the beverage made by aqueous extraction of powders prepared from the rhizomes of this plant. The beverage is consumed in the south Pacific region as a narcotic/stimulant. Also used in treatment of anxiety and a range of disorders. The pharmacologically active components are lactones. Non-addictive, but there have been reports of adverse effects, such as muscle weakness, drying of the skin and liver damage, if consumed over a long period of time or in high amounts.

Kawal  Strong-smelling pastes prepared by fermentation of leaves of the legume Cassia obtusifolia. Rich in proteins. Used as meat substitutes in soups and stews.

KCl  Chemical formula for potassium chloride. One of the chlorides widely used in food processing at varying levels to replace salt (NaCl), for example in brines, in order to reduce Na levels in foods, and specifically to produce low sodium foods and salt substitutes. Generally used in blends with NaCl to balance perceptions of saltiness and bitterness.

Kebabs  Pieces of meat, fish and/or vegetables grilled or roasted on skewers or spits.

Kecap  Indonesian soy sauces prepared by fermentation of black soybeans in a 2-stage process involving a solid state fermentation and a brine fermentation.

Keeping quality  Alternative term for shelf life.

Kefalograviera cheese  Greek hard cheese made usually from ewe milk.

Kefalotyri cheese  Greek hard cheese made from whole raw milk or a mixture of ewe and goat milk. The colour varies from white to yellow and it has a tangy flavour and sharp aroma. It ripens in 2-3 months and is generally served grated over cooked dishes. Also produced in Romania.

Kefir  Alcoholic fermented milk product made traditionally by addition of kefir grains to milk. The traditional product contains alcohol and CO₂ in addition to lactic acid, making it foaming and viscous. Since this can cause blowing of packs, starters with few or no yeasts and lactobacilli are used in industrial production of kefir. Commercial kefir tends to contain much lower amounts of alcohol than traditionally prepared products. Kefir is generally more digestible than milk and more easily tolerated by lactose-intolerant individuals. It is marketed with various fat contents.

Kefiran  One of the exopolysaccharides produced by Lactobacillus kefiranofaciens and found in kefir grains. Potentially useful as a food additive due to its gelation properties. Also displays antitumour activity.

Kefir grains  Traditionally used in the culture of milk during manufacture of kefir. An irregularly shaped, elastic mass of microbial polysaccharides (e.g. kefiran), proteins (e.g. casein) and microorganisms. The microflora of the grains is highly variable, but tends to include lactic acid bacteria (e.g. streptococci, leuconostocs, lactobacilli, lactococci), acetic acid bacteria and yeasts. Fungi such as Geotrichum candidum may also be present. Kefir
grains are recovered from the finished product and can be re-used several times. However, this process is laborious on a large scale, so kefir grains are not used for industrial manufacture of kefir. Kefir starters that produce no grains are used instead.

**Kegs** Small barrels, often used for transportation or storage of alcoholic beverages, especially beer. May be made from wood, but are commonly made from plastics or metals.

**Kelp** Alternative term for the acaricide *dicofol*.

**Ketjap** Alternative term for *kecap*.

**Kieselguhr** Soft, crumbly sedimentary material used as filter aids and in other industrial applications.

**Killka** Brackish and freshwater fish species (*Clupeonella cultriventris*) from the herring family (*Clupeidae*), found in the Black Sea (northwestern parts), Sea of Azov and Caspian Sea; also occurs in lakes in Turkey and Bulgaria. Often marketed as a dried, salted product. Also known as *black sea sprat*.

**Killer yeasts** Exotoxins secreted as either *proteins* or *glycoproteins* by *killer yeasts*, such as *Pichia* and *Saccharomyces* spp., that are fatal to other susceptible *yeasts*. Can be used as a viable control for contaminant *wild yeasts* in fermented beverages.

**Killer yeasts** Yeasts (including brewers yeasts, wine yeasts and sake yeasts) which secrete protein or glycoprotein *toxins* able to kill sensitive yeast...
strains. This may be disadvantageous, if desirable yeast strains are killed, or beneficial if wild yeasts or contaminating yeasts are eliminated.

**Kilning** Final stage of malting, in which steeped germinated malting barley is heated and dried to a specified moisture content. This halts metabolism and enzyme activity in the malt. Kilning temperature and duration may be selected to give malts with a range of colour and flavour.

**Kilns** Furnaces or ovens for burning, baking or drying. An oat is a kiln used to dry products such as hops and malt.

**Kimchies** Fermented vegetable products, made mainly from cabbages or radishes, eaten widely in Korea. Prepared vegetables are soaked in brines for several hours before mixing with flavourings and fermentation by microorganisms present in the raw materials. Rich in vitamin C.

**Ki-mikan** Common name for citrus fruits produced by Citrus flaviculpus, which are eaten in Japan. Also known locally as ogon-kan.

**Kinases** Enzymes that transfer a phosphate group from one compound, such as adenosine triphosphate (ATP), to another. The acceptor may be an alcohol group (EC 2.7.1), a carboxyl group (EC 2.7.2), a nitrogenous group (EC 2.7.3) or a phosphate group (EC 2.7.4). The pyrophosphokinases are in subclass EC 2.7.6. The dikinases (EC 2.7.9) transfer 2 phosphate groups from a donor such as ATP to two different acceptors.

**Kinema** Traditional Indian product made by fermentation of cooked soybeans, usually with Bacillus subtilis. Rich source of protein, with a stringy texture and characteristic flavour. Consumed as meat substitutes, usually in a side dish with cooked rice.

**Kinetin** Member of the cytokinins group of plant growth regulators. Kinetin (6-furfurylaminopurine) occurs naturally in plants and is an important determinant of growth and development. Employed in plant tissue culture to induce cell division, and also added exogenously to fruits and vegetables during cultivation.

**Kingklip** Eel-like marine fish species (Genypterus capensis) primarily caught off the coast of southern Africa. Normally marketed in frozen form, but also sold fresh.

**King salmon** Alternative term for Chinook salmon.

**Kinins** Alternative term for the cytokinins.

**Kinnow mandarins** Variety of mandarins with very sweet flesh and numerous seeds.

**Kippers** Fish products consisting of boned and gutted herring which are split open along the back, lightly brined and cold smoked; sometimes artificially coloured. Marketed chilled, frozen or canned; ground flesh is made into kipper paste.

**Kirsch** Fruit brandies distilled from cherries, commonly in the presence of the cherry stones.

**Kishk** Dried mixture of fermented milk and cereals originating from the Middle East. Typically, made from bulgur wheat fermented with yoghurt and then dried and ground to a powder. Easy to store and can be reconstituted with water to make soups. Known as tarhana in Turkey or trahanas in Greece.

**Kisra** Fermented thin pancake-like leavened bread made from whole sorghum flour.

**Kissel** Russian jelly-type desserts made from sweetened fruit purees. Typically made with cranberries and thickened with arrowroot, corn starch or potato meal. Served hot or cold.

**Kitten foods** Pet foods specifically designed for kittens. Contain extra nutrients to encourage growth and development of strong teeth, bones and muscles. Easier to digest than cat foods. Main ingredients include meat, fish, cereals, fruits, yeast extracts, taurine, vitamins and minerals. May also contain probiotic bacteria. Available dried, in cans or in pouches. Dried kitten foods may contain smaller, specially shaped kibbles and may need to be moistened for newly weaned kittens.

**Kitten milks** Commercially available milk for kittens, formulated to closely match the protein, fat and carbohydrate composition of queen's milk. May contain added vitamins and taurine, and is either lactose free or contains very low levels. Available in liquid or powder form. Their composition differs from that of cat milks.

**Kiwano** Fruits produced by Cucumis metuliferus. A spiky cross between cucumbers and melons containing white seeds in a bright green, jelly-textured pulp. Also known as horned melons.

**Kiwifruit** Fruits produced by Actinidia delicosa (green kiwifruit) or A. chinensis (golden kiwifruit). Rich in vitamin C, also contain a range of minerals and B vitamins. The flesh of A. delicosa is bright green near the surface, with a ring of black seeds near the centre and a core of lighter green flesh, while A. chinensis has yellow flesh with a sweeter, less acidic flavour. Eaten fresh, often in fruit salads, or used to top desserts and in garnishes. Also known as Chinese gooseberries.

**Kiwifruit juices** Fruit juices extracted from kiwifruit.

**Kjeldahl nitrogen** Total nitrogen in a substance, determined by digesting the sample with sulfuric acid and a catalyst. Kjeldahl nitrogen is used extensively for determination of proteins levels in foods. In these
cases, the nitrogen measured is converted to the equivalent protein content by use of an appropriate numerical factor.

**Klebsiella** Genus of Gram negative, facultatively anaerobic, rod-shaped, coliform bacteria of the family Enterobacteriaceae. Occur in the gastrointestinal and respiratory tracts of humans and animals, soil, dairy products, raw shellfish and fresh raw vegetables. *Klebsiella pneumoniae* may be responsible for gastroenteritis in humans due to consumption of contaminated food. *K. aerogenes* is responsible for early blowing in cheese.

**Kloechera** Genus of mitosporic yeasts of the phylum Ascomycota which are anamorphs of Hanseniaspora spp. Occur on fruits and in soil. *Kloechera apiculata* is used in winemaking.

**Kluveromyces** Genus of ascomycetous yeasts of the family Saccharomycetaceae. Occur in foods, beverages, plants, soil, insects and sea water. *Kluveromyces marxianus* var. *marxianus* is used in the production of fermented milk (e.g. koumiss and kefir). *K. marxianus* var. *bulgarius* is used in the production of yoghurt and *K. lactis* is used in the production of buttermilk, Italian cheese and fermented milks. *Kluveromyces* spp. may be responsible for the spoilage of yoghurt and cheese. Biotechnological applications of *K. marxianus* include production of enzymes (β-galactosidases, β-glucosidases, inulinas, polygalacturonases), single cell proteins, aroma compounds and ethanol.

**Knackwurst** Cooked, smoked sausages, traditionally made in Germany. Knackwurst are prepared from similar ingredients to bologna and frankfurters, including coarsely textured pork, beef and veal; however, knackwurst additionally include garlic, which gives them a stronger flavour. They may also be known as garlic sausages or knoblouch. Some are prepared in wide diameter edible natural casings, whilst in other types, casings are removed before retail. Although they are cooked sausages, they are recooked before eating; commonly, they are simmered with sauerkraut, served like frankfurters, or added to stews and soups.

**Kneading** Working of dough, usually with the hands or by machine, in order to form a cohesive, smooth and elastic mass. The network of gluten strands stretches and expands during kneading, so enabling dough to retain gas bubbles formed by the actions of the leavening agent. When done by hand, kneading is performed by pressing down into the dough with the heels of both hands, then pushing away from the body. The dough is then folded in half, given a quarter turn, and the pressing and pushing action is repeated.

**Knives** Sturdy and well balanced cutting instruments consisting of a blade fixed into a handle, or blades on a machine for cutting, peeling, slicing or spreading. Most knife blades are made of steel or ceramic zirconia, a hard material that doesn't rust, corrode or interact with food. Knife handles are usually made of wood, plastics, horn or metal. Preferably, the end of the blade should extend to the far end of the handle, where it should be anchored by several rivets. Knives are tailored for specific applications. For example, a chef's knife has a broad, tapered shape and fine edge, which is ideal for chopping vegetables, while a slicing knife with its long, thin blade cuts cleanly through cooked meat. Knives with serrated edges are good for slicing softer foods such as bread, tomatoes and cakes. The easy-to-handle, pointed, short-bladed paring knife is ideal for peeling and coring fruits.

**Kocho** Traditional Ethiopian product made by lactic acid bacteria fermentation of ensete (*Ensete ventricosum*; Abyssinian banana), a crop related to bananas and plantains. The pseudostem, corm and inner leaf sheaths are the plant parts which are fermented. Fermentation lasts for a month to a year, depending on the ambient temperature. The fermented product is then baked.

**Kochujang** Korean name for chilli bean pastes, pastes or sauces made from fermented soybeans, or sometimes fermented black beans, chillies, garlic and seasonings. Popular also in Chinese dishes. Also known as kochu chang.

**Kochwurst** German sausages made from pre-cooked ingredients. The major types include: liver sausages, brawn sausages, blood sausages, spreadable sausages and aspic sausages.

**Kocuria varians** Species of bacteria of the family Micrococcaceae used in the production of fermented sausages. Former name *Micrococcus varians*.

**KOH** Chemical formula for potassium hydroxide.

**Kohlraibi** Variety of *Brassica oleracea*. Available in white, green and purple types. Rich in vitamin C and potassium. Leaves are used in salads or cooked as a vegetable; the swollen, turnip-like stem is eaten raw or cooked. Also known as cabbage turnips.

**Koji** Cereals or beans inoculated with *Aspergillus* or other fungi and used as starters for a wide range of Oriental fermented foods and fermented beverages, including miso, sake and soy sauces. Acts as a supplier of various enzymes, such as lipases, which contribute to the quality and functional properties of the products.

**Kojic acid** Metabolite produced by various fungi, particularly *Aspergillus oryzae*. Exhibits antibacte-
Kokja starters containing fungi and bacteria used in manufacture of Korean takju rice wines.

Koko thin, fermented porridge made from corn, sorghum or cassava flour, either singly or in mixtures. Often consumed as infant foods in Ghana and Kenya. Also known as uji.

Kokum Common name for the tropical tree, Garcinia indica, fruits of which are used in preparation of a spice. The dark purple fruits are picked when ripe, dried and the peel removed for use in foods, where it adds colour and a sour, slightly astringent flavour. Used especially in curries, vegetable dishes, chutneys and pickles. Fats prepared from kokum seeds have been used in cocoa butter extenders suitable for use in chocolate and sugar confectionery. Kokum is also known by a variety of other names, including cocum, kokam and Goa butter.

Komatsuna leafy vegetables (Brassica campestris or B. rapa) that are types of turnips developed for their leaves. Rich in vitamin C with a relatively high content of carotenoids. Young shoots are used in salads, while leaves are cooked as vegetables or used in soups. Also known as mustard spinach or spinach mustard.

Kombu Japanese name for seaweeds of the genus Laminaria.

Kombucha beverages made by fermentation of tea infusion with a mixed bacteria/fungi culture.

Koningklip Alternative term for kingklip.

Konjac Alternative term for some elephant yams.

Konjac glucomannans Gums composed of glucose and mannose obtained from elephant yams. Used primarily in Japan as gelling agents.

Konnyaku Alternative term for some elephant yams.

Korn spirits, produced mainly in Germany and the Netherlands, made by distillation of fermented grain mashes.

Kosher foods Foods permitted under Jewish biblical law and prepared in accordance with Jewish dietary code. Laws relate not only to the types of foods permitted (e.g. pork and rabbit meat products are non kosher) but also to the methods of slaughter/preparation, and to food combinations (e.g. meat products and dairy products may not be mixed). Kosher foods are perceived by many as having been prepared to high standards of wholesomeness and hygiene, and are currently attracting a new market of non-Jewish consumers who use kosher certification as an indication of quality.

Kostroma cheese Russian cheese made from cow milk.

Koumiss fermented milk usually made from mare milk. Produced using a 2-stage fermentation in which lactic acid bacteria are added, followed by yeasts on completion of lactic fermentation. In addition to lactic acid, it contains ethanol and CO₂, giving a light effervescence.

Krill Small, shrimp-like marine crustacea occurring abundantly in cooler waters. Commercial species include Euphausia superba and E. pacifica. They are mainly used in aquaculture feeds and fish foods, but are also fed to livestock and consumed by humans in Japan where they are called okiami. Krill are a rich source of proteins, lipids and vitamins, and their oils contain ω-3 fatty acids. Krill exhibit saltiness and are stronger in flavour than shrimps. Peeling is necessary before commercial use as the exoskeleton contains fluorides.

Krokant Alternative term for croquant.

Kudzu legumes of the genus Pueraria. Leaves are used in salads and the tubers are eaten cooked. The large tubers are also used as a source of starch (Japanese arrowroot) that is used in thickeners.

Kulfi Concentrated frozen milk product similar to ice cream popular in India and Pakistan.

Kumquats Orange or golden-yellow fruits of trees of the Fortunella species, belonging to the same family as Citrus species. Rich in vitamin C. Eaten fresh, cooked, candied or preserved in syrups. Used in marmalades, chutneys and jellies.

Kunun zaki Traditional Nigerian non-alcoholic fermented beverage which is one of a group of beverages called kunu. Commonly made from millet, sorghum, rice, acha or corn, singly or in mixtures, a combination of sorghum and millet being preferred. Cereal grains are steeped in water and dry or wet milled with spices such as ginger, red peppers, black pepper, cloves and garlic to impart flavour. Saccharifying agents, including malted rice, sweet potatoes, soybeans and malted sorghum, may also be added. The finished product is sweet with a potato-like flavour.

Kurakkan Alternative term for finger millet.

Kurthia Genus of obligately aerobic, coccoid or rod-shaped Gram positive bacteria of the family Planococcaceae. Occur in manure and stagnant water. Kurthia zopfii is responsible for the spoilage of meat and meat products.

Kuruma prawns Species of prawns (Marsupenaeus japonicus) highly valued for its flavour and texture.
Kusaya  particularly in Japan. Occurs in the Indian Ocean and the Southwestern Pacific Ocean from Japan to Australia; cultured in Japan and Australia.

Kusaya  Traditional Japanese fish products consisting of dried, brined mackerel.

Kusum  Oilseeds from the kernels of the tree Schleicheria oleosa (Macassar oil tree). Extracted oils are rich in arachidic acid and used in hair preparations and soap manufacture. Culinary use is rare due to their toxicity, but application in the adulteration of edible oils has been reported.

Kuth  Common name for Saussurea costus or Saussurea lappa. Medicinal plants which have been used as spices. Also known as costus.

Kvass  Alcoholic beverages originating in Russia, made by fermentation of mashes based on mixed cereals and bread.

Kwoka  Non-fermented corn product popular in Nigeria.

Kylar  Alternative term for the plant growth regulator daminozide.
Laban Alternative term for leben.
Labban Alternative term for leben.
Labelling Process of attaching labels to items to make them identifiable, or the information included on the labels. For foods, information may include bar codes, brand names, trademarks, illustrative matter, and compositional and nutritional details.
Labels Pieces of paper, plastics or fabric which are attached to, and provide information about, an item. For foods, this information may include branding or the trademarks of a food company, the geographical origin, date marking, compositional details, health claims, nutritional values and warnings relating to specific ingredients, e.g. nuts. The content of information on food labels is often governed by legislation.
Lablab beans Seeds of Lablab niger or Dolichos lablab. Rich in proteins and carbohydrates. Young and mature seeds as well as young pods are consumed. Also known as hyacinth beans and bonavist beans.
Labneh Strained concentrated yoghurt product popular in the Middle East. Also called yoghurt cheese and labaneh.
Laccases EC 1.10.3.2. Ligninolytic multicopper-containing enzymes that catalyse the oxidation of phenols and non-phenols with concomitant reduction of molecular oxygen. Can be used for removing phenols from fruit juices, as well as olive oil waste water and other effluents, detoxification of lignocellulosic hydrolysates and gelation of sugar beet effluents and other products. Also used for removing phenols with concomitant reduction in veterinary practice. Commonly classified into 4 groups according to antimicrobial activity: aminocillins; cephalosporins; carbapenems; and monobactams.
β-Lactam antibiotics Large group of antibiotics comprising naturally occurring and semisynthetic penicillins; the most widely used antimicrobial drugs in veterinary practice. Commonly classified into 4 groups according to antimicrobial activity: aminocillins; cephalosporins; carbapenems; and monobactams.
β-Lactamases EC 3.5.2.6. Hydrolases that act on β-lactam antibiotics. Those that act on penicillins are sometime known as penicillinases. Associated with antibiotics resistance traits in pathogenic bacteria. Widely used analytically for the detection of bacterial resistance to β-lactam antibiotics, and have also been used for detection of antibiotic residues in foods.
Lactarius Edible fungi also known as milk cap mushrooms. Commonly consumed species include Lactarius deliciosus, L. helvus, L. trivialis and L. sanguifluus. While most edible types are eaten cooked, some species are dried and used in condiments, and others are pickled or salted.
Lactases Alternative term for β-galactosidases.
Lactate dehydrogenases EC 1.1.1.27 (L-lactate dehydrogenases) and EC 1.1.1.28 (D-lactate dehydrogenases). These enzymes catalyse the conversion of Lactacin A is produced by L. delbrueckii subsp. lactis. It has a narrow host range and is heat labile. Lactacin B is produced by L. acidophilus, and its synthesis is chromosomally linked. This protein forms aggregates of molecular weight 100,000 Da; however, the actual molecular weight of lactacin B is 6000-6500 Da. Lactacin F is produced by L. acidophilus, and its synthesis is plasmid linked. It has a broader activity range than lactacin B, and forms aggregates of molecular weight 180,000 Da; however, the actual molecular weight of lactacin F is 25,000 Da.
α-Lactalbumin One of the major whey proteins, accounting for approximately 20% of total whey proteins in cow milk. Rich in tryptophan and cystine. Found in genetic variants A, B and C that differ in amino acids composition and have a bearing on the properties and yield of milk.
Lactalbumins Albumins present in milk. The main protein is α-lactalbumin.
Lacquers Liquids consisting of resins, cellulose esters, shellac or similar synthetic substances dissolved in a solvent, such as ethanol. Dry to form shiny, hard, protective or decorative coatings for plastics, wood, metals and other products.
Lactacins Bacteriocins synthesized by Lactobacillus spp. that are inhibitory only to other lactobacilli.
pyruvic acid into (S)- and (R)-lactic acid, respectively. Involved in lactic acid biosynthesis and useful for determination of D- and L-lactic acid levels in beverages, and for detection of lactic acid spoilage bacteria in beer.

Lactate 2-monooxygenases EC 1.13.12.4. Flavoproteins that convert (S)-lactate to acetate. Have been used to construct lactic acid biosensors and for production of D-lactate from a racemic mixture. Also known as lactate oxidases.

Lactate oxidases Alternative term for lactate 2-monooxygenases.

Lactates Salts or esters of lactic acid. Lactates such as sodium lactate are widely used in foods as preservatives, whilst calcium or iron lactates can be used in food fortification. Lactate concentrations are frequently determined in foods as a measure of lactic acid levels.

Lactation Physiological process involving secretion of milk from the mammary gland, usually beginning at the end of pregnancy and controlled by the hormones prolactin and oxytocin. At the beginning of lactation, colostrum is produced, mature milk being secreted later. In cows, milk yield as well as composition varies during lactation. Yield increases up to the 2nd month of lactation and decreases thereafter. Milk protein and fat contents are lowest during the 2nd month, then increase. Free fatty acids contents and proportions of stearic acid, oleic acid and linolenic acid in milk fat increase as lactation progresses, while proportions of short- and medium-chain fatty acids and linoleic acid decrease. Lactose content of milk decreases as lactation proceeds. Contents of immunoglobulins, minerals and trace elements, and activities of some enzymes increase towards the end of lactation.

Lactation number Value defining the number of lactations undergone by an animal. Can affect physicochemical properties and functional properties of milk.

Lactation stage Measure of the number of weeks of lactation that have passed since parturition. Lactation is generally divided into three stages during which three distinct secretions are produced: colostrum; transient milk; and mature milk. Colostrum is produced for approximately the 1st week, transient milk for the following 2-3 weeks and mature milk is produced thereafter.

Lactic acid α-Hydroxypropionic acid. One of the organic acids present in sour milk, molasses, fruits, beer and wines. Produced via lactic fermentation of sugars by lactic acid bacteria, a process that is an important step in manufacture of cheese, yoghurt and other acidic fermented dairy products. Also used for acidulating worts in brewing and in preservation of meat products, such as salami and pepperoni.

Lactic acid bacteria Gram positive bacteria (e.g. Lactobacillus, Lactococcus, Leuconostoc, Pediococcus and Streptococcus spp.) that are capable of lactic fermentation of sugar substrates. Used extensively in the food industry as starters to initiate lactic acid fermentation in the production of fermented dairy products (e.g. yoghurt and cheese), fermented meat products (e.g. salami), and fermented plant products (e.g. sauerkraut and sourdough).

Lactic beverages Beverages, manufacture of which includes lactic fermentation.

Lactic fermentation Process by which certain bacteria, such as lactic acid bacteria, convert sugars entirely, or almost entirely, to lactic acid (homolactic fermentation) or to a mixture of lactic acid and other products (heterolactic fermentation). Lactic acid bacteria produce either L(+)- or D(-)-lactic acid or both, depending on the specificity of the NAD-dependent lactate dehydrogenases present.

Lacticins Bacteriocins synthesized by Lactococcus lactis subsp. lactis. Classed as antibiotics and contain the unusual amino acid lanthionine. Lacticin 481 (also known as lactococcin DR) is a broad spectrum bacteriocin that is inhibitory towards strains of Lactococcus, Lactobacillus, Leuconostoc and Clostridium tyrobutyricum. Lacticins 3147 A1 and 3147 A2 are active against Enterococcus, Lactobacillus, Lactococcus and Leuconostoc strains.

Lactic starters Starters containing lactic acid bacteria.

Lactic streptococci Bacteria of the genus Streptococcus capable of lactic fermentation, and therefore often used as starters in the production of fermented foods. S. salivarius subsp. thermophilus is used in starters for production of yoghurt.

Lactitol Polyol, with the systematic name 4-0-β-D-galactopyranosyl-β-D-sorbitol, present in milk. May be isolated from whey or manufactured by hydrogenation of lactose. Has approximately 40% of the sweetness of sucrose and is used in sweeteners and bulking agents for sugar confectionery, ice cream and jams. Lactitol is not readily absorbed by the gastrointestinal tract and thus may be used in low calorie foods and diabetic foods.

Lactobacillaceae Family of anaerobic or facultatively anaerobic, rod-shaped or coccoid, Gram positive lactic acid bacteria of the order Lactobacillales. Occur in the mouth and gastrointestinal tract of
humans and animals, in food (e.g. dairy products) and in fermenting vegetable juices. Includes the genera **Lactobacillus** and **Pediococcus**.

**Lactobacillus** Genus of Gram positive, anaerobic or facultatively anaerobic, rod-shaped lactic acid bacteria of the family Lactobacillaceae. Occur in foods and beverages (e.g. wines, beer, fruits, milk products, dairy products), and in the mouth and gastrointestinal tract of humans and animals. Used as starters in the manufacture of fermented foods and fermented beverages (e.g. Lactobacillus acidophilus in the manufacture of kefir, *L. plantarum* in the manufacture of sauerkraut and *L. delbrueckii* subsp. bulgaricus in the manufacture of cheese). Some species may be responsible for spoilage of beer, meat, milk and wines.

**Lactobionic acid** Organic acid, synonym 4-((β-D-galactosido)-d-gluconic acid, produced by oxidation of lactose. Can be produced microbially from whey substrates. Has prebiotic activity, and has been used in a number of fermented dairy products, as well as pharmaceuticals, dietary supplements and cosmetics.

**Lactocins** Bacteriocins produced by **Lactobacillus** spp. Lactocin 27 is produced by *L. helveticus* LP27 and is a 12,400 Da glycoprotein inhibitor with a narrow spectrum of activity (restricted to *L. helveticus* and *L. acidophilus*). Lactocin 27 exerts a bacteriostatic effect rather than being bactericidal in activity, and is very heat stable. Lactocin S is produced by *L. sake* L45 and is one of the lantibiotics. It has antimicrobial activity against other lactobacilli, *Leuconostoc, Carnobacterium* spp., *Listeria* spp. and *Pediococcus* spp., and is moderately heat stable. Lactocin S has an estimated molecular weight of <13,700 Da. Lactocin 705 is produced by *L. paracasei*. It is effective against lactic acid bacteria, *Listeria* and streptococci, and is a good candidate for biopreservation of fermented meat.

**Lactococcos** Plasmid encoded bacteriocins produced by **Lactococcus** spp. that are small and heat stable. Examples include lactococcosins A and B, which are produced by *L. lactis* subsp. cremoris and have a narrow host range, against lactococcal strains only. Their mechanism of action is on the bacterial membrane of susceptible organisms. Lactococcin MMFI is produced by *L. lactis* subsp. lactis and is active against *Enterococcus, Lactobacillus*, *Lactococcus* and *Listeria* spp. Lactococcin G is a two-peptide bacteriocin.

**Lactococcus** Genus of Gram positive, facultatively anaerobic, coccoid lactic acid bacteria of the family Streptococcaceae. Occur in milk and dairy products. Used extensively as starters (e.g. *Lactococcus lactis* subsp. lactis and *L. lactis* subsp. cremoris strains) in the manufacture of fermented dairy products (e.g. cheese and fermented milk).

**Lactoperoxidase systems** Antimicrobial systems that occur naturally in raw milk, consisting of lactoperoxidases, thiocyanate (the major antimicrobial agent)
Lactose

and H₂O₂. The systems can be activated by addition of exogenous thiocyanate and H₂O₂ in order to increase the storage time of raw milk. They may also be useful for extending the shelf life of other foods.

Lactose  Also known as milk sugar, this disaccharide comprises glucose and galactose monomer units. Exhibits a low level of sweetness, approximately 16-20% that of sucrose, is the predominant sugar in milk, and can be recovered from whey by removal of whey proteins and minerals, followed by crystallization. Used in infant formulas and a variety of processed foods, although lactose crystallization can cause problems with product stability and sensory properties. Some individuals suffer from lactose intolerance due to an inability to digest this sugar, and this has prompted the development of a range of low lactose foods. Lactose can be converted to value-added products including lactulose, lactitol, galactooligosaccharides, lactobionic acid and tagatose.

Lactose intolerance  Impaired ability to digest the disaccharide lactose due to lack of lactases (β-galactosidases) in the small intestinal mucosa. Undigested lactose remains in the intestinal contents, and is fermented by bacteria in the colon, resulting in explosive and watery diarrhoea. Treatment is to omit lactose from the diet.

Lactose synthases  EC 2.4.1.22. Glycosyltransferases which catalyse the transfer of galactose from UDP-galactose to D-glucose, forming lactose. These enzymes are complexes of N-acetylglucosamine synthases (EC 2.4.1.90) and α-lactalbumin. In the absence of α-lactalbumin, the enzymes catalyse the transfer of galactose from UDP-galactose to N-acetylglucosamine.

Lactose syrups  Syrups consisting predominantly of lactose. Manufactured from whey by removal of whey proteins and minerals using ultrafiltration and ion exchange chromatography, respectively. Used as sweeteners in dairy products, infant formulas and sugar confectionery.

Lactosucrase  Oligosaccharide with the systematic name 4(G)-β-D-galactosylsucrose, which promotes the growth of Bifidobacterium in the human gastrointestinal tract. It also inhibits growth of harmful bacteria. Made commercially from sucrose and lactose in a reaction catalysed by β-fructofuranosidases. Used as a low-calorie sweetener in foods and beverages, including soft drinks, bakery products and sugar confectionery, and as a component of functional foods.

Lactulose  Nutritive sweetener produced by isomerization of lactose which has 1.5 times the sweetness of lactose.

Lactylates  Salts or esters of lactyl lactate. Include stearyl lactylates, which are used in the food industry as emulsifiers.

Laevulose  Alternative term for fructose.

Lager  Type of beer, originating in Central Europe but now popular worldwide. Made by fermentation with bottom fermenting yeasts.

Lairage  Temporary housing for animals whilst they are awaiting slaughter or transportation.

Lake water  Water derived from lakes. After treatment, it may be used as drinking water.

Lamb  Meat derived from young sheep (lambs). Lamb is pink in colour and has creamy-white fat, which has a firm, dry texture. The older the sheep, the coarser the texture and stronger the flavour of lamb. In many cultures, consumption of lamb is associated with festivals and religious ceremonies.

Lambanog  Spirits made in the Philippines from fermented sap of coconut palms.

Lamb chops  Thick slices of lamb, usually including an ‘eye’ of meat, a rib and a layer of subcutaneous fat.

Lamb cutlets  Portions of lamb, particularly lamb chops from just behind the neck. Lamb cutlets are usually cooked by grilling or frying.

Lambic  Belgian beer, made by a slow spontaneous fermentation process. Frequently flavoured with fruits such as cherries, raspberries or peaches.

Lamb kidneys  Paired abdominal excretory organs, which form part of the edible carcasses. Kidneys from young animals, particularly lambs, are more tender than those of older animals. Lamb kidneys, along with those from calves, have a more delicate flavour, whilst cattle kidneys and swine kidneys have a stronger flavour.

Lamb livers  Livers from lambs; part of edible offal. Usually cooked by frying or grilling, but may also be used to prepare pates. Milder and sweeter in flavour than swine livers or cattle livers.

Lamb mince  Meat mince prepared from lamb. Also known as ground lamb or minced lamb.

Lambs  Domestic sheep (Ovis aries) that are typically aged 12 months or less, particularly those that have yet to be weaned. Rearing lambs is an important aspect of the meat industry in many countries. The flesh obtained is called lamb.

Lamb sausages  Sausages made from lamb or mutton. Fresh lamb sausages may be seasoned with rosemary or mint. Dry fermented lamb sausages are often prepared using lean meat from older sheep.

Laminaria  Genus containing several species of large brown seaweeds, many of which are utilized for food purposes. Rich source of minerals, including...
Laminarin

- An alternative term for Lamprey Fish.
- Materials made up of several layers of Laminarin.
- Laser light scattering

Lampetra fluviatilis

- A large group of creeping terrestrial gastropods.
- Usually eaten as snail meat.

Land snails

- A large group of creeping terrestrial gastropods.
- Usually eaten as snail meat.

Lanternfish

- Any of a number of relatively small deepwater marine fish species from the family Micropogonidae.
- Widely distributed around the oceans of the world. Some species are utilized as food fish.

Lanthanides

- Group of elements with atomic numbers 57-71, of which cerium is the most abundant.
- Used in industry, e.g. in alloys and magnets as catalysts; used in fertilizers for food crops in some countries.
- Due to their widespread use, lanthanides can enter the food chain as pollutants, wild mushrooms being particularly susceptible to accumulation, although trace amounts are found in many foods.
- Also known as rare earth elements.

Lanthione

- Di-(α-amino acid) formed from the amino acids alanine and cysteine.
- Synonyms include S-(alanin-3-yl)-L-cysteine and 2,2′-diamino-3,3′-thiobis(propionic acid). The lanthionine skeleton occurs in lantibiotics, a group of polypeptide bacteriocins synthesized by Gram positive bacteria.

Lantibiotics

- Plasmid encoded bacteriocins produced by Lactococcus lactis, consisting of small membrane active peptides (<5 kDa) containing the amino acids lanthionine, β-methyl lanthionine and other dehydro residues.
- Heat sensitive at pH 9.4, and act on a wide host range of Gram positive bacteria. Include nisin and lactacin 481.

Lanzones

- Alternative term for langsat.

Lao-chao

- Traditional fermented rice product.

Lard

- Soft, white, solid fat traditionally obtained by rendering or melting the internal fats from swine.
- Rich in a number of fatty acids, including sn-2 palmitic, stearic, oleic and linoleic acids; contains cholesterol. Has a bland flavour and aroma. Used in cooking and baking.

Lasagne

- Rectangular sheets of pasta. Usually eaten layered with meat or vegetables and cheese sauces and baked.

Lasalocids

- Polyether ionophore antibiotics used widely as coccidiostats in the control of coccidiosis in poultry; also used as growth promoters in cattle.
- Rapidly metabolized in animals and residues are normally absent from all tissues except livers within 7 days post-treatment.
- Residues may accumulate to relatively high levels in eggs, and consequently, lasalocids are banned by the EU from being added to feeds that are given to laying hens.

La Serena cheese

- Spanish cheese made from raw ewe milk using vegetable rennets prepared from thistles.
- Has a semi-hard rind, a soft to semi-hard curd and a minimum fat content of 50%.

Laser light scattering

- One of the analytical techniques used for measuring the concentration or molecular weight of substances, including proteins, carbohydrates, etc., in solution. The amount of light scattered by a solution is directly proportional to the concentration and weight average molecular weight of the solute(s). For larger molecules, measurement of light scattered at different angles to the laser beam is
Lasers

Any apparatus in which light amplification by the stimulated emission of radiation (acronym: laser) occurs. Lasers require a lasing medium, which on excitation emits light, and mirrors which reflect the radiation emitted through the medium. Lasers emit non-diffuse (directional) light of a narrow wavelength range. Have many applications including in various analytical techniques, e.g. confocal laser scanning microscopy and MALDI-TOF-MS, and for marking, e.g. laser printing and cutting.

Lasoda fruit Fruits produced by Cordia myxa. Harvested green and used in making pickles.

Lassi Sweetened fermented milk beverage popular in India. Prepared by stirring sugar, water and flavourings into dahi, giving a viscous, white, mild to highly acidic drink.

Laurel Common name for the bay laurel plant Laurus nobilis, leaves (bay leaves) of which are used as flavourings in sauces, pickles and seasonings. Imparts a sweet, spicy flavour. Also termed bay or sweet bay.

Laurencia Genus of red seaweeds found on rocky shores around the world. Some species have a pungent, peppery flavour and are used as condiments. Pepper dulce is an alternative name for Laurencia pinnatifida, which is used in this way.

Lauric acid One of the medium-chain saturated fatty acids. Contains 12 carbon atoms and has a melting point of 44°C. Synonymous with dodecanoic acid. Slight odour of bay oil. Occurs as a triacylglycerol component of milk fats and vegetable oils including rapeseed oils and palm oils, and is a component of several cocoa butter substitutes. Identified as an aroma component in cheese.

Lautering Separation of worts from insoluble material in brewing mashers by running off the worts through the perforated bottom of lauter tuns, in which the insoluble solids are retained.

Lauter tuns Circular vessels equipped with a perforated or wire mesh base and rotating stirrer arms, used for the lautering process.

Lavender Common name for plants of the genus Lavandula. Used mainly as a source of essential oils which are used medicinally and in aromatherapy, but also as a flavouring ingredient in foods. Applications include sauces, dressings, cookies and herb tea. Lavender flowers are the botanical source of popular monofloral honeys.

Laver Name given to dried, edible seaweeds of the genera Porphyra and Ulva.

Laverbread Product made from red seaweeds of the genus Porphyra. Prepared by boiling in brines, cooling and chopping; often fried prior to consumption.

Lben Alternative term for leben.

LC Abbreviation for liquid chromatography.

LDPE Abbreviation for low density polyethylene.

Lead One of the heavy metals, chemical symbol Pb. The main source of lead for humans is dietary; lead can be present as a contaminant in both foods and beverages, including water. Following consumption, lead is accumulated predominantly in bones and teeth. In excess, lead causes a range of toxicity problems including anaemia, encephalopathy, neuropathy and renal dysfunction. Current research indicates that there is no safe level of lead exposure.

Leaf beet Common name for Beta vulgaris. Leaves, including the stalk, are eaten as a green vegetable in a similar way to spinach. Used raw in salads, boiled as a vegetable and in savoury dishes. Also known as Swiss chard, chard, white beet, spinach beet and silver beet. Good source of vitamin A, vitamin C and iron.

Leaf proteins Proteins contained in plant leaves, a very good source of protein in the diet.

Leaf vegetables Plants in which the edible parts are the leaves.

Leafy vegetables Leafy plants, the stems and leaves of which are used as vegetables.

Lean The part of meat which contains very little fat.

Leavening The process by which dough is made to rise due to fermentation by yeasts.

Leaves Organs that grow from the stems of plants. Often green, flattened and lateral structures that specialise in photosynthesis and, in many plants, are the sites where respiration and transpiration take place. Play a prominent role in the diet as leafy vegetables.

Leban Alternative term for leben.

Lebaycid Alternative term for the insecticide fen-thion.

Leben A fermented milk similar to yoghurt produced in North Africa and the Middle East. Since the starters used include yeasts, the product contains some ethanol. Also known as laban, labban, uben, leban and lebben.

Leccinum Genus of fungi of the family Boletaceae which is native to Europe and North America. Most species are thought to be edible.
Lecithinases  Lecithinases A, C and D, alternative names for phospholipases A₂, C and D, respectively; lecithinase B, alternative term for lysophospholipases.

Lecithins  Products comprising phospholipids. Composed of phosphate esters of diglycerides (mostly oleic acid, palmitic acid and/or stearic acid) esterified to choline via the phosphate group. Due to the presence of both polar and non-polar moieties, the molecule forms micelles and has uses as food emulsifiers. Prevalent in soybeans and egg yolks; by-products in manufacture of soybean oils. Lecithin is also called phosphatidylycholine.

Lectins  Carbohydrate-binding proteins or glycoproteins, synonyms include phytohaemagglutinins and agglutinins. Lectins are of non-immune origin and agglutinate cells and/or precipitate glycoproteins. Found in many plant foods and can have detrimental properties as antinutritional factors and toxins, or possible beneficial properties including antitumour activity. Lectins are widely used analytically as specific binding and separating agents.

Leeks  Common name for Allium porrum or A. porrum. Lower part is eaten as a vegetable or used as an ingredient in soups and stews.

Legumes  Vegetables of the family Fabaceae. The seeds or beans are contained in pods. Edible products include dry seeds (beans or pulses), immature green seeds, oilseeds (such as soybeans), green pods, spices, shoots, leaves and sprouts. Rich sources of good quality proteins, and generally low in fat (exceptions include peanuts, soybeans and chick peas). Also good sources of dietary fibre and some B vitamins. Carotenes, vitamin C and vitamin E can be obtained from immature seeds, pods, leaves and sprouts. Some seeds also contain antinutritional factors or toxins that can cause diseases. These can usually be destroyed by careful processing of the seeds.

Legume sprouts  Produced by germination of legume seeds, commonly mung beans, alfalfa, lentils, soybeans and black gram. Rich in proteins, vitamins and minerals. Fresh sprouts are crisp and tender, and are often eaten raw. In dishes, they are cooked for a short period only to avoid wilting. Also available canned.

Legume starch  Types of starch found in legumes, such as peas, chick peas and various beans. Tend to have lower digestibility than cereal starches and are used as ingredients of foods with low glycaemic index values. Also used as texturizing agents and fat substitutes, sometimes in pregelatinized form.

Legumin  One of the storage proteins formed in seeds of legumes.

Lemonade  Effervescent or still beverages made from lemon juices, or, more generally, carbonated beverages with a lemon flavour. May be added to spirits before consumption.

Lemon balm  Spices also called bee balm, melissa, bee herb, balm mint and balm gentle. Lemon balm leaves possess a citrus-like aroma and can be added directly to foods without further processing.

Lemon essential oils  Distillates of lemon peel used as flavourings. The active component of lemon oils is citral, a mixture of the terpene aldehydes neral and geranial.

Lemongrass  Spices made from the grasses Cymbopogon flexuosus or Andropogon nardus (East Indian lemongrass) or Cymbopogon citratus (West Indian lemongrass). Used as flavourings in Asian cuisine and particularly in Thai dishes. The characteristic flavour compound of lemongrass is citral.

Lemon grass  Alternative term for lemongrass.

Lemon grass oils  Alternative term for lemongrass oils.

Lemongrass oils  Essential oils produced by steam distillation of fresh lemongrass, comprising approximately 65-75% citral.

Lemon juice  Fruit juices prepared from lemons (Citrus limon). Used in beverages and as a flavouring ingredient in cooking.

Lemon peel  Outer skin of lemons. Used to make candied peel, as a garnish and to add flavour to a range of sweet and savoury dishes.
Lemons

Yellow citrus fruits (Citrus limon) that are extremely rich in vitamin C. Total sugar content is relatively low for a citrus fruit. Its citric acid content of approximately 5% makes it too acidic for eating as a dessert. However, lemon juices are widely used as food and beverage flavourings, and lemon peel is also used in foods.

Lemon tea Tea beverages with the flavour of lemons.

Lenacil One of the uracil herbicides used particularly on crops such as beets. Classified by WHO as unlikely to present acute hazard in normal use.

Lentils Seeds of the legumes Lens culinaris or L. esculenta, rich in proteins and carbohydrates. Used to make dhal, in soups or in snack foods. Flour made from the seeds can be used as an ingredient in cakes and infant foods. Young pods of the plant are eaten as vegetables.

Lentinula edodes Species of edible fungi of the family Tricholomataceae, commonly known as shiitake, which is native to China. Former name Lentinus edodes.

Lentinus Edible fungi, the most commonly consumed example being shiitake or Japanese black forest mushrooms (Lentinus edodes, renamed Lentinula edodes).

Leucoanthocyanidins Anthocyanidins found in a range of plant foods.

Leucine One of the essential amino acids. A common protein constituent and free amino acid in many foods. Leucine is also a precursor of several aroma compounds and participates in the Maillard reaction. Produced industrially by fermentation of Corynebacterium glutamicum or other microorganisms.

Leucaena Genus of legumes. Seeds of some species, mainly Leucaena leucocephala and L. glauca, are used as food and as a source of gums; leaves and pods are also eaten. However, proteins in leaves, pods and seeds contain the toxic amino acid mimosine, which can be destroyed by heating.

Leucaena Genus of legumes. Seeds of some species, mainly Leucaena leucocephala and L. glauca, are used as food and as a source of gums; leaves and pods are also eaten. However, proteins in leaves, pods and seeds contain the toxic amino acid mimosine, which can be destroyed by heating.

Leukocytes White, nucleated blood cells that lack haemoglobin, which are found in blood and lymph. Formed in lymph nodes and bone marrow. Can produce antibodies and move through the walls of vessels to migrate to the sites of injuries, where they surround and isolate dead tissue, foreign bodies and bacteria. There are two major types: those with granular cytoplasm (granulocytes), which include basophils and neutrophils; and those without granular cytoplasm,

Lettuces Common name for Lactuca sativa. Generally used as a salad plant, but sometimes eaten as a vegetable. Good source of fibre, potassium, β-carotene, vitamin E and vitamin C. Some cultivars have red pigmentation.

Leucoanthocyanidins Anthocyanidins found in a range of plant foods.

Leuconostoc bacteria are used as starters in the production of fermented foods. Leuconostoc mesenteroides subsp. cremoris strains are used as starter cultures in the production of fermented dairy products (e.g. fermented cream, cheese, kefir, buttermilk).
such as lymphocytes and monocytes. Alternative spelling is leucocytes.

Levanases EC 3.2.1.65. Catalyse the random hydrolysis of 2,6-β-D-fructofuranosidic linkages in 2,6-β-D-fructans (levans) containing more than 3 fructose units. Useful for production of fructooligosaccharides.

Levans Fructose-based polysaccharides which are synthesized by bacteria, commonly Zymomonas mobilis. These β(2→6) fructans have potential applications in foods, and have been attributed with health-promoting properties, such as prebiotic effects, hypolipidaemic activity and immunomodulation; they are also used in the production of fructooligosaccharides, including kestose.

Levansucrases EC 2.4.1.10. Glycosyltransferases which transfer a fructosyl group from sucrose to 2,6-β-D-fructans (levans), increasing the chain length by one fructosyl unit. Useful for production of fructooligosaccharides.

Lichenases Alternative term for licheninases.

Licheninases EC 3.2.1.73. Glycosidases which hydrolyse 1,4-β-D-glucosidic linkages in β-D-glucans containing both 1,3- and 1,4-bonds. Act on β-glucans in cereals and on lichenin, but not on β-D-glucans containing only 1,3- or 1,4-bonds. Used in the brewing industry to hydrolyse mixed β-glucans during malting and brewing, and potentially useful for production of oligosaccharides for use in prebiotic foods. Also known as lichenases.

Lichens Composite, plant-like organisms of the division Lichenes formed by the symbiotic association of fungi and algae. Form crusty patches or bushy growths on areas such as tree trunks and rocks. Used mainly as a source of dyes, but some species, such as Parmelia nepalensis, Ramalina farinacea and Gyrophora esculenta, are eaten.

Life cycle assessment Assessment of the impacts associated with a system, function, product or service over its entire life cycle. Sometimes considered to include four stages: initiation; inventory; impact analysis; and improvement.

Ligases EC 6. Enzymes that catalyse the joining of 2 molecules with concomitant hydrolysis of the diphosphate bond in adenosine triphosphate (ATP) or a similar triphosphate. Important in the synthesis or repair of many biological molecules, such as DNA. Subdivided into enzymes that form carbon-oxygen bonds (EC 6.1), carbon-sulfur bonds (EC 6.2), carbon-nitrogen bonds (EC 6.3), carbon-carbon bonds (EC 6.4), phosphoric ester bonds (EC 6.5) and nitrogen-metal bonds (EC 6.6).

Light Source of illumination that makes objects visible; electromagnetic radiation in the wavelength range 390-740 nm.

Lignans Cinnamic acid dimers in which the phenyl-propane units are linked tail-to-tail. These phenols are present in many plant foods. Flax seeds are a particularly good source of lignans, but they are also present in cereals, vegetables, fruits and legumes. Lignans are of interest as phytoestrogens, and may play a role in the prevention of oestrogen-dependent cancer.

Lignin Random phenylpropanoid polymer component of plants, where it confers strength, rigidity and resistance to degradation. Lignin is one of the most abundant biopolymers, and a major component of insoluble dietary fibre in plant foods.

Ligninases Term formerly used for enzymes involved in the degradation of lignin, particularly lignin peroxidases.

Lignin peroxidases EC 1.11.1.14. Lignin-degrading enzymes potentially useful for lignin depolymerization, degradation of toxic pollutants and catalysis of difficult chemical transformations (e.g. during the production of vanillin). Thought to be required for the decoloration of olive oil mills effluents by white rot fungi.

Lignocelluloses Complexes of lignin and celluloses found in the cell walls of plants, and components of dietary fibre in plant foods. Plant-derived wastes such as pomaces and bagasse contain lignocelluloses, and these wastes can be hydrolysed chemically or enzymically to release sugars which can be used as microbial fermentation substrates, for example for ethanol synthesis.

Lignoceric acid One of the saturated fatty acids, synonym tetracosanoic acid, molecular formula C24H48O2. Occurs as a minor lipid in plants and some vegetable oils, and has been used as an indicator of cocoa shell contamination of cocoa products. Also present in animals, especially in brains and other central nervous system tissues, and has been used as a marker of meat contamination with these tissues.

Lily bulbs Bulbs from plants of the genus Lilium that may be consumed as vegetables and undergo cultivation in Japan and China for this purpose. They resemble onions in appearance, but are more starchy and less pungent. They are often subjected to vacuum packaging before sale and may be cooked by baking or frying. Parboiling effectively reduces any bitterness.

and a good source of vitamin A, vitamin C, some of the vitamin B group, fibre and potassium. As well as dried beans and immature beans (often canned or frozen), pods and leaves are also eaten. Mature seeds can contain toxic hydrocyanic acid, which is destroyed by soaking and boiling in water before consumption. Also known as butter beans, sieva beans and Madagascar beans.

**Limburg cheese**  Belgian soft cheese made from cow milk. Sometimes called Limburger cheese. The washed rind is reddish-brown and the slightly sticky smear interior is yellow. It has a spicy and aromatic flavour, and a characteristic aroma caused by enzymes breaking down proteins on the cheese surface. Unripened cheese contains some holes, but ripened cheese has only a few, if any, small holes. The cheese ripens in 6-12 weeks and its fat content can be between 20 and 50%.

**Lime berries**  Reddish, edible fruits (10-15 mm diameter) produced by Triphasia trifolia or T. aurantiola, native to southeastern Asia. Fully ripe fruits have a sweet, aromatic flavour. They can also be pickled, or cooked to make jams or preserves.

**Lime essential oils**  Essential oils from limes produced by compression of peel or distillation of mashed lime pulps or juices. Used as flavourings, particularly in carbonated beverages, such as cola beverages. The predominant flavour compound present is terpineol which is produced from citral during distillation.

**Lime juices**  Fruit juices prepared from limes (Citrus aurantifolia). Used in beverages and as a flavouring ingredient in cooking.

**Limes**  Greenish-yellow citrus fruits (Citrus aurantifolia) which are rich in vitamin C. Total sugar content is relatively low for a citrus fruit and they are very acidic. Used in marmalades and as flavourings in products such as saucers, pickles and chutneys. Lime juices are used in beverages and the peel is a source of essential oils. Cultivated mainly in warmer climates, as the plant is very sensitive to frost.

**Liming**  One of several sugar processes used for purification of sugar juices. Involves addition of some form of lime, e.g. calcium oxide, milk of lime (a slurry of calcium hydroxide) or calcium saccharate, to sugar juices and heating. The lime neutralizes organic acids present and forms insoluble lime salts with the impurities. Suspended particles from the sugar cane or sugar beets that remain after filtration associate with the precipitate formed. Forms of liming include cold liming, hot liming and intermittent liming; these differ with respect to the order in which addition of lime and heating are carried out.

**Limit dextrinases**  EC 3.2.1.142. Glycosidases which hydrolyse (1,6)-α-D-glucosidic linkages in amylopeptins and pullulan, and in α- and β-limit dextrins of amylopeptin and glycogen. The smallest sugar released as a result of this reaction is maltose. Also used erroneously as an alternative term for pullulanases and oligo-1,6-glucosidases.

**Limoncello**  Lemon liqueurs traditionally made in Italy by soaking zest of lemon peel in alcohol, such as vodka, and adding sugar syrup. Commonly consumed on its own, cold or iced, as an ingredient of longer drinks or poured over ice cream or fruits.

**Limonene**  One of the monoterpenoid aroma compounds, with lemon-like aroma. Found in citrus fruits and their products, including citrus juices and citrus essential oils. Also found in dill and caraway seeds.

**Limonin**  One of the main bitter compounds found in citrus fruits. Limonin and other limonoids are highly oxygenated triterpenoids of interest as anticarcinogenic phytochemicals.

**Limonoid glucosides**  Limonoids with carbohydrate (glucose) substituents; in contrast to limonoids, the glucosides are generally non-bitter. Over 17 different limonoid glucosides have been isolated from citrus fruits, and limonoids are mainly accumulated as glucoside derivatives in mature citrus fruit tissues. Along with limonoid aglycones, the glucosides show possible anticarcinogenicity.

**Limonoids**  Highly oxygenated triterpenoids found predominantly in citrus fruits. Over 35 limonoids have been identified in citrus species, and many are bitter compounds. Limonoids demonstrate anticarcinogenicity and also antifeedant activity against insects and termites.

**Limpets**  Any of a number of marine gastropod moluscs having compressed conical shells. Found attached to substrates on rocky shores worldwide. Limpet meat is valued for its flavour, but generally has a tough texture. Consumed raw or lightly sauteed; meat is often tenderized prior to consumption.

**Lin**  Alternative term for tench.

**Linalool**  One of the monoterpenoid aroma compounds, with floral/sweet/citrus aroma characteristics. Linalool is found naturally in many foods and beverages, and is also added as a flavour compound to processed foods.

**Linalyl acetate**  Ester with sweet/floral aroma characteristics. This flavour compound is found in several plant essential oils, including bergamot oils, sage oils and citrus oils.

**Linamarases**  Alternative term for β-glucosidases.
Linamarin  One of the cyanogenic glycosides, linamarin is found in cassava roots. This toxin has to be removed by processing, generally fermentation, before cassava can be eaten safely.

Lincomycin  Lincomycin is a group positive bacteria. Used to treat a variety of infections (e.g. staphylococcal infections) in farm animals, but mainly used for swine in control of necrotic dysentery and mycoplasma infections. Swine producing meat for human consumption should not be slaughtered within 48 hours of treatment with lincomycin. In turkeys, lincomycin is used for treatment of arthritis caused by bacteria and/or mycoplasma. Also used as growth promoters.

Linseed oils  Yellow to amber viscous vegetable oils obtained from flax seeds, Linum usitatissimum. Rich in iodine and α-linolenic acid. Polymerize on exposure to air, resulting in thickening. Used as a food oil. Also known as flax seed oils.

Linseeds  Seeds derived from flax, Linum usitatissimum, used as the source of linseed oils.

Linuron  Selective systemic urea herbicide used for pre- and post-emergence control of annual grasses and broad-leaved weeds around a range of plants, including vegetables and cereals. Classified by WHO as unlikely to present acute hazard in normal use. Also known as afalon.

Lipasa activity  Human physiology term relating to the ability of certain compounds to either increase or decrease levels of lipids in the blood.

Lipases  Enzymes that hydrolyse tri-, di- or monoacylglycerols at a lipid-water interface to form free fatty acids and either di- or mono-glycerides, or free glycerol. The term usually refers to triacylglycerol lipases (EC 3.1.1.3), which act on triglycerides. Can cleave various natural lipids and oils, such as olive oils, soybean oils, coconut oils, butterfat, and pork and beef fats, and can show positional-, fatty acid- or stereo-specificity. Useful for enhancing of flavour during cheese ripening and, due to their esterification, interesterification and transesterification activities, for production of modified esters and lipids, speciality fats and cocoa butter substitutes. Lipases are also active in organic solvents.

Lipids  Naturally occurring organic chemicals that are characteristically poorly soluble in water but are soluble in organic solvents. Lipids constitute one of the four main classes of compounds found in living tissues, and also one of the major nutrient types, and as a class include oils, fats, fatty acids, long-chain (or fatty) alcohols, triglycerides, phospholipids, waxes, steroids, terpenoids and some hormones and vitamins.

α-Lipoic acid  Sulfur-containing organic acid with antioxidative activity used in food supplements and functional foods. Found in spinach, broccoli, potatoes and offal. Cofactor for enzymes involved in aerobic metabolism.

Lipolysis  Hydrolysis (splitting) of lipids by lipases to yield glycerol and fatty acids.

Lipolytic enzymes  Encompasses lipases, lipoprotein lipases and phospholipases.
Lipoproteins Conjugated molecules containing proteins and lipids. The lipid may be a phospholipid, triglyceride or cholesterol, or a mixture of these. Serum lipoprotein and lipoprotein-cholesterol profiles are frequently measured as biomarkers of cardiovascular diseases (CVD) and used to examine the relationship between diet and health. Oxidation of serum low density lipoproteins (LDL) is implicated in the aetiology of CVD, and certain functional food constituents such as flavonoids from green tea and red wines have the ability to inhibit LDL oxidation due to their antioxidative activity. Lipoproteins are also present in foods, e.g. lipovitellins in egg yolks.

Liposcelis Genus of insects of the family Psocidae common as pests in cereal stores in hot, humid areas. Can feed on grain, oilseeds and pulses. In large numbers, they may cause heating of grain with consequent damage to its quality and value. Also found in food manufacturing premises and domestic situations where conditions are favourable.

Liposomes Microscopic vesicles comprising a bilayer composed of phospholipids, particularly lecithins, and cholesterol surrounding an aqueous core. May also be prepared using synthetic surfactants. Formed by sonication of the lipids component in an aqueous medium or by rapid mixing of the lipids in an aqueous solution of ethanol. Tool for delivery of hydrophilic substances, e.g. enzymes or drugs into cells, or for encapsulation to allow controlled-release of substances, e.g. active ingredients of functional foods, or protection of ingredients during food processing.

Lipovitellins Lipoproteins present in egg yolks.

Lipoxidases Alternative term for lipoygenases.

Lipoygenases Term used specifically for EC 1.13.11.12 and also as a general collective term for other oxygenases including EC 1.13.11.31, EC 1.13.11.33, EC 1.13.11.34, EC 1.13.11.40 and EC 1.13.11.45. All of these enzymes catalyse the oxidation of unsaturated fatty acids containing a cis-cis penta-1,4,diene unit to the corresponding monohydroperoxide. The preferred substrates are linoleic acid, arachidonic acid and linolenic acid. Plant lipoxygenases (EC 1.13.11.12) are important for the synthesis of flavour compounds, e.g. in tomatoes and olive oils, and can be used to introduce new flavours into foods, but can also contribute to food spoilage by production of a rancid off flavour, e.g. in soybeans and soy products.

Liqueurs Alcoholic beverages made from spirits or neutral alcohol with addition of other ingredients such as sugar and flavourings.

Liquid chromatography A form of chromatography that utilizes a liquid mobile phase; usually abbreviated to LC. May be performed in a column or on a plane. The modern method is often referred to as high performance liquid chromatography.

Liquid egg Pasteurized egg whites, egg yolks or whole eggs in liquid form. The long shelf life and Salmonella-free status of such products make them suitable for use by food manufacturers and caterers.

Liquid egg whites Pasteurized egg whites in liquid form. Processing conditions confer a long shelf life and ensure that they are free of Salmonella contamination. Usually packaged in pourable containers. May be used in the manufacture of merengues and cakes. Due to the pasteurization process, the beating time necessary for merengues may be 3 to 5 times longer than that required when using unpasteurized egg whites.

Liquid egg yolks Pasteurized egg yolks in liquid form. Processing conditions confer a long shelf life and ensure that they are free of Salmonella contamination. Usually packaged in pourable containers. May be used in the manufacture of mayonnaise and salad dressings.

Liquid membranes Thin layers of liquid, separating two phases: a process stream and a stripping phase. Impurities, e.g. metal ions, can be extracted almost completely by a carrier that is dissolved in the liquid membrane. On the other side of the membrane, stripping takes place. While the carrier is stripped continuously, the driving force for the extraction remains high. Types of liquid membranes in use include: bulk liquid membranes; emulsion liquid membranes; thin sheet supported liquid membranes; hollow fibre supported liquid membranes; two module hollow fibre supported liquid membranes; and spiral wound membranes.

Liquid nitrogen Nitrogen gas (N2) that has been cooled to a temperature less than or equal to 77.4 K, thus existing in a liquefied state.

Liquid phase microextraction One of various analytical techniques used for extraction and concentration of an analyte from a sample prior to its analysis.
Liquids

The analyte is extracted into a very small volume of solvent, commonly a drop suspended from the tip of a microsyringe, or a volume impregnated into the pores of a hollow fibre membrane. Applications include the analysis of residues in foods and water, or in migration studies.

Liquids Fluids that flow freely but have constant volume at a given temperature and pressure. Their shape is usually determined by the containers they fill.

Liquid smoke Oil or water extracts of smoke produced from burning woods, often maple, oak or mesquite. Imparts a smoky flavour to foods.

Liquid whole egg Pasteurized blend of egg whites and egg yolks in liquid form. Processing conditions confer a long shelf life and ensure that the product is free of Salmonella contamination. Usually packaged in pourable containers. May be used in the manufacture of doughnuts, cookies, mayonnaise, salad dressings and egg noodles.

Liquorice Sugar confectionery product made from the dried root extract of the Mediterranean plant Glycyrrhiza glabra. Contain the triterpenoid glycoside glycyrrhizin.

Listeria Genus of aerobic, rod-shaped or coccoid Gram positive bacteria of the Listeriaceae family. Occur in soil, fresh and salt water, sewage sludge and decaying vegetation. Listeria monocytogenes, the causative agent of listeriosis in humans, has been associated with foods such as soft cheese, milk, ice cream, raw vegetables, prepared salads, cakes, fermented sausages, sliced cold meat, and raw and smoked fish.

Listeriolysins Toxins produced by Listeria monocytogenes which lyse cells.

Listeriosis Infection in humans caused by Listeria monocytogenes. Usually transmitted by contaminated foods. Pregnant women, babies, the elderly and the immunocompromized are particularly susceptible to infection. Symptoms vary from a mild influenza-like illness with high fever and dizziness to meningitis and meningoencephalitis. In pregnant women, intrauterine or cervical infections may result in spontaneous abortion, stillbirth or premature birth. Gastrointestinal symptoms such as nausea, vomiting and diarrhoea may precede more serious forms of listeriosis or may be the only symptoms exhibited.

Litchis Fruits produced by Litchi chinensis. A rough, pink-red rind covers the white edible aril that encloses a single seed. The aril is a good source of vitamins (B, C, D and E). Available fresh, canned and frozen. Eaten alone or as a component of sauces and compounds. Also known as lychees, lechees, lichees and litchees.

Liver sausages Cooked, ready-to-eat sausages prepared from finely minced swine livers and other meat, and seasoned with onions and spices. Liver sausages
sauces may be prepared using smoked meat, such as bacon, or may be smoked after cooking. Their texture ranges from firm and sliceable to smooth and spreadable. Plastic bags or tubes are often used as casings for liver sausages, but other liver sausages are shaped into loaves. Usually, they are used to prepare snack foods or sandwiches. They are also known as liverwurst or leberwurst.

Liverwurst The German term for liver sausages, including the famous braunschweiger.

Livestock Domesticated animals reared for production of food (meat, eggs or milk), other animal products (wool, skins or fur) or for other commercial purposes.

Lizardfish Any of a number of marine fish species in the family Synodontidae. Widely distributed in warmer oceanic waters. Some species are fished commercially, principally off the coast of Japan. Marketed fresh and also used to make kamaboko products.

Loaf vol. Space occupied by bread as it rises during baking. Often measured in cubic centimetres. Used as a measure of baking quality of cereals, flour and dough.

Lobsters Common name for several large marine crustacea belonging to the families Homaridae (including the large north Atlantic lobsters of the genus Homarus) and Palinuridae (including rock lobsters and spiny lobsters). Many species are of high commercial value as they are prized for their flesh.

Locust bean gums Gums extracted from carob beans (Ceratonia siliqua). Used as thickeners, emulsifiers and stabilizers in foods, such as cream cheese, bakery products, salad dressings and ice cream. Exhibit good water binding capacity, protect against freeze/thaw damage and impart a creamy mouthfeel. Heating is required for maximum solubility.

Locust beans Alternative term for carob beans.

Loganberries Red, acid berries produced by Rubus loganobaccus, generally thought to be a hybrid between raspberries and blackberries or dewberries. Contain high amounts of citric acid and vitamin C. Can be eaten fresh, though often considered too acid, and also can be canned or used in jams or wines.

Lokum Alternative term for Turkish delight.

Lollipops Large sugar confectionery products on wooden or plastic sticks.

Longaniza Dry, cured pork sausages, traditionally produced in Spain. Ingredients for these highly seasoned, light-coloured sausages include lean pork, belly pork, pimiento peppers, additives and condiments. In Spain, they are often served as an entree with potatoes and other vegetables, but also make good cooking sausages, fillings for omelettes or tapas.

Longans Fruits produced by Dimocarpus longan, Euphoria longana or Nephelium longana. The thin, brown rind contains the soft, white edible pulp that surrounds a single seed. Eaten raw, preserved or dried; also available canned. Consumed as snack foods or used in soups, some savoury dishes and desserts. Also known as dragon's eyes.

Long life foods Foods that have a prolonged shelf life, usually under ambient conditions. Includes ultra high temperature (UHT) treated and sterilized products, such as UHT milk, and shelf stable bakery products.

Loquats Fruits produced by Eriobotrya japonica. Pale yellow to deep orange in colour, they are rich in carotenes but contain little vitamin C. Eaten fresh or used to make jams, jellies, desserts and pies. Also known as Japanese medlars, Japanese plums, Chinese medlars and Chinese loquats.

Lorries Large motor vehicles designed to transport heavy loads. Used in a wide range of applications, including transport of animals to slaughterhouses, carriage of cereals and other raw materials to processing facilities, and transfer of processed foods from factories to retail premises. Also known as trucks, especially in Canada and the USA.

Los Pedroches cheese Spanish semi-hard cheese made from raw or pasteurized ewe milk, usually from Merino ewes. Rind is yellow and shiny. The ivory white interior is compact, with small holes distributed throughout.

Lotus roots Underground stems, or rhizomes, of the lotus plant (Nelumbo nucifera), commonly used in Asian cooking. Rich in sodium, the vitamin B group, vitamin C and vitamin E. Eaten as a vegetable and also in sweet dishes. Lotus root flesh is creamy-white, with the texture of raw potatoes. Flavour is similar to that of fresh coconuts. Seeds and leaves of the lotus plant are also consumed.

Loukanka Raw dry sausages, traditionally produced in Bulgaria. They are made from pork, or pork and beef mixtures. Loukanka may be eaten smoked or unsmoked.

Lovage Common name for Levisticum officinale Koch, fruits of which are used as spices. Imparts a warm, maple-like flavour during cooking similar to that of celery; however, unlike celery, lovage maintains its flavour after cooking. Lovage leaves and essential oils are often included in sweet sauces, gravy, pickles and seasonings.

Low alcohol beer Beer in which the alcohol content is lower than that considered to be normal for the
specific type; legal definitions covering the limit differ between countries. Low alcohol beers are made by two general classes of process: formation of lower than normal amounts of alcohol by interrupted fermentation or restricted fermentation (using immobilized yeasts or low fermentation temperatures); or removal of alcohol from normally-fermented beer (by techniques such as vacuum evaporation or dialysis).

Sensory properties of low alcohol beer frequently differ from those of normal beer; defects include a worts-like flavour, and lack of typical beer aroma notes formed during fermentation.

Low alcohol beverages Beverages in which the alcohol content is lower than that considered to be normal for the beverage type; legal definitions of the limit differ between countries. Low alcohol beverages are made by two general classes of process: formation of lower than normal amounts of alcohol (by restricted or interrupted fermentation processes); or removal of most of the alcohol from normally-fermented beverages (generally by evaporation or membrane processes). Low alcohol beverages commonly have sensory properties which differ, to a greater or lesser extent, from those of normal beverages of the same type.

Low alcohol wines Wines in which the alcohol content is lower than that considered to be normal for the specific type; legal definitions for limits differ between countries. Low alcohol wines are made by two general classes of process: formation of lower than normal amounts of alcohol (by use of glucose oxidase treated musts, early arrest of fermentation, aerobic fermentation or use of special yeasts); or removal of alcohol from normally-fermented wines (by distillation processes, membrane processes, adsorption or extraction). Low alcohol wines commonly have sensory properties which differ from those of conventional wines of the same type.

Low calorie beverages Beverages that are low in calories. May be consumed by health-conscious consumers who want to maintain their body wt. or as part of a wt. loss diet to reverse overweight and obesity.

Low calorie diet A diet that has comparatively fewer calories than a standard or typical diet. Calorie restriction forms the basis of many weight loss diets for the management of overweight and obesity.

Low calorie foods Any foods that are low in calories, i.e. those that are naturally low in calories such as lettuces, and processed foods that have been manufactured to give a reduced calorie content for a given reference amount, such as low calorie spreads. Although originally developed for those with specific health or weight problems, low calorie processed foods are now consumed by many who perceive them to be a healthy option. Sensory properties of these foods have also improved due to developments of new sugar substitutes and fat substitutes. Many of these foods can also be classed as low fat foods.

Low calorie spreads Spreads with a reduced content of calories.

Low density lipoproteins Plasma lipoproteins that carry cholesterol in the blood and release it at sites in the body where it can be used. High concentrations in the blood may result in excess cholesterol being deposited in the walls of blood vessels, and are thus associated with atherosclerosis and an increased risk of cardiovascular diseases. A healthy diet and regular physical activity may help reduce low density lipoprotein cholesterol levels. Often abbreviated to LDL.

Low density polyethylene Polyethylene of low-density grade. Less rigid and with better resistance to impact than high density polyethylene (HDPE). Commonly abbreviated to LDPE.

Low fat diet A diet that provides comparatively fewer calories from fats than a standard or typical diet. Adoption of a low fat diet is one diet therapy approach used to achieve weight loss and manage overweight and obesity.

Low fat foods Foods that are low in fats, either naturally or because they have been formulated to contain a reduced fat content compared with a given reference amount. Some of the most popular foods in this sector are low fat dairy products, low fat spreads and low fat bakery products, many of which contain fat substitutes as a means of reducing fat content while maintaining acceptable sensory properties. Much of the growth in this sector is attributed to consumer perception of these foods as a healthy option. Also classed as low calorie foods.

Low fat spreads Spreads with a reduced content of fats.

Low lactose foods Foods that are free from or have a minimum amount of lactose. Particularly suitable for people who have a lactose intolerance. Many low lactose dietetic foods are available on the market, including lactose-free infant formulas, dairy products and chocolate.

Low sodium foods Foods containing relatively low levels of sodium, and therefore deemed suitable for consumption by those suffering from hypertension and certain other diseases. Reduced sodium levels may be achieved by replacement of NaCl with salt substitutes.

Low sugar confectionery Confectionery in which sucrose is partially replaced with sweeten-
Low sugar foods

- (e.g. polyols). Such low sugar foods may provide a reduction in dietary calories and also be beneficial for dental health.

Low sugar foods

Foods manufactured in such a way that they are low in sugar, such as low sugar confectionery. Commonly contain sweeteners and bulking agents as sugar substitutes. Such foods may also provide a reduction in calories (low calorie foods) and are regarded as a healthy option by the consumer. The reduced sugar contents may also be beneficial for dental health.

Lozenges

Small, flat sweets made from icing sugar, glucose syrups, gum arabic/gelatin and flavourings. Sometimes medicated, as in the case of cough drops.

LTLT pasteurization

Low temperature, long time batch pasteurization treatment (also known as the holder method) that is applied to liquid foods, particularly milk. A quantity of milk is placed in an open vat, heated to 63°C, held at that temperature for 30 minutes, and then pumped over a plate-type cooler prior to bottling or cartoning. In addition to destroying common pathogens, this heat treatment also inactivates lipases, which might otherwise quickly cause the milk to become rancid.

Lubricants

Substances, e.g. oil or grease, applied to equipment components to minimize friction.

Lucerne

Alternative term for alfalfa.

Lukum

Alternative term for Turkish delight.

Lulo

Alternative term for naranjilla and quito oranges (Solanum quitoense or S. angulatum). Orange fruits with green-yellow juicy flesh. Rich in vitamin A and vitamin C. Most commonly used in beverages, but also eaten out of hand, as ingredients in desserts, or in jellies and marmalades.

Luminescence

The emission of light from a substance or organism, and which occurs at temperatures below those required for incandescence. Includes phospholuminescence, chemiluminescence, electroluminescence, fluorescence and phosphorescence.

Lumpfish

Marine fish species (Cyclopterus lumpus) belonging to the lumpfishes and snailfishes family (Cyclopteridae). Widely distributed in the western and eastern Atlantic Ocean. Eaten fresh or smoked, especially in Nordic countries. Eggs are used as inexpensive caviar substitutes; roes are also sold fresh. Also known as lumpstucker.

Lumpiness

Texture term relating to product consistency and the extent to which an item contains lumps. Lumpy products contain inhomogeneities in structure, which can be present as invisible defects. Lumpiness has a negative effect on the spreadability of products such as margarines, and hampers the formation of a smooth surface of the spread film.

Luncheon meat

A cooked meat product prepared from chopped pork, ham and/or beef. Luncheon meat is available canned or sliced, and is sold in vacuum packaging.

Lunches

One of the main meals of the day, served at around midday.

Lung cancer

A form of cancer involving the uncontrolled growth of abnormal cells in lung tissue. Incidence is strongly correlated with cigarette smoking. Some foods and food components may offer protective effects against this and other forms of cancer, including some fruits and vegetables.

Lungs

Paired organs within the rib cage into which air is inhaled during breathing. The lungs of slaughtered animals form a part of edible offal and lung mince may be included in cooked sausages (e.g. frankfurters and pepperoni). Some mechanical stunning techniques used in cattle slaughter may result in brain emboli in the lungs. This is of particular concern in relation to bovine spongiform encephalopathy (BSE) and the transmission of prions in foods, and, as a result, high risk techniques are prohibited in certain countries.

Lupanine

One of the toxic alkaloids present in lupins.

Lupin meal

Flours prepared from lupin seeds by crushing. Seeds may have been subjected to hulling prior to crushing. The crushed seeds may undergo subsequent extraction for removal of lupin seed oils and/or further grinding to produce finer flour. Rich source of vegetable proteins.

Lupin proteins

Vegetable proteins extracted from lupin seeds.

Lupins

Species of Lupinus, some of which are used as food. Seeds are rich sources of proteins and oils. High levels of alkaloids make some seeds too bitter for consumption, but contents may be reduced by washing in water. Varieties selected as grain crops are low in alkaloids (sweet lupins). Seeds have been used as coffee substitutes and seed flour has been suggested as a substitute for soy meal.

Lupin seed oils

Vegetable oils derived from seeds from plants of the genus Lupinus which have low to intermediate levels of unsaturated fatty acids.

Lupin seeds

Seeds from species of the genus Lupinus, annual or perennial herbs or shrubs of the family Leguminosae. Rich in proteins, with low to intermediate levels of unsaturated fats; may be used as oilseeds or are roasted, boiled and salted and used as snack foods.
Lupulin  A fine yellow powder or resin containing high concentrations of the bitter compounds and essential oils present in hops. Occurs in lupulin glands found predominantly on hop cones.

Lupulones  Alternative term for the β-acids found in hops and beer. Compared to other bitter compounds, these poorly soluble resin constituents have little bittering capacity in beer.

Lutein  One of the most widespread naturally occurring carotenoids. Found in many foods, and particularly fruits and vegetables.

Luteolin  Member of the flavonoids, found in a range of plant foods, including sage, olives, lettuces, endives and citrus fruits. Has also been found in honeys.

Lysine  One of the essential dietary amino acids. Present as a free amino acid and protein constituent in a wide range of foods. Cereals such as rice and some wheat varieties contain low lysine levels, and both conventional plant breeding and genetic engineering techniques have been used in attempts to increase lysine contents of these dietary staples.

Lysinoalanine  Dipeptide formed from lysine and alanine. One of the cross-linked peptides formed in food proteins during thermal processing, especially in alkaline conditions, and can be released upon subsequent protein hydrolysis. Can be used as an indicator of milk quality after thermal processing.

Lysozymes  Alternative term for egg whites lysozymes. Important antimicrobial agents for cold pasteurization of certain foods and beverages.

Lycades  Trade name (Roquette) for a range of very low dextrose equivalent fat substitutes based on maltodextrins derived from corn starch. Use in a range of low fat foods, including spreads, salad dressings, sauces and cakes.

Lycasin  Trade name (Roquette) for maltitol syrups manufactured by hydrogenation of starch hydrolysates. Consist of approximately 50% maltitol, 16% maltotriitol and 7% sorbitol. Used as sweeteners in a range of sugar free products, such as boiled sweets, pastilles, chewy candy, fudges and toffees, where they possess noncariogenic properties. May be used in combination with other sugar alcohols as a substitute for glucose syrups.

Lycees  Alternative term for litchis.

Lycopene  One of the carotenoids, particularly characteristic of tomatoes.

Lycoperdon  Edible fungi commonly known as puff balls.

Lyes  Aqueous solutions of alkalis, generally sodium hydroxide or potassium hydroxide, of use in food processing treatments such as peeling or sugar processes.

Lymeswold cheese  British mould-ripened cheese made from cow milk.

Lyophilization  Alternative term for freeze drying.

Lysophospholipases  EC 3.1.1.5. Hydrolyse single fatty acid ester bonds in lysoglycerophospholipides with the formation of glyceryl phosphatides and free fatty acids. Also known as lecithinases B and phospholipases B, these lipases are potentially useful for improving the quality of wheat starch hydrolysates.

Lysophospholipids  Phospholipids decylated at position 1 or 2.

Lysozymes  EC 3.2.1.17. Glycosidases which hydrolyse 1,4-β-linkages between N-acetylmuramic acid and N-acetyl-D-glucosamine residues in peptidoglycans, and between N-acetyl-D-glucosamine residues in chitodextrins. Found in milk, particularly human milk, and egg whites (egg whites lysozymes; eggs lysozymes). Important antimicrobial preservatives since they are able to break down the cell wall of many Gram positive bacteria. Used in the production of certain types of cheese to kill harmful bacteria, and for cold sterilization of certain foods and beverages.
Mabinlin  Sweet proteins isolated from seeds of the Chinese plant Capparis masaikai. Four homologues of mabinlin have been isolated - mabinlin I to IV. A recombinant mabinlin has been produced that is 400 times sweeter than sucrose for potential use in sweeteners for low calorie foods and beverages.

Macadamia nuts  Nuts produced by the Australian species Macadamia integrifolia or M. tetraphylla, with smooth or rough shells, respectively. Considered among the finest gourmet nuts, they are eaten roasted and salted, or as ingredients in bakery products, ice cream and sugar confectionery. Also known as Queensland nuts.

Macaroni  Common name for pasta, a product of the word macaron, derived from seeds of the Lepidium sativum plant, that resemble a cockerel's comb. Macaroni are Hollow tubes of pasta which are usually short and curved.

Macaroons  Small chewy cakes or cookies made from ground almonds/Almond paste or coconut, sugar and egg whites. Often baked on rice paper.

Mace  One of the spices, along with nutmeg, derived from seeds of the Myristica fragrans. Mace is produced from the arillodes of M. fragrans. These are red-coloured structures, situated on top of the nuts of this plant, that resemble a cockerel's comb.

Maceration  Softening or breaking up of foods by soaking in a liquid, or the soaking of foods (usually fruits) in a liquid in order to absorb the flavour of the liquid. Spirits or liqueurs are often used as the macerating liquid.

Machine vision  Inspection systems in which samples are examined using a camera, the image from which is analysed by computer using image processing algorithms. Operations which can be performed include defect detection, dimensions measurement, orientation detection, grading, sorting and counting.

Mackerel  Any of a number of marine fish species in the family Scombridae, many of which are commercially important food fish. Found in temperate and tropical seas around the world. Commercially important species include Scomber scombrus (Atlantic mackerel) and Scomber japonicus (Pacific mackerel). Flesh is firm and fatty, with a distinctive savoury flavour. Marketed fresh, frozen, smoked, salted, dried and canned. Roes of some species are also consumed, often marketed as canned products.

Macroccocus caseolyticus  Species of aerobic Gram positive bacteria of the family Staphylococcaceae, found in fermented sausages and raw milk.

Macroystis  Genus of large brown seaweeds (kelp) found on rocky coastal substrates in many parts of the world. Some species, such as Macroystis pyrifera, are an important source of alginates used by the food industry.

Madeira  Fortified wines produced in the island of Madeira, characterized by being aged for several months at high temperature in special rooms called estufas. Types include Sercial (the driest), Verdelho, and Bual (the sweetest).

Madeirization  In the context of Madeira wines, the process of development of the characteristic flavour as a result of controlled heat treatment. For other wines, a flavour defect due to excessive heating and oxidation.

Madhuca seeds  Seeds from plants of the genus Madhuca, often used as oilseeds.

Magnesium  One of the essential mineral nutrients, chemical symbol Mg. Widely distributed in plant and animal foods, good sources including fruits, vegetables and dairy products. Standard Western diets generally contain adequate levels of magnesium, so fortification is largely unnecessary. Absorption of dietary magnesium may be affected by other dietary nutrients such as calcium, phosphates and vitamin D, and also by some clinical conditions, including alcoholism and diabetes. Magnesium is an important bone constituent and intracellular inorganic cation acting as an essential co-factor in many enzymic reactions. Magnesium deficiency can cause calcification of soft tissues, electrolyte imbalances, gastrointestinal symptoms and personality changes. If taken in excess, magnesium toxicity symptoms can include nausea, vomiting, hypotension and neurological changes.

Magnetic fields  Regions around a magnet within which the force of magnetism acts. Various applica-
Magnetic resonance imaging  
Non-destructive analytical technique based on nuclear magnetic resonance which is used widely in the food industry. Applications include assessment of meat quality, determination of components in foods and measurement of thermophysical properties.

Mahewu  
African lactic fermented, non-alcoholic beverages made from corn, sorghum or millet.

Mahimahi  
Alternative term for the common dolphinfish ( Coryphaena hippurus ), a marine fish species of high commercial importance. Widely distributed in tropical and sub-tropical waters throughout the world, and also produced commercially by aquaculture. Marketed fresh and frozen. Other forms of the name are mahi mahi and mahi-mahi.

Mahon cheese  
Spanish hard cheese made from cow milk, produced on the Balearic Island of Minorca. During manufacture, curd is piled in the centre of a piece of cheesecloth, the corners of which are knotted and twisted together. The cheese is then pressed and twisted for a few days, resulting in the typical ‘cushion’ shape of this cheese. The hard, orange rind carries the imprint of the cheesecloth. Although sold at various stages of maturity, Mahon is usually sold young, when it has a smooth and supple texture combined with a sweet and fruity aroma.

Maida  
Indian refined white flour made from wheat.

Maillard reaction  
Chemical reaction that occurs between reducing sugars and the amino groups of proteins or amino acids present in foods, and, along with caramelization, is responsible for nonenzymic browning. Maillard reaction products cause a darkening of colour, reduced solubility of proteins, development of bitter flavour, and reduced nutritional availability of certain amino acids, such as lysine. Rate of Maillard reaction is influenced by many factors, including water activity, temperature and pH of foods.

Maillard reaction products  
Soluble and insoluble polymers produced via the Maillard reaction when reducing sugars and amino groups of amino acids and proteins are heated together. Contribute to the colour and flavour of foods such as soy sauces, caramels and toffees, milk chocolate and bread. Important functional components of caramel colorants.

Maize  
Alternative term for corn.

Maize meal  
Alternative term for corn flour.

Maize oils  
Alternative term for corn oils.

Makhana  
Alternative term for gorgon nuts.

Malabar nightshade  
Alternative term for Ceylon spinach.

Malabsorption  
Impaired absorption of nutrients across the gastrointestinal tract. Depending on the abnormality, absorption of a single nutrient or multiple nutrients may be impaired. Malabsorption may be a feature of several diseases, including coeliac disease, food intolerance, Whipple's disease and cystic fibrosis. Impaired nutrient absorption can lead to malnutrition and anaemia.

Malachite green  
Chemical dye which shows antibacterial activity, antifungal activity and also properties of anthelmintics. Used primarily in aquaculture for treatment and control of a range of parasitic and fungal infections in fish and shellfish. Residues may persist in aquaculture products. Suspected mutagen, and banned from use in various countries in products for human consumption.

Malate dehydrogenases  
Generic term for a group of dehydrogenases including: EC 1.1.1.37 which converts (S)-malic acid and NAD+ to oxaloacetic acid and NADH; EC 1.1.1.38 and EC 1.1.1.39 which convert (S)-malic acid and NAD+ to pyruvic acid, CO2 and NADH; and EC 1.1.1.40 which converts (S)-malic acid and NADP+ to pyruvic acid, CO2 and NADPH. The latter three enzymes are also known as malic enzymes. Involved in malic acid metabolism, the ripening of certain fruits, and can be used for determination of the malic acid content of foods and beverages.

Malathion  
Non-systemic organophosphorus insecticide and acaricide used for control of biting, chewing and sucking insects in a wide range of crops, including fruits, vegetables and rice. Also used to control pests during storage of cereals. Classified by WHO as slightly hazardous (WHO III). Also known as carbofos.

Malay apples  
Bright red fruits produced by Syzygium malaccense, a tree native to Malaysia and India. The white flesh is slightly sweet and juicy. Eaten raw or used to make preserves and wines. Also known as mountain apples or pomerac.

MALDI-TOF-MS  
Commonly used abbreviation for matrix-assisted laser desorption/ionization time of flight mass spectroscopy. Technique used to determine biomolecular structure of substances such as proteins, sugars and oligonucleotides, including those of food origin. Molecules are embedded in a matrix on a metal surface, desorbed into a gas phase by the force of a laser beam, accelerated by an electric field and fly through a drift tube at high vacuum. They are characterized according to molecular weight, which is indicated by the time taken to pass through the drift tube.
Maleic acid Carboxylic acid which occurs as a colourless, crystalline solid and is used in making synthetic resins. The term maleic acid refers to cis-butenedioic acid, while the more stable trans isomer is known as fumaric acid. On heating, water is eliminated from maleic acid to form maleic anhydride, which can be used in modification of proteins, particularly enzymes, and in preparation of copolymers used in plastics packaging materials.

Maleic hydrazide One of the plant growth regulators. Used particularly to control sprouting in potatoes and onions during storage.

Maleic acid Aliphatic dicarboxylic acid, an important metabolic intermediate in the glyoxylate and tricarboxylic acid cycles, and also commonly accumulated in some fruits and vegetables including apples and grapes. This organic acid is the substrate for malolactic fermentation by bacteria which produces lactic acid and carbon dioxide and reduces the overall acidity of the fermented products, generally wines, thereby increasing product quality.

Malic enzymes Alternative term for certain malate dehydrogenases.

Malignant hyperthermia Progressive hyperthermia, severe muscular rigidity and acidosis, which occurs in some swine in response to stress. It is associated with porcine stress syndrome, pronounced halothane sensitivity and the PSE defect in pork.

Mallards Wild ducks (Anas platyrhynchos) belonging to the Anatidae family, which are hunted for production of duck meat.

Mallow seeds Seeds produced by plants belonging to the family Malvaceae, often used as oilseeds.

Malnutrition Condition resulting from inappropriate nutrition. Includes both inadequate and excessive dietary intakes of nutrients and/or calories. Insufficient intake of proteins causes kwashiorkor in children, and a diet deficient in all nutrients causes marasmus. Lack of vitamins causes a wide variety of deficiency diseases, including scurvy, rickets, beriberi and pellagra. Malnutrition may result from eating disorders, such as anorexia nervosa and bulimia nervosa. Overnutrition can lead to toxicity and obesity.

Malolactic fermentation A type of fermentation carried out by species of bacteria such as Lactobacillus, Leuconostoc and Pediococcus, in which l-malic acid is converted to l-lactic acid and CO₂. In certain fermented products (e.g. wines and soy sauces), it has the effect of reducing the acidity, since lactic acid is a weaker acid than malic acid, and can be used, therefore, to impart desirable acidity on these products.

Malonaldehyde Synonym for malondialdehyde.

Malondialdehyde One of the aldehydes produced as a result of oxidation of lipids. Traditionally used in the determination of thiobarbituric acid values (TBA values), a measure of lipid rancidity or oxidation. Synonymous with malonaldehyde.

Malt Cereal grains which have been steeped, partially germinated, then kilned to terminate germination. The malting process includes starch saccharification and partial breakdown of proteins present in the grain to yield fermentable material; activity of enzymes is also increased. Malt is used mainly in brewing; small quantities are used in making bakery products. Malt is most commonly made from barley, but other cereals such as wheat and sorghum may also be malted.

Maltases Alternative term for α-glucosidases.

Malt beverages Beverages based on malt. May resemble beer, but do not comply with national regulations for beer.

Malthouses Industrial premises used for malting of barley.

Malting Process of conversion of cereals (especially barley) into malt by controlled steeping, germination and kilning to terminate germination.

Malting barley Barley (Hordeum vulgare) cultivars which have composition and germination properties making them suitable for malting and brewing.

Malting properties Properties of barley or other cereals which determine suitability for malting and quality of the malt produced. These include germination characteristics, composition, proteins and starch modification properties, and activity of enzymes.

Maltitol Polyol, systematic name 4-O-α-glucopyranosyl-D-sorbitol, manufactured by hydrogeneration of maltose syrups. Has 0.6-0.9 times the sweetness of sucrose and is used in sweeteners.

Maltodextrins Dextrins of varying, but generally intermediate, length (degree of polymerization), containing D-glucopyranose residues with α1→4 linkages, as in maltose. Synonym for maltooligosaccharides.

Maltose A type of disaccharide consisting of six maltose residues linked via α-1,4-glycosidic bonds. Produced by hydrolysis (treatment with acids or α-amylases) of starch. Has low sweetness compared with sucrose (0.1 times as sweet) but higher viscosity, thus making it useful in bulking agents.

Maltol Pyrone with the systematic name 3-hydroxy-2-methyl-4H-pyran-4-one. Used as flavourings with caramel-like aroma that impart a freshly baked flavour and aroma to bread and cakes.
Maltooligosaccharides

Maltooligosaccharides are Oligosaccharides containing D-glucopyranose residues with $\alpha1\rightarrow4$ linkages, as in maltose. Synonym for maltodextrins.

Maltose is a disaccharide comprising two molecules of glucose linked by a $\alpha1\rightarrow4$-glycosidic bond which is manufactured by hydrolysis of starch. Has 0.4-0.5 times the sweetness of sucrose and is used in sweeteners and as a fermentation substrate in brewing. Also known as malt sugar.

Maltose syrups are syrups in which the predominant sugar is maltose. Manufactured by hydrolysis of starch and may contain up to 90% maltose.

Maltotetraose is a Maltooligosaccharide consisting of four glucose residues linked by $\alpha1\rightarrow4$-glycosidic bonds which is produced by hydrolysis of starch. Has approximately 0.2 times the sweetness of sucrose.

Maltotetraose syrups have many applications, including as sweeteners, bulking agents, humectants and in glazes.

Maltotriose is an Oligosaccharide consisting of three maltose residues linked by $\alpha1\rightarrow4$-glycosidic bonds which is produced by hydrolysis of starch. Has approximately 0.3 times the sweetness of sucrose.

Malt vinegar is produced by fermentation of barley malt. Starch is hydrolysed during malting and the sugars in the resulting hydrolysate are fermented to produce acetic acid. Malt also imparts flavour to the vinegar. Malt vinegar is often used for pickling and as a condiment, most commonly in the UK.

Malvidin is one of the anthocyanidins, a pigment commonly found in grapes and wines, sometimes as a glycoside. Also found in other berries.

Mamey is a Fruits produced by Mammea americana, also known as mamey apple. Round and green with a rough, leathery skin and pale yellow flesh. Eaten fresh or in jams, preserves or sauces. Pulp is used to make wines. Mature fruits contain high levels of pectins. May also refer to the fruits of Pouteria sapota (mamey sapote) which have brown peel and creamy, sweet flesh that can be eaten fresh or processed into products such as desserts and beverages.

Manchego cheese is a Spanish hard cheese made from pasteurized ewe milk, the name indicating that it is made in the La Mancha region of Spain. The cheese has a black, grey or buff rind, and a white to yellow interior, depending on age. The interior contains a number of holes and has a mild, nutty and slightly briny flavour which can have a peppery bite in older cheeses. The finished cheese is usually smeared with olive oil and surface mould is removed. Manchego is sold at various stages of maturity; at 13 weeks of ripening, it is described as curado (cured), and, after more than 3 months of age, it is referred to as viejo (aged).

Mancozeb is a Dithiocarbamate fungicide used for control of many fungal diseases (e.g. blights, leaf spot, rusts and downy mildew) in a range of fruits, vegetables and cereals. Classified by WHO as unlikely to present acute hazard in normal use.

Mandarin juices are fruit juices prepared from mandarins (Citrus reticulata).

Mandarins are small, loose skinned citrus fruits (Citrus reticulata). Eaten as a dessert, commonly as canned segments. Relatively high vitamin C content. Varieties include tangerines and satsumas, but the names tend to be used indiscriminately. Used in several citrus hybrids.

Mandoo are Korean dumplings which are stuffed with a spicy mixture of vegetables and/or meat. Fast foods eaten as a snack or main dish. Cooked by steaming, frying or boiling. Also used in making dumpling soups.

Maneb is one of the Dithiocarbamate fungicides. Used for control of a range of fungal diseases on crops. Classified by WHO as unlikely to present acute hazard in normal use.

Manganese is a mineral, with chemical symbol Mn. Limited evidence for its role as an essential nutrient in humans, although it is required as a cofactor for several enzymes. However, deficiency diseases have been reported in other animals. Widely distributed in foods and beverages. Toxicity in humans is generally associated with mining, although manganese levels in foods are often determined along with those of other heavy metals.

Manganese peroxidases EC 1.11.1.13. Oxidize Mn(II) to Mn(III). Major ligninolytic enzymes produced by a number of white rot fungi that are important in the potential use of these organisms for lignin degradation, degradation of toxic pollutants and decoloration of olive oil mills effluents.

Mangoes are tropical fruits produced by Mangifera indica. Vary in size, shape and colour, but the flesh surrounding the large stone is always yellow to orange. Rich in vitamin C and carotenoids, with approximately 14% sugar. Eaten fresh as a dessert; also sold canned or dried. Used in a range of products, including jams, pickles and chutneys, or as a source of fruit juices. The seeds (kernels) inside the stone can also be used as a food or as a source of flour, fats and oils.

Mango jams are jams made from mangoes, sometimes combined with other fruits.
Mango juices

Fruit juices prepared from mangoes (*Mangifera indica*).

Mango kernels Edible seeds found within the stone of mangoes. Good source of nutrients for humans in times of food shortages. Fats and oils extracted from the kernels have been used in foods, e.g. as cocoa butter substitutes. Meal prepared from the kernels can be used as a substitute for wheat flour in baking.

Mango nectars Fruit juice beverages made by addition of water, sugar and optionally other ingredients to mango juices.

Mango pickles Products made by pickling pieces of mangoes with spices, salt and oils.

Mango pulps Soft mass prepared from the flesh of mangoes. Used in a range of products including beverages, ice cream, yoghurt, bakery products, jams and jellies.

Mango purees Smooth, creamy preparation made from the flesh of mangoes by sieving or reducing in a blender or liquidizer. Used as sauces or in preparation of products such as fruit juices, fruit nectars, bakery products, ice cream, yoghurt and jams.

Mangosteen Tropical fruits produced by *Garcinia mangostana* with a dark purple, hard rind and juicy white flesh. Sugar content is relatively high, but vitamin C level is low.

Manioc Alternative term for cassava.

Mannanases Alternative term for β-mannosidases.

Mannan endo-1,4-β-mannosidases EC 3.2.1.78. Catalyse the random hydrolysis of 1,4-β-D-mannosidic linkages in mannans, galactomannans and glucomannans. Useful for production of food additives, extraction of vegetable oils from legumes and reduction of the viscosity of coffee extracts during the manufacture of instant coffee.

Mannans Polysaccharides containing a high proportion of mannose. Mannans that also contain glucose or galactose residues are known as glucomannans and galactomannans, respectively. Mannans are produced by plants, e.g. konjac glucomannans, bacteria and fungi, including yeasts. Uses include in thickeners and texturizers.

Mannases Alternative term for β-mannosidases.

Mannitol Polylol consisting of six carbon atoms that occurs naturally in plants, plant exudates and seaweeds. Manufactured by reduction of mannose or reduction and isomerization of glucose. Has approximately 0.6 times the sweetness of sucrose. Uses include as nutritive sweeteners, anticaking agents, stabilizers and thickeners. The name is derived from manna, the sweet exudate from the ash tree, from which it has been isolated. Also called manna sugar.

Mannoproteins Glycoproteins. Yeast mannoproteins are used in winemaking to prevent haze formation.

Mannose Monosaccharide consisting of six carbon atoms (hexoses). Has approximately 0.6 times the sweetness of sucrose.

Mannosidases Glycosidases that act on mannosidic linkages in polysaccharides containing mannose residues. Include the enzymes EC 3.2.1.24 (α-mannosidases) and EC 3.2.1.25 (β-mannosidases), which act on mannans, and EC 3.2.1.78 (mannan endo-1,4-β-mannosidases), which act on mannans.

α-Mannosidases EC 3.2.1.24. Hydrolyse terminal, non-reducing α-D-mannose residues in α-D-mannosides. Involved in the ripening of fruits and can be used for synthesis of novel cyclodextrins.

β-Mannosidases EC 3.2.1.25. Glycosidases which hydrolyse terminal, non-reducing β-D-mannose residues in β-D-mannosides. In plants, these enzymes are involved in ripening processes. Microbial β-mannosidases have several industrial uses such as in food and feed processing, viscosity reduction in gums and also for the synthesis of mannoooligosaccharides. Also known as mannases and mannanases.

Manometers Instruments used for measuring the pressure of liquids or gases.

Manometry Measurement of the pressure or tension of gases or liquids.

Maple saps Sweet, viscous fluids produced by, and tapped from, maple trees (*Acer*), which are native to North America. Those obtained from the sugar maple or the black maple have high contents of sugars and are used for the manufacture of maple syrups.

Maple syrups Concentrated sugar solution produced by evaporation of maple saps. Sucrose is the predominant sweet substance, comprising approximately 60% of the syrup by weight; hexoses are also present. Maple syrups also contain flavour compounds, e.g. syringalddehyde, and natural colourants, which provide the characteristic maple syrup flavour and amber colour.

Marbling Streaks of intramuscular animal fats in meat from mammals. Marbling is one of the factors used to assess quality of meat, particularly beef. For example, good quality beef is marbled with fine strands of fat; this fat bastes the meat as it cooks, thus affecting juiciness and tenderness. Lower quality beef has either no marbling or thicker marbling; it tends to be tougher after cooking.
**Marc Spirits** made by distillation of fermented mashes based on grape marc.

**Mare milk** Milk obtained from horses. Differs from cow milk by its lower fat and protein contents (1.5 and 2.4%, respectively) and higher lactose content (approximately 6.2%). Levels of most minerals are also lower than in cow milk, but contents of iron and copper are higher. Vitamin A and most B vitamins are present in lower concentrations in mare milk than in cow milk, but contents of carotenes and niacin are higher than in cow milk. Ascorbic acid is present in a similar amount to that in cow milk.

**Margaric acid** Carboxylic acid with 17 carbon atoms, member of the saturated fatty acids, with a melting point of 59–61°C. Synonyms include heptadecanoic acid, margaric acid and n-heptadecylic acid. Occurs as a free fatty acid and lipid component of animal fats and vegetable fats.

**Margarines** Water-in-oil emulsions usually composed of approximately 80% animal fats or hydrogenated vegetable fats and 20% water, together with emulsifiers, colorants, vitamin A, vitamin D and flavourings. Usually solid at room temperature. Used as spreads, butter substitutes, in baking or as cooking fats. Low fat products may contain as little as 20% fat.

**Maribo cheese** Danish semi hard cheese made from cow milk. Similar in appearance to Gouda cheese, with a yellow wax coating and a firm interior containing many eyes. Sometimes flavoured with caraway seeds.

**Marigolds** Bright yellow edible flowers of the genus *Tagetes* used to add flavour and colour to dishes including soups and salads. A source of lutein, the petals are dried and the powder used as colorants for foods. Dried preparations are also added to chicken feeds to enhance pigmentation of egg yolks.

**Marinades** Seasoned liquids used for marination mainly of meat or fish. Usually contain oils mixed with wines, vinegar or lemon juices, and herbs or spices.

**Marination Soaking** of foods in marinades, mixtures of ingredients such as oils, vinegar and herbs, before cooking, in order to add flavour or promote tenderization. Because most marinades contain acidic ingredients (lemon juices, vinegar or wines), marination should be conducted in glass, ceramic or stainless steel, but not in aluminium, containers.

**Marine fish** Any fish which exist in sea water environments. The majority of commercially important food fish are found in sea water.

**Marine oils** Lipids derived from marine animals. Include fish oils, squid oils, seal oils and whale oils.

**Marjoram** Common name for *Origanum majorana*, the leaves and seeds of which are used as spices. Also called sweet marjoram. Leaves of the plant have a warm wood-like aroma similar to that of nutmeg. Leaf essential oils are also used as flavourings.

**Marker genes** Genes that confer a readily detectable phenotype on cells, either in culture, or in transgenic or chimeric organisms. They may encode reporter enzymes or markers conferring antibiotic resistance.

**Market research** The activity of gathering information about customers’ needs and preferences. Market research uses surveys, tests and statistical studies to analyse consumer trends and to forecast the quantity and locale of markets favourable to the profitable sale of products or services. The social sciences, for example psychology and sociology, are increasingly utilized to provide clues to people’s activities, circumstances, wants, desires and general motivation.

**Markets** As well as conveying the offering of goods for sale or promotion of products, this term can also cover the regular gatherings for the purchase and sale of food, livestock and other commodities, the outdoor spaces or large halls where vendors sell their goods, or particular areas of commercial or competitive activity.

**Marlins** Any of a number of large, fast swimming marine fish species belonging to the family Istiophoridae. Commercially important species include *Makaira indica* (black marlin), *M. nigricans* (blue marlin) and *Tetrapturus audax* (striped marlin). Marketed fresh or frozen and occasionally smoked; also used in manufacture of fish sausages in Japan.

**Marmalades** Preserves, often clear, produced from the pulps and rind of fruits, mainly citrus fruits.

**Marrons glaces** Chestnuts cooked in syrups and glazed.

**Marrons** Vegetables produced by plants of the genus *Cucurbita*, which also includes squashes and pumpkins. Vegetable marrows are varieties of *C. pepo*. Large cylindrical or round vegetables of various...
colours, with greenish-white or yellow flesh. Contain mainly water (usually at least 90%), with small amounts of starch, sugar, fats, proteins, carotenoids and vitamin B, and moderate amounts of vitamin C. Eaten boiled or stuffed with meat or other vegetables. Marrows harvested when young are courgettes or zucchini.

Marsala Fortified wines produced in the Marsala region, Sicily. Traditionally served as aperitifs, but also used in cooking and popular as dessert wines. Classified as Fine, Superiore, Superiore Riserva, Vergine, and Vergine Stravecchio or Vergine Riserva, according to their age (up to 1 year and at least 2, 4, 5 and 10 years, respectively). Available in both sweet (dolce) and dry (secco) varieties.

Marshmallows Soft aerated confectionery products made from corn syrups, glucose, gelatin and egg whites. Originally manufactured from the root sap of the marshmallow plant (Althaea officinalis).

Marula Plum-size fruits produced by Sclerocarya caffra or S. birrea subsp. caffra, a tree native to Africa. Rich in vitamin C and several minerals. Beneath a strong, leathery skin are a layer of white flesh similar to mangoes and a pit containing a small, tasty kernel. Eaten out of hand or made into jams, jellies and a range of beverages, including fruit juices, wines, beer and schnapps-like spirits.

Marzipan Malleable confection made with crushed almonds or almond pastes, together with powdered sugar and egg whites. Often used to decorate cakes or as fillings in pastries and candy.

Mascarpone cheese Italian high-fat soft cheese made from cow milk. Although not strictly a true cheese, it is described as a curd cheese. Mascarpone is made by adding a culture to the cream skimmed from milk used in manufacture of Parmesan cheese. Tartaric acid is also used in its production. After addition of the culture, the cream is gently heated and allowed to mature and thicken, after which it takes only a few days to ripen. The white to yellow cheese is spreadable and frequently used in dishes and sauces.

Mashed potatoes Potato products typically served as a carbohydrate component of meals. Prepared by pulping of potatoes following peeling and boiling. Seasonings, butter, milk and/or other dairy products are commonly added to the boiled potatoes before pulping to improve creaminess of the product.

Mashes Mixtures of ground malt, optionally with other brewing adjuncts, with hot water. Heated under controlled conditions to solubilize and extract fermentable constituents and other materials of importance for the brewing process and beer quality.

Mashing Preparation of aqueous extracts of malt (optionally together with brewing adjuncts) by heating them in water under a time/temperature regime which will optimize enzymic solubilization and extraction of carbohydrates, soluble nitrogen compounds and other constituents of importance for fermentation and beer quality. Brewing enzyme preparations may be used to enhance the enzymatic solubilization process, especially when non-malted adjuncts are used.

Mashua Alternative term for anu.

Massecuites Mixture of crystallized sugar and sugar syrups which is produced during manufacture of sugar. Centrifuged to separate the sugar crystals (which are dried and stored) from the syrup, which undergoes further crystallization to improve sugar yield.

Mass spectrometry Alternative term for mass spectrometry.

Mass spectroscopy Spectroscopy technique in which separation is based on atomic and molecular mass. Samples are bombarded with electron beams which fragment the molecules. The fragments are accelerated through magnetic fields and sorted on the basis of charge to mass ratio. Usually abbreviated to MS.

Mass transfer Movement of matter from one place to another, usually considered with reference to a defined boundary, as in the transfer of water within or from a wet product during drying.

Mastication First stage in the digestion of foods, whereby food taken into the mouth is processed into a form suitable for swallowing. During mastication, foods are chewed, ground and torn with the teeth, and mixed with saliva. Small food particles result which have a large surface area on which saliva can act. Mastication also releases food flavour and aroma. In conjunction with the action of the tongue, a cohesive food bolus is formed of the correct size to pass through the oesophagus.

Masilitis Inflammation of the mammary gland caused by pathogenic microorganisms. In cows, can cause reductions in milk yield and alterations in the composition of milk from infected quarters.

Masu salmon Alternative term for cherry salmon.

Mate Infusion beverages prepared from dry leaves and twigs of the plant yerba mate (Ilex paraguariensis).

Matjes Traditional Dutch product of lightly cured herring. Herring used for matjes production must have no development of the reproductive system, giving them a high fat content. They are prepared in a special way, cutting into the gills and leaving the pancreas in the fish after gutting so that the pancreatic enzymes
Matrix solid-phase dispersion promote maturation of the product. As well as having a high fat content, matjes are rich in \textit{ω-3 fatty acids}.

\textbf{Matrix solid-phase dispersion} One of the analytical techniques, it is used as a pre-treatment for viscous, semi-solid or solid samples prior to extraction and analysis of the target analyte(s). Sample is blended with a bonded-phase solid support, e.g. silica, which acts as an abrasive to disrupt the sample. Compounds adsorbed to the bonded phase can be selectively eluted for analysis. Used for studying composition or contamination of foods, in particular agricultural products.

\textbf{Matsutake} Wild Japanese mushrooms (\textit{Tricholoma matsutake}) which are usually exported either in canned or dried form.

\textbf{Maturation} Alternative term for ageing and ripening.

\textbf{Maturity} Alternative term for ripeness.

\textbf{Mauritia} Genus of palm trees that grow in South America. Fruits are used in preparation of beverages and in some cases as the source of oils. Pulps of the fruits from \textit{Mauritia vinifera} are used as a food. Wines and sago are produced from stems of \textit{M. flexuosa}.

\textbf{Mawa} Type of condensed milk made by heating milk until boiling and then stirring continuously over a low heat until it thickens to the consistency of cream cheese. Used in preparation of Indian desserts and sweetmeats. Also known as khoya.

\textbf{Mawe} Porridge made from dehulled and partially germinated white corn.

\textbf{Maximum residue limits} Maximum concentrations of pesticide residues, resulting from the registered use of agricultural or veterinary pesticides, that are recommended to be legally permitted or recognized as acceptable in or on a food, agricultural commodity or animal feed. Commonly abbreviated to MRL.

\textbf{Mayonnaise} Condiments prepared from vegetable oils, egg yolks, vinegar or other acidifying agents (e.g. lemon juices) and flavourings (e.g. mustard). For manufacture of commercial mayonnaise, oil content must be \( \geq 65\% \) (by weight). Commonly 70-80\% (by weight) oil is used to give a thicker product that has been shown to be more acceptable to consumers.

\textbf{MCPA} Selective systemic herbicide used for post-emergence control of annual and perennial broad-leaved weeds in crops, particularly cereals. Classified by WHO as slightly hazardous (WHO III).

\textbf{Mead} Alcoholic beverages made by fermentation of a medium in which honeys are the main source of fermentable sugars.

\textbf{Meadowfoam} Flowering plant, \textit{Limnanthes alba}, which yields high quality oils from its seeds. 95\% of the oil is composed of 20 and 22 carbon fatty acids. It shows high oxidative stability and may be used as a substitute for whale oils or jojoba oils.

\textbf{Meadowfoam oils} Oils extracted from meadowfoam (\textit{Limnanthes alba}), which contain high proportions of long-chain fatty acids of >20 carbon atoms, including some which are unique to this oil. Display high oxidative stability and can improve the stability of other vegetable oils. Used in cosmetics and personal care products, and applicable to specialty industrial products such as lubricants, detergents and plasticizers. Development of low erucic acid lines has enabled potential food application. Have been used as plasticizers in chewing gums.

\textbf{Meal} Flour prepared from non-cereal plants.

\textbf{Mealiness} Sensory properties relating to the extent to which products (usually fruits such as apples, peaches and nectarines) are perceived as being mealy, i.e. soft, powdery and floury. Mealiness is the result of breakdown of flesh into small pieces that tend to be dry in the mouth; it is related to an increase in the levels of water-soluble pectins and decreases in insoluble pectins during ageing. Thus, when eaten, the cells separate easily without the release of cell sap, and the mouth perceives the outside surfaces of the cells rather than the cleaved cells leaking sap.

\textbf{Meal replacers} Products designed for consumption in place of conventional meals for a specific dietary purpose, e.g. weight management.

\textbf{Meals} Processed foods eaten at mealtimes and/or designed to be one of the main dishes of the day, e.g. lunches, pub meals, ready meals, school meals.

\textbf{Meat} Animal tissues which are used as food, including those of domestic mammals, poultry, game birds and game animals. Meat is composed of lean muscles, connective tissues, fats, skin, nerves, blood vessels and water. It can be classified as red or white, based on its colour intensity, which results from the proportion of red and white muscle fibres that it contains. Red fibres have a higher myoglobin content than white fibres. Composition of meat differs between species and between retail cuts; it depends greatly on the fat to lean ratio, which determines energy value and concentrations of most nutrients. Water content of meat tends to decrease with increasing fat content. Lean meat includes substantial amounts of high biological value proteins; however, meat is also an important dietary source of fat, high bioavailability inorganic nutrients (including Fe, Zn, Cu and Se) and the vitamin B group.
Meat alternatives  Alternative term for meat substitutes.

Meat analogues  Simulated foods, comparable in structural and mechanical properties to natural meat. They can be produced from various high protein content raw materials including beans, fish and grain, and also from protein recovered from offal. Examples include textured vegetable proteins and mycoprotein. Ingredients such as protein fibres, produced by spinning, may be incorporated into meat analogue mixtures as texture imparting materials.

Meat balls  Meat products prepared from chopped meat, which is formed into balls and then cooked. Ingredients may also include onions, breadcrumbs, eggs and seasonings.

Meat emulsions  Meat products which include sausage emulsions and emulsions used in the preparation of comminuted meat products. They are composed of a continuous phase (protein and water) and a dispersed phase (fat particles). They are prepared from meat, such as mechanically recovered meat and offal, and other ingredients, such as non-meat proteins (e.g. sodium caseinate and soy protein isolates). Enzymes may be added to improve the functional properties of meat and non-meat proteins in the emulsions. Mechanical treatment during comminution has major effects on properties of products prepared from meat emulsions.

Meat extenders  Non-meat ingredients used to improve flavour, texture, appearance and nutritional values of meat emulsions. In general, they cost less per kilogram than meat, and include: dairy products, such as dried skim milk, sodium caseinate, milk coprecipitates, whey and whey products, and other milk derivatives; soy protein isolates and concentrates; oilseeds; cereal products; and pea meal, chick pea meal and textured navy bean protein concentrate.

Meat extracts  Water-soluble extracts of meat which are used as flavourings. Meat mince is immersed in boiling water to leach out the water-soluble extracts; meat extract (no. 1 extract) is produced by concentrating these extracts. Exhaustive extraction of meat produces a direct extract, which contains a high concentration of gelatin. Meat extracts are rich nutritional sources of the vitamin B group, particularly vitamin B₂, vitamin B₁₂ and nicotinic acid.

Meat loaf  Meat products commonly prepared from comminuted meat, such as meat mince, poultry mince or fish mince. Meat loaf may include offal, blood and low value meat, such as mechanically recovered meat. Other ingredients may include binders, onions, tomato purees, garlic, white bread, milk, herbs and seasonings. The ingredients are mixed before cooking, usually in a loaf tin; however, meat loaf may also be prepared in casings. Some meat loaf is prepared with colour contrasts or patterns; preparation of these products tends to involve traditional, high-cost, labour-intensive methods. Once cold, meat loaf can be cut into firm slices. Generally, it is served cold.

Meat mince  Meat cut up or shredded (minced) into very small pieces by the process of mincing. Quality depends on the part of the animal carcass that the meat originated from; in particular, it varies with fat and connective tissue contents. Also known as ground meat or minced meat.

Meat pastes  Comminuted meat products similar to pates, and of intermediate texture, commonly with a meat content of approximately 70%. The non meat portion consists of rusk and water, or other suitable filler such as soy protein concentrates or sodium caseinate. The product is usually heat sterilized after filling into jars or cans.

Meat patties  Round, flat cakes of comminuted meat. Although they may be prepared from meat mince, they may also be reconstituted, e.g. from mechanically recovered meat. Some may include meat extenders. Varieties include beef patties, chicken patties and turkey patties.

Meat pies  Meat products in which chopped meat or meat mince is encased in pastry and baked. Meat pies often contain offal and low value meat, such as mechanically recovered meat. They may be prepared in pie dishes that are lined and sealed with pastry, e.g. steak and kidney pie. Pasties are a type of meat pie prepared in a folded pastry case, e.g. Cornish pasties.

Meat products  Products such as burgers, gravy, ham, patties and sausages that are made from meat or contain meat as a major constituent.

Meat sauces  Any sauces that contain meat as the main ingredient. Meat sauces are usually used as an accompaniment to pasta and rice, for example bolognese sauces or meat curry sauces.

Meat substitutes  Simulated foods used as direct substitutes for meat. They may be included in meat products or may provide vegetarian alternatives to meat. Meat substitutes include textured vegetable proteins (TVP), texturized milk proteins, quorn and tofu. Aroma compounds, stabilizers and colorants may be included. Also known as meat alternatives.

Mechanical boning  Removal of bones from meat or fish, usually before cooking, using specially designed boning equipment.
Mechanical harvesting

Gathering (harvesting) of crops by mechanical means.

Mechanically recovered meat

Meat recovered from bone using separation machinery. Mechanical recovery increases the efficiency of separation and thereby allows the recovery of extra meat per carcass; it is also less time consuming than hand boning of meat. In many systems, meat and bone are forced against perforated plates or cylinders; the meat passes through, leaving the bone to be removed as waste. Composition of the meat recovered varies between the methods used, but in general consists of comminuted meat, bone marrow, collagen, bone and fat. Bone content is very important and must be minimized. Initial raw materials need to have low bacterial counts; they should be handled at low temperature and treated as promptly as possible. Advanced meat recovery (AMR) systems produce a product which is similar in appearance, texture and composition to meat trimmings and similar hand deboned meat products. Other systems produce a paste- or batter-like meat product, or liquid meat extracts. Mechanically recovered meat is widely used in meat products. It is also known as mechanically separated meat or mechanically deboned meat.

Mechanical properties

In relation to foods, physical properties associated with the reaction of foods to stress. Include parameters such as hardness, viscosity, elasticity and adhesiveness.

Media

Liquid or solid substances used for the culture of microorganisms, containing all the nutrients required for growth. Some types of media contain ingredients which select for the growth of specific microorganisms.

Medical foods

Foods specially formulated to be consumed by individuals who suffer from disease or health conditions that require special dietary management, because of distinctive nutritional requirements associated with the conditions.

Medicinal plants

Plants with healing properties that are often used to promote health in traditional systems of medicine such as Ayurveda. A source of plant extracts and other material that may be used in functional foods or functional beverages.

Mediterranean diet

Diet eaten in certain Mediterranean countries, in which the populations enjoy low recorded rates of chronic diseases and high adult life expectancy. Contains an abundance of foods from plant sources, including fruits and vegetables, potatoes, bread and grains, beans, nuts and seeds. Emphasis is placed on eating a variety of minimally processed foods and, wherever possible, seasonally fresh and locally grown foods. Olive oils replace other fats and oils (including butter and margarines) in the diet. The diet also includes daily consumption of low to moderate amounts of cheese and yoghurt, and weekly consumption of low to moderate amounts of fish and poultry meat, and from zero to four eggs per week (including those used in cooking and baking). Fresh fruit is used as the typical daily dessert; sweets with a significant amount of sugar (often in the form of honeys) and saturated fats are consumed not more than a few times per week. Red meat is consumed only a few times per month. There is also moderate consumption of wines, normally with meals.

Medlars

Fruits produced by Mespilus germanica. Rich in sugar and potassium, but not a good source of vitamin C. Palatable only when partially rotten or after exposure to frost, when they become soft. Consumed along with port or used in making jams and wines.

Megasphaera

Genus of anaerobic, spheroid Gram negative bacteria of the family Acidaminococcaceae. Found in the rumen of sheep and cattle, and also in humans. Some species, especially Megasphaera cerveisiae, are responsible for spoilage of beer.

Megrim

Marine fish species (Lepidorhombus whittiiagonis or L. boscii) of high commercial value belonging to the family Scophthalmidae. Found in the north east Atlantic Ocean and western Mediterranean Sea. Flesh tends to be dry and is best eaten fried in fat. Skin is used as a source of collagen and gelatin.

Meitauza

Traditional Chinese food made by fermentation of okara.

Meju

Product made traditionally from soybeans that are malted, formed into blocks and dried. Fermented to produce soy sauces and bean pastes as by-products.

Melamine

A heterocyclic organic nitrogen compound, molecular formula C₃H₆N₆. Due to its relatively high N content, melamine has been used for adulteration of foods to increase their apparent protein content. Can also occur in foods as a metabolite of the pesticide cryomazine. Previously considered to have low toxicity, infant deaths in China in 2008 due to acute renal failure have been linked to melamine-contaminated infant formulas, and cat and dog deaths in the US in 2007 have been linked to melamine-contaminated wheat gluten in pet foods. Melamine is also used to make melamine resins, which are widely used food contact materials, particularly in kitchen and table wares. Some concerns exist about migration of monomers (melamine and formaldehyde) from these plastics.

Melanins

High molecular weight pigments with reddish-brown to black colour, formed by the action
of oxidoases on phenols, as in enzymic brown- ing. Widely distributed in animals and plants, generally bound to proteins. Although a normal constituent of certain foods and beverages, including black tea, melanins can sometimes produce an undesirable dis- coloration of foods, such as mushrooms, several fruits and shrimps.

Melanoidins Pigments with yellow to brown colour and malt-like aroma formed by reactions between reducing sugars and amino acids in foods during heating. Formation of these Maillard reaction products is important during food processing procedures such as baking and roasting.

Melanosis Darkening in shrimps between the shell and tail muscle, which develops as the product deteriorates. Produced by an enzymatic reaction affecting naturally occurring amino acids when exposed to sunlight. While they may not be as attractive, affected shrimps are safe to eat, unless spoilage characteristics are present. Sulfitation agents are used to prevent melanosis.

Melatonin Hormone produced by the pineal gland in animals where it stimulates colour change in lower vertebrates and plays a role in circadian rhythms of humans. Also present in insects, bacteria and plants. Its activities as a broad-spectrum, free radical scavenger and indirect antioxidant suggest health benefits of ingestion.

Melengestrol Progesterone-like steroid used as an additive in cattle feeds for its growth promoting effects and suppression of oestrus.

Melezitose Trisaccharide formed from two molecules of glucose and one molecule of fructose. Occurs naturally in honeys and tree exudates.

Melibiose Alternative term for α-galactosidases.

Melibiose Disaccharide formed from a molecule of galactose and a molecule of glucose linked by a 1,6-glucosidic bond. The dihydrate of melibiose has approximately one third the sweetness of sucrose by weight.

Melomel Type of mead made from honeys, water and any fruits other than grapes or apples.

Melon juices Fruit juices extracted from melons (Cucumis melo). Melons Widely grown fruits produced by Cucumis melo. Available in a number of types, including honeydew melons, cantaloupes, muskmelons, winter melons and ogen melons, which differ in surface and flesh characteristics. Commonly consumed as a dessert, sometimes sprinkled with ginger or lemon juices, or as an appetizer with Parma ham. Flesh contains at least 90% water, relatively high amounts of sugar and vitamin C and, in cases where there is a pink or orange colour, high levels of carotenes.

Melon seeds Seeds found in the centre of melons. Rich in protein and fat. Used in the manufacture of bakery products and confectionery, as well as in the preparation of beverages. Also roasted and consumed as snack foods.

Melting Conversion of solid foods (such as butter or chocolate) into a liquid or semi-liquid state by application of heat.

Melting point Temperature at which a solid changes into a liquid, i.e. the solid and liquid forms exist together in equilibrium. A pure substance at a pressure of 1 atmosphere has a single reproducible melting point. The melting point is a characteristic of a pure substance; the presence of impurities lowers the melting point.

Membrane bioreactors Bioreactors in which reaction products are removed through membranes by, for example, ultrafiltration, reverse osmosis and dialysis, thus allowing continuous operation. Can be used in processes such as bioremediation of waste water, purification of drinking water, bioconversions and biotransformations. The membranes can also be used as supports for immobilization of enzymes or cells.

Membrane distillation Separation of aqueous solutions using hydrophobic, microporous membranes. Vapour molecules pass from a liquid feed phase on one side of the membrane to a condensing permeate phase on the other due to a difference in partial pressure across the membrane. Membrane distillation can be used for water purification, the concentration of fruit juices and waste water treatment.

Membranes Solid matrices used for separation of molecules in processes such as dialysis, filtration and reverse osmosis, as supports for immobilization of cells and enzymes, and in techniques such as blotting and hybridization.

Memory Ability to retain and recover learned information and knowledge of past events. Short-term memory is concerned with recalling memories of recent events, while long-term memory recovers memories from the more distant past. The elderly are particularly prone to a decline in memory. Some neurodegenerative diseases, such as Alzheimer's disease, can also affect memory and other indices of cognitive performance. Loss of memory is known as amnesia. Some foods and food components may have beneficial effects on memory, such as antioxidant compounds, ω-3 fatty acids and some vitamins and minerals.
Menadione  Synonym for vitamin K₃. Synthetic compound with vitamin K activity, used in prevention and treatment of hypoprothrombinaemia, secondary to factors that limit absorption or synthesis of vitamin K. Two to three times more potent than naturally occurring vitamin K.

Menadione  Mesquite pods

Menadione  Menhaden

Mental health  State of emotional and psychological well-being. Those in good mental health are able to adapt to environmental stresses, function in society and meet the ordinary demands of daily living. A break-down of mental health is associated with a wide range of psychiatric disorders that are characterized by alterations in thinking, mood and behaviour, such as depression, schizophrenia, bipolar disorder and anxiety disorders. Research indicates that diet can have a significant impact on mental health.

Menthone  Member of the monoterpenoid aroma compounds, with a ketone functional group. Present in mint and mint oils, and used in mint flavourings.

Menus  A list of culinary dishes and beverages available for selection by diners. Used in many catering establishments, such as restaurants and hotels, as well as in hospitals and other institutions serving meals.

Mercaptans  Organic compounds, synonym thiols, containing the thiol (-SH) group, also called a mercapto group or a sulfhydryl group. Sulfur analogues of alcohols in which the oxygen atom has been replaced by a sulfur atom.

Mercaptophos  Alternative term for the insecticide fenphos.

Mercosur  A regional trade organization formed in 1991 by Argentina, Brazil, Paraguay and Uruguay under the Treaty of Asuncion to establish a common market and a common trade policy for South America. Venezuela became the fifth full member in July 2006, and associate members include Bolivia, Chile, Colombia, Ecuador and Peru.

Mercury  A heavy metal, chemical symbol Hg, formerly known as quicksilver. Liquid at room temperature, and exhibiting two valencies - mercury(I) and mercury(II). Present in the environment naturally as mercury sulfide, but also as an industrial pollutant, for example as methylmercury, and occurs as a contaminant in foods. Accumulation of mercury in fish and other sea foods is of particular concern. Toxicity symptoms include chronic muscular problems and reduced fertility.

Merguez  Highly seasoned fresh sausages which are popular in France. They are prepared from beef, pork or mutton. Usually, they are grilled or fried before eating.

Meringues  Confectionery products made by whipping egg whites to a foam, incorporating sugar and drying to a crisp finish. The term may refer to small cakes or shells made of this material which have been decorated or filled, e.g. with whipped cream, ice cream or fruits. Also used as toppings added to flans or pies, as in lemon meringue pies.

Merissa  Type of sorghum beer made and consumed in Africa.

Mesentericins  Bacteriocins produced by Leuconostoc mesenteroides. Mesentericin Y105, a 37-residue peptide, is active against species of the genera Enterococcus, Lactobacillus, Carnobacterium and Listeria, including L. monocytogenes, and has potential for use in food preservation.

Mesophiles  Organisms, especially microorganisms, that grow best at intermediate temperatures. Their optimum growth temperature lies within the generally accepted range of 20 to 45°C.

Mesquite pods  Pods produced by the mesquite tree (Prosopis species, including P. velutina and P. glandulosa), a plant that grows well in semi-arid climates. The sweet pods are a good source of minerals, including calcium, manganese, iron and zinc, and are sometimes made into syrups, wines or jelly. Mesquite meal, made by grinding whole pods, is rich in proteins and can stabilize blood sugar levels in persons with diabetes due to its high contents of fructose, which is processed by the body without insulin, and soluble fibre, which is absorbed slowly. It is used in flavour enhancers, as an ingredient in bakery products, and to flavour meat, fish and other foods. Seeds inside the pods are the source of mesquite seed gums.
Mesquite seed gums  Gums obtained from seeds of trees of the genus *Prosopis*. Physical and chemical properties of mesquite seed gums resemble those of *gum arabic*, for which they can be used as substitutes.

Metabisulfites  Disulfurous acids, the disodium salts of which are used as preservatives and antioxidants.

Metabisulphites  Alternative spelling of metabisulfites.

Metabolic disorders  Generic term for diseases caused by an abnormal metabolic process. They can be congenital, due to inherited enzyme abnormality (inborn errors of metabolism), or acquired due to disease of an endocrine organ or failure of a metabolically important organ such as the liver.

Metabolic engineering  Genetic engineering strategy for the targeted and purposeful modification of existing metabolic pathways or the introduction of entirely new ones in living organisms. Widely applied to the production of desirable industrial and commercial use (such as nutrients, flavour compounds and antibiotics) in microorganisms and in transgenic plants and animals.

Metabolic rate  The rate at which the body burns calories. It is influenced by many factors, including age, gender, physical activity, muscle-to-fat ratio and hormone function. Some foods and beverages are claimed to raise metabolic rate, such as hot, spicy foods and beverages containing caffeine. Metabolic rate plays a role in weight gain and loss.

Metabolic syndrome  A collection of disorders that increase the risk of developing cardiovascular diseases and type 2 diabetes. Various diagnostic criteria are employed, such as a cluster of at least three of the following risk factors: increased blood glucose levels; increased levels of triglycerides; decreased levels of high density lipoproteins; elevated blood pressure; and abdominal obesity. Insulin resistance is thought to be an underlying cause of metabolic syndrome. A healthy diet and physical activity may assist in reducing the risk or severity of the syndrome. Weight loss should be a priority for individuals with this condition.

Metabolism  The sum of the chemical and physical processes that occur in cells or living organisms, including the pathways by which nutrients are used for energy production or cell growth and reproduction. It involves two major processes, catabolism and anabolism. Catabolism involves the breakdown of compounds into smaller units, with the release of energy. Anabolism is concerned with the construction of larger, more complex molecules from smaller units; this process requires energy.

Metabolomics  Study of the molecules generated in the process of metabolism (metabolites), which represent the final products of gene expression. Metabolic profiling provides information about the biochemical status or phenotype of a cell or organism. A key aim of metabolomics is to identify the effects of diet and nutrition on metabolic profiles.

Metacercariae  Mature infectious forms of parasitic trematode larvae.

Metalafoxyl  Systemic, benzenoid fungicide used for control of a wide range of fungal diseases in food crops, including fruits and vegetables. Classified by WHO as slightly hazardous (WHO III).

Metal detectors  Electronic devices that give an audible signal when close to metal; used to detect metal foreign bodies or contaminants during food processing.

Metalloenzymes  Enzymes that contain a bound metal ion as part of their structure. This ion may be required for enzymic activity, either participating directly in catalysis or stabilizing the active conformations of the proteins.

Metallothioneins  Cysteine-rich proteins which bind divalent heavy metal ions. Widely distributed in animals and microorganisms. Metallothionein-like proteins have been identified in plants.

Metals  Metals are generally solid, have a metallic lustre, are malleable and ductile, and conduct both heat and electricity. Approximately 75% of known minerals are metals. Metal ions can replace the hydrogen in acids to form salts; they also form alloys with each other.

Metanil yellow  Azo dyes not permitted for use in foods, drugs or cosmetics. Also called CI Acid Yellow 36.

Metaphos  Alternative term for the insecticide parathion-methyl.

Metallyls  Short-chain aliphatic compounds with alcohol, chloride or cyanide substituents. Have been used as fumigants to control pests in stored grain.

Methamidophos  Systemic organophosphorus insecticide and acaricide used to control chewing and sucking insects and spider mites on a range of crops.Restricted or banned in various countries. Classified by WHO as extremely hazardous (WHO Ib). Also known as monitor.

Methanal  Ethanal.

Methanal  Simplest of the aldehydes, synonym formaldehyde.

Methane  Simplest of the alkanes (molecular formula, CH₄) and principal component of natural gas and biogas. Large amounts are produced anaerobically by
Methanearsonic acid

Methanearsonic acid Alternative term for the herbicide methylarsonic acid.

Methanethiol Smallest of the thiols, synonym methyl mercaptan. One of the volatile aroma compounds found in cheese and other foods.

Methanol One of the alcohols, methanol contains a single carbon atom, and is a light, volatile flammable, poisonous, sweet-smelling liquid at room temperature. Widely used as a solvent, antifreeze or fuel. Can occur as a fermentation by-product in alcoholic beverages and vinegar. Synonym for methyl alcohol.

Methanalysis A form of alcoholysis or transesterification involving esters and methanol. Used to prepare fatty acid esters from vegetable oils. Catalysed by lipases or chemical catalysts. Also used as a tool for the structural analysis of food compounds, such as pectins, monosaccharides and hydrocolloids.

Methidathion Non-systemic insecticide and acaricide used for control of a wide range of chewing and sucking insects (especially scale insects) and spider mites in a wide range of fruits, vegetables and cereals. Classified by WHO as highly hazardous (WHO Ib). Also known as supracide.

Methional Aldehyde with a boiled-potato like aroma. Important aroma compounds in wines; also identified in many other foods, including sea foods, coffee, beer and yeast extracts. Synonymous with 3-(methylthio)propionaldehyde.

Methionine One of the essential dietary amino acids, this thiol-containing amino acid is a common protein constituent in foods. Also a precursor of several organic sulfur compounds which are important in food flavour.

Methionol A thiol alcohol, synonym 3-(methylthio)-1-propanol. One of the important sulfur flavour compounds found in wines and fermented soy products.

Methomyl Systemic N-methylcarbamate insecticide and acaricide used to control a wide range of insects and spider mites on fruits and vegetables. Also used for control of flies in animal houses and dairies. Classified by WHO as extremely hazardous (WHO Ib). Also known as lannate.

Methoprene Hormonal insecticide (pheromone analogue) with insect growth regulating activity. Used for control of a range of insects in food storage areas and processing and handling establishments. Also used in cultivation of mushrooms. Classified by WHO as unlikely to present acute hazard in normal use.

Methoxychlor Organochlorine insecticide used for control of a wide range of insects (particularly chewing insects) in fruits, vegetables and cereals. Also has been used for insect control in animal houses, dairies and food factories. Classified by WHO as unlikely to present acute hazard in normal use. Also known as DMDT.

Methyl alcohol Alternative term for methanol.

Methylamine Amine present in a wide range of foods and beverages, often detected in food analyses of biogenic amines.

Methylarsonic acid Organoarsenic compound and selective contact herbicide used for control of grass weeds. Classified by WHO as slightly hazardous (WHO III). Also known as methanearsonic acid.

Methylation Chemical modification involving attachment of methyl (CH₃-) groups to molecules, usually replacing H atoms. Excessive methylation (hypermethylation) of DNA is thought to play a role in carcinogenesis. May be triggered or prevented by components of the diet. Aberrant DNA methylation is associated with low dietary folates and high alcohol intakes. Also used as a tool in the structural analysis of food compounds, such as proteins.

Methyl benzoate An ester with the molecular formula C₈H₈O₂. One of the aroma compounds present in fruits such as mangoes, guavas, kiwifruit and grapes, and in the aroma of wines.

Methyl bromide Colourless, poisonous gas, synonym bromomethane. Employed in the fumigation of fruits and vegetables to control pests. Use is now curtailed in many countries under the Montreal Protocol on Substances that Deplete the Ozone Layer, and it is largely being replaced with other fumigants.

3-Methylbutanal Chemical name for isovaleraldehyde. May be one of the flavour compounds or cause taints in various foods, beverages and water.

Methyl butanol One of the aliphatic alcohols, with a characteristic odour and pungent taste. Synonyms include isovaleric alcohol, isopentanol and isopentyl alcohol. Used as an esterification substrate for production of isovaleral esters. Also identified as one of the aroma compounds present in wines, cider and beer as a result of yeast fermentation.

Methyl carbamate Carcinogen that may occur, along with ethyl carbamate, in some fermented foods and alcoholic beverages.

N-Methylcarbamate insecticides Class of insecticides sharing carbamic acid as a common base structure. Widely used for control of insect pests on crops and in food storage and preparation areas. Generally biodegradable and of low soil persistence.
N-Methylcarbamate pesticides

Commonly used examples include aldicarb, carbaryl, methomyl and propoxur.

N-Methylcarbamate pesticides Major class of pesticides which includes N-methylcarbamate insecticides. Members share carbamic acid as a common base structure.

Methylcellulose Methyl ester of cellulose. Prepared by alkali treatment of celluloses followed by methylation of the alkali cellulose with chloromethane. Due to its ability to absorb water and form viscous colloidal aqueous solutions, methylcellulose can be used as a substitute for gums. Also used in thickeners, stabilizers, emulsifiers, bulking agents and binders for foods including bakery products, desserts, sauces and dressings. Suitable as a substitute for gluten in gluten free foods.

1-Methylcyclopropane Volatile unsaturated cyclic hydrocarbon which acts as an inhibitor of ethylene activity by binding to ethylene receptors. Inhibits post-harvest ripening and softening in fruits and vegetables, thus extending shelf life.

Methylglyoxal Aldehyde present in many foods, but most commonly determined along with other dicarbonyl compounds as a natural component in beer and wines, and as an ozonation by-product in water purification. Synonyms include pyruvic aldehyde and pyruvaldehyde. Can be formed as one of the Maillard reaction products in nonenzymic browning, but is toxic at high levels.

Methylhistidine Histidine derivative which is frequently determined in meat and meat products to indicate levels of connective tissues or breakdown of myofibrillar proteins.

Methyl iodide Organic halogen compound, synonym iodomethane. Used in some disinfectants and in fumigation of fruits. Also used in several analytical techniques, including methylation treatments.

2-Methylisoborneol Member of the terpenoids group, formed by soil microorganisms. Along with geosmin, causes mouldy, musty taints in a variety of foods and beverages, but especially in drinking water and freshwater fish.

Methyl jasmonate One of the group of plant growth regulators which control growth and development. Particularly involved in plant defence responses. Can be applied exogenously to control fruit development and abscission.

Methyl linoleate Methyl ester of linoleic acid. Used widely as a substrate in studies of lipid oxidation and antioxidative activity.

Methyl mercaptan Smallest of the thiols, synonym methanethiol. One of the volatile aroma compounds found in cheese and other foods.

Methylmercury Organomercury compound produced as a result of industrial activity and present environmentally as a pollutant of soils and water, and hence plants and animals. Often measured as an indicator of mercury contamination of foods, especially seafoods and water.

S-Methylmethionine Synonym for vitamin U. A compound found in raw cabbages, other green vegetables, beer and citrus juices. A precursor of the off flavour compound dimethyl sulfide. Used in treatment of ulcers.

Methyllobacillus Genus of obligately methanol-assimilating, rod shaped Gram negative bacteria of the family Methylphilaceae. Of particular interest as sources of biomass and exopolysaccharides.

Methylcoccus Genus of aerobic, coccolid Gram negative bacteria of the family Methylcocccaceae. Occur in mud, soil and water. Capable of oxidizing methane, and able to grow on sugars and sulfur. Methylcoccus capsulatus is a methylotrophic Gram negative bacterium used in the production of single cell proteins.

Methylomonas Genus of aerobic, rod-shaped Gram negative bacteria of the family Methylcocccaceae. Obligately methylotrophic (able to metabolize single-carbon compounds as the sole source of both carbon and energy). Some species, e.g. Methylomonas methanica, are used in the production of single cell proteins. Carotenoids have also been produced by genetically engineered Methylomonas strains.

Methylparaben Common name for 4-hydroxybenzoic acid methyl esters used as preservatives for foods and beverages.

Methylparathion Alternative term for the insecticide parathion-methyl.

Methylenetones General term for sugars containing six carbon atoms but only five hydroxyl groups. Examples include rhamnose and fucose.

2-Methylpropanal One of the volatile compounds present in foods, beverages and spices which imparts a sharp, pungent aroma and is used in flavourings. Has a molecular formula of C₅H₁₀O, and is a member of the aldehydes. Synonyms include isobutanal and isobutyraldehyde.

Methyl propanol One of the aliphatic alcohols, with a mild alcoholic, sweet odour. Synonyms include isobutyl alcohol and isobutanol. Several isomers exist, including 2-methyl-1-propanol and 2-methyl-2-propanol. One of the aroma compounds produced during fermentation of alcoholic beverages, including wines, beer and cider.

Methyl sulfide Colourless liquid, synonym dimethyl sulfide, commonly used as a solvent. Also occurs
Methylthiophanate

Methylthiophanate is a compound used in the manufacture of certain drugs and in various industrial processes. It is used as a fungicide and is a metabolite of certain fungi.

Methylenediamine

Methylenediamine is a chemical compound with the formula (CH₂)₂(NH₂). It is a colorless, volatile, and poisonous liquid with a strong smell. The compound is highly reactive and is used in the production of various organic chemicals and pharmaceuticals.

Methionine

Methionine is an essential amino acid that is required by all animals, including humans. It is a sulfur-containing amino acid that plays a crucial role in the synthesis of proteins and in the function of numerous enzymes.

Methanol

Methanol is a colorless, flammable liquid with a distinct smell. It is a byproduct of the production of agricultural products and is used as a solvent, fuel, and a raw material in the production of formaldehyde.

Methylxanthines

Methylxanthines are a group of compounds that include caffeine, theobromine, and theophylline. These compounds are found in various plants and are known for their stimulant properties.

Methyltransferases

Methyltransferases are enzymes that transfer a methyl group (CH₃) from a donor molecule to an acceptor molecule. They are involved in the formation of flavor compounds, such as caffeine and mustards, as well as in the metabolism of certain drugs.

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Microbial biomass are produced by certain species. Others are found on the surface of smear cheese (Microbacterium gubbeenense).

Microbial biomass Quantitative estimate of the entire assemblage of microorganisms in a given habitat in terms of mass, volume or energy.

Microbial counts Numbers of microorganisms in a given sample.

Microbial proteins Proteins produced by microorganisms.

Microbial rennets Enzymes sourced from microorganisms, commonly fungi, that are used as substitutes for animal rennets in coagulation of milk for cheesemaking.

Microbial spoilage Spoilage caused by the activity of microorganisms.

Microbial spores Spores of bacteria or fungi.

Microbicidal compounds Compounds used for killing microorganisms.

Microbiological quality Extent to which a substance (e.g. a food) is contaminated with microorganisms.

Microbiological techniques Techniques used in microbiology, including those used to detect or quantitate microorganisms in substances such as foods and beverages.

Microbiology Scientific study of microorganisms and their interactions with other organisms and the environment.

Microbreweries Small breweries making speciality beer in small quantities (generally under 15,000 barrels annually). Frequently, the products are sold on the premises.

Microchip technology Technology that uses electronic equipment consisting of small pieces of semiconductor, usually made of silicon, that can carry electronic circuits.

Micrococcaceae Family of aerobic or facultatively anaerobic, cocoid Gram positive bacteria of the suborder Micrococcoineae and order Actinomycetales. Range from free living and saprophytic to parasitic and pathogenic forms. Includes the genera Arthrobacter, Kocuria and Micrococcus.

Micrococcus Genus of obligately aerobic, cocoid Gram positive bacteria of the family Micrococcaceae. Occur in soil, water, raw milk, dairy products and beer, and on mammalian skin. Micrococcus varians is used as a starter in the ripening of dry fermented sausages. Other species may cause spoilage of meat and eggs.

Microcrystalline celluloses Highly crystalline particulate material produced by acid hydrolysis of celluloses. Used as stabilizers, thickeners, emulsifiers, bulking agents, anticaaking agents, foaming agents and fat substitutes in foods such as salad dressings, dairy products, cereal products, dried foods and bakery products. Also known as cellulose gel.

Microcystins Hepatoxins produced by some strains of the cyanobacterium Microcystis aeruginosa. Exert hepatotoxic effects in humans and animals upon ingestion of contaminated water.

Microcystis Genus of Gram negative, photosynthetic cyanobacteria that occur in aquatic environments. Species are planktonic in fresh water, and often form blooms in water (e.g. reservoirs). Microcystis aeruginosa produces microcystins which are hepatotoxic in humans and animals upon ingestion of contaminated water.

Microemulsions Emulsions having a droplet diameter that is too small to be seen by the naked eye, typically 10-100 nm. Applications include edible films, coatings and delivery systems for nutrients and flavourings.

Microencapsulation Encapsulation process in which thin films or polymer coatings are applied to small solid particles, droplets of liquids or gases. Can be used to encapsulate enzymes, microorganisms, flavour compounds, sweeteners and other food ingredients. Useful for controlled flavour release and enhancing the stability of sensitive ingredients. Methods for microencapsulation include spray drying, spray chilling, spray cooling, extrusion, air suspension coating, liposome entrapment, co-crystallization, molecular inclusion and interfacial polymerization.

Microfiltration A method of sterile filtration that removes particles of approximately 0.1-10.0 µm in size, such as large fat globules, large proteins and suspended particles such as microbial cells. Microfiltration is generally used in the clarification and separation of beer, wines and soft drinks, and in the dairy industry for processing of low heat sterile milk.

Microflora In a microbiological context, refers to all microorganisms present in a particular habitat. May refer to all the microscopic plants, bacteria, fungi and algae present in a particular habitat in a broader biological context. Also, can be used to describe the plants, bacteria, fungi and algae that are present in a particular microhabitat.

Microfluidization High pressure homogenization technique for the deagglomeration and dispersion of uniform submicron particles and creation of stable emulsions and dispersions. Microfluidizers generate product streams under pressure, and cause them...
Microwaves

Electromagnetic waves with a wavelength in the range 0.001 to 0.3 m, shorter than that of normal radio waves, but longer than those of infrared radiation. Microwaves are used in microwave ovens for cooking, heating and defrosting of foods.

Microwave susceptors

Devices used in the form of active packaging that cause browning and crisping of foods that are prepared in microwave ovens. A

Microwaveable cooking

A method for cooking foods using microwave ovens. Microwaves are passed through the foods at a frequency of 2.45 GHz and energy from them is absorbed by molecules of water, fats and sugars, which vibrate and collide, generating heat. The microwaves only penetrate a few centimetres into the food, so the centre of many products cooks by heat conduction. Microwave cooking does not cause browning as the temperature range does not support the Maillard reaction.

Microwave ovens

Ovens, ranging in power from approximately 500 to 1000 W, that use microwaves to cook, heat or defrost foods. The high-frequency electromagnetic waves cause the food molecules to vibrate, so creating friction that heats the food. Microwaves penetrate only a few centimetres into the food, so the centre of most products is cooked by heat conduction. Non-metal containers (such as glass and ceramics) need to be used, as microwaves can pass through them (unlike metal) and cook the food from all angles at once. As the microwaves pass through the containers, they are able to stay relatively cool themselves while the food becomes hot. However, during longer cooking periods, the containers can become hot due to heat conduction from the food. To assist in administration of an even distribution of microwaves, some ovens have turntables while others have revolving antennae. As browning does not occur in the normal manner when foods are cooked in microwave ovens, microwave susceptors are often used to promote browning.

Microwave popcorn

Popcorn made with popping corn which has been specially formulated for preparation in microwave ovens.

Microwaves

Microwaveable containers

Containers that may be used safely for microwave cooking or reheating of foods. Must be made of materials that will not cause damage to microwave ovens during operation or allow migration of undesirable components into the foods being heated.

Microwaveable foods

Foods suitable for heating in microwave ovens. Ready meals that can be rapidly reheated in this manner and microwave popcorn are some of the most popular types of microwaveable products. Further applications have been limited by problems such as lack of browning in foods cooked in microwave ovens, and arcing during microwave cooking of foods packaged in foils. However considerable advances have been made in development of microwave susceptors and other devices for promoting browning and crisping during microwave heating and cooking.

Microwaveable packaging

Packages or wrappings that may remain on foods during microwave cooking or reheating without causing damage to microwave ovens or causing contamination of the products with undesirable components.

Microorganisms

Microscopic organisms which include algae, bacteria, fungi, protozoa, archaea and viruses.

Microsatellite markers

Highly polymorphic DNA markers comprising mono-, di-, tri- or tetra-nucleotides repeated in tandem arrays and distributed throughout genomes. Used as genetic markers in genetic mapping studies.

Microscopy

Analysis of samples using microscopes which produce magnified images. Includes basic light microscopy and more complex techniques such as electron microscopy.

Microstructure

Structure of organic materials or objects that can be observed using microscopy.

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Micrometers

Instruments used in conjunction with microscopes or telescopes for measuring small distances.

Micromonospora

Genus of aerobic, filamentous Gram positive bacteria of the family Micromonosporaceae. Occur in soil, decaying vegetation and water. Some species, e.g. Micromonospora chalcea and M. cellulolyticum, produce cellulases and β-glucosidases. Various species are sources of amionglycoside antibiotics.

Micronization

Indirect infrared (IR) heating method that relies on heat that is generated externally being applied to the surface of a food mostly by radiation, but also by convection, and, to a lesser extent, conduction. IR heating is mostly used to alter eating quality of foods by changing the surface colour, flavour and aroma. The main commercial application of radiant energy is in drying of low moisture foods and in baking and roasting ovens.

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microwave active metal is lightly deposited on a thermally stable substrate (such as PET) and this sheet is laminated onto a back stock that provides rigidity. Once placed in the microwave, these packages will reach temperatures in excess of 170°C almost instantaneously. The high temperatures allow the food to cook quickly, and promote the Maillard reaction, thus enhancing browning characteristics.

Migraine Condition characterized by severe, usually unilateral, vascular headache. Sometimes combined with any of a range of other symptoms such as nausea, vomiting and heightened sensitivity to light or sound. In some cases, attacks are triggered by ingestion of specific foods, food additives or beverages. Commonly suspected dietary triggers include alcoholic beverages, beverages containing caffeine, cheese, some beans, cured meat and chocolate based products.

Migration Movement of undesirable compounds (e.g. plasticizers from packaging materials) into foods.

Military rations Foods for those serving in the armed forces. Various categories are available for use in different situations. The foods are packaged so that they are compact and light with a long shelf life (at least 6 months at 38°C, 3 years or more at 27°C). Canned foods and dried foods are common. All rations, with the exception of restricted rations, which are intended only for short term use, must meet military RDA for nutrients.

Milk Secretion of the mammary gland of mammals. Composition varies among species, and is affected by many factors, including feeds and season. When used without further clarification, the term milk is generally accepted to mean cow milk. Cow milk is sold in various forms that differ in fat content (whole milk, semi skimmed milk and skim milk). Whole milk contains approximately 87% water, 4% fat, 3% protein and 5% lactose. It is rich in calcium (approximately 1.2 g/l), riboflavin (2 mg/l), vitamin B₁₂ and iodine. A good source of vitamin A and vitamin B₁. Also contains folates and other vitamins and minerals. Due to risk of contamination with pathogens and spoilage organisms, milk for drinking is generally sold pasteurized, sterilized or UHT (ultra high temperature) treated, although raw milk is sometimes used to make dairy products such as cheese.

Milk beverages Drinks in which milk is a major constituent. Include milkshakes, flavoured milk, carbonated milk beverages, milk mixed with fruit or vegetable juices or pulps, and products enriched with specific nutrients, e.g. fibre or calcium. Alternative term for milk drinks.

Milk chocolate Type of chocolate made by incorporating milk powders with sugar, chocolate liquor and cocoa butter. More widely eaten than dark chocolate and white chocolate. Compared with dark chocolate, milk chocolate has a creamier texture and taste, and tends to be softer.

Milk clotting Process in which milk is separated into curd and whey by the action of milk clotting enzymes, e.g. rennets, lactic acid produced by bacteria, or a combination of both. Used in cheesemaking. During clotting (or coagulation), k-casein, which resides on the surface of casein micelles and confers stability, is removed by the action of the enzymes, causing the destabilized casein to precipitate; acid acts by destroying linkages between components of the micelle. Curd produced by using enzymes generally has a higher calcium content than that formed by acids.

Milk clotting enzymes Enzymes used in the clotting or coagulation of milk during cheesemaking. Most commonly, rennets extracted from the stomach of young ruminants have been used traditionally in this process, but other sources of enzyme have been developed in the light of shortages of animal rennets and the increasing popularity of vegetarian products. Alternatives include microbial rennets, produced by a range of microorganisms, and enzymes produced by plants, e.g. cardoons.

Milk fat globule membranes Membranes surrounding milk fat globules, comprising approximately 60% lipid and 40% protein. Enzymes and trace elements are associated with these membranes. When broken down, e.g. during churning of cream in buttermaking, fat globules are released and may coalesce.

Milk fat globules Emulsified form in which milk fats exist in milk. Surrounded by milk fat globule membranes. Fat globules have a diameter of 2–6 μm and a large surface area.

Milk fats Lipids present in milk mainly in the form of emulsified milk fat globules. Mainly triglycerides, with small amounts of monoglycerides, diglycerides, cerebrosides and free fatty acids. Milk fat globule membranes also contain phospholipids and sterols. Fat content of milk varies greatly among species and among animal breeds. Fatty acid composition of milk fats is governed by many factors, including feed, lactation stage and fat content of milk. Cow milk fat contains a great number of fatty acids, principal ones including palmitic acid, oleic acid, myristic acid, stearic acid, linolenic acid and linoleic acid.

Milkfish Marine fish species (Chanos chanos) widely distributed in the Indo-Pacific; a commercially impor-
Milk ice

Product similar to ice cream but generally containing less milk fat.

Milk infant formulas
Preparations for feeding to infants and young children intended to satisfy their specific nutritional requirements. Made from cow milk with the nutrient composition adjusted to mirror that of human milk. Composition is varied according to the age of the infant to be fed.

Milking
Drawing of milk from the udders of female mammals. Extraction is performed manually or, where large numbers of animals are to be milked, using equipment specifically designed for the purpose (milking machines).

Milking frequency
Number of times an animal is milked during a given period. Dairy cattle are generally milked twice daily. Alteration of milking frequency can have effects on milk composition and quality.

Milking interval
Time elapsing between consecutive milkings. Affects milk composition and quality.

Milking machines
Devices used to extract milk from the udders of female mammals. Modern machines operate by suction, utilizing a partial vacuum and a pulsating action to simulate hand milking.

Milk powders
Products prepared by drying whole milk to a low moisture content, giving a powder with a long shelf life. Also called dried milk.

Milk products
Alternative term for dairy products.

Milk protein concentrates
Preparations made by concentration of milk, usually skim milk, by ultrafiltration, during which milk proteins are separated from other milk constituents, followed by drying. Milk protein content varies according to manufacturing procedures. Products with high protein contents often have low lactose contents and are suitable for use in low carbohydrate foods. Additionally used in a similar way to skim milk powders in foods such as processed cheese, infant formulas, beverages, fermented dairy products and diet products.

Milk proteins
Proteins found in milk, comprising casein (approximately 80% of total protein) and the whey proteins, including α-lactalbumin, β-lactoglobulin, serum albumin and immunoglobulins. Used as ingredients in various foods, including bakery products, coffee whiteners, nutritional beverages and imitation cheese, to modify functional properties and sensory properties. In some food allergies, cow milk proteins act as allergens.

Milk puddings
Puddings made by baking milk with a grain, such as rice, semolina or tapioca, sugar and sometimes flavourings.

Milksakes
Beverages made by addition of flavourings, often fruits-based, to milk and agitation by beating or shaking, sometimes with the addition of ice cream.

Milk substitutes
Multipurpose term covering replacements for mothers’ milk, e.g. human milk, used in infant feeding (infant formulas) or young animal feeding, as well as products prepared for use by individuals unable to tolerate milk or not wishing to consume it for other reasons, e.g. vegans. Depending on the intended consumers, the latter category may or may not contain dairy components, e.g. whey. Non dairy foods used as the basis of milk substitutes include soybeans and oats.

Millet
Small seeds from any of a number of cereal grasses, including common millet (Panicum miliaceum), finger millet (Eleusine coracana), foxtail millet (Setaria italica), pearl millet (Pennisetum typhoides) and teff (Eragrostis tef). Good sources of many minerals and with good storage properties. Forms the staple diet of much of the world population, especially in Asia and Africa. Consumed like rice or made into various products such as porridge, gruel and bread.

Millet flour
Flour produced by grinding of millet after hulling. These cereal flours are used most commonly in Africa and Asia, being a major ingredient of porridges and bread.

Millet oils
Vegetable oils extracted from millet grains.

Millet starch
Starch isolated from millet.

Milling
Grinding in mills. For example, grinding of grain to produce flour.

Milling properties
Ability of solid materials, such as grain, to be ground into powders.

Mills
Machinery for grinding solid substances, or buildings equipped with such machinery. Include equipment used for grinding grain into flour.

Milo
Drought resistant grain sorghum, especially Sorghum bicolor, which is similar to millet and is grown in Africa, Asia and the USA.

Milt
Gonads from male fish, particularly herring and mackerel. Often called soft roe. Marketed as fresh or canned products.

Miltone
Vegetable-toned milk product developed in India to overcome problems of milk shortages. Prepared using a protein isolate from peanuts which is added to cow milk or buffalo milk along with sugar and vitamins. Suitable for drinking on its
Mincers or Mincing  Shredding
Alternative term for Minced meat

Minerals  Solid inorganic elements, including metals
Minerals are not normally volatilized when their organic matrix is ashed to remove carbonaceous materials. Many minerals are essential nutrients in that they are necessary in the diet of humans or animals to allow completion of the life cycle.

Mineral oils  Oils derived from hydrocarbon sources, some of which may be of food grade and may be used as food additives. Other mineral oils are not of food grade and may act as food contaminants.

Mineral waters  Natural spring waters or similar waters, which are produced and bottled under conditions specified under national regulations. In the UK, mineral waters may also be used as a general term for carbonated soft drinks.

Minimally processed foods  Foods that are processed using technologies that do not significantly alter their fresh-like attributes, but achieve reliable preservation and control over enzyme activity and microbial growth. Most commonly applied to fruits and vegetables. Examples of such processing for fruits and vegetables include washing, sorting, cutting, trimming, slicing and dicing. Other methods of minimal processing include various high temperature short time (HTST) thermal processes in combination with minimal processes such as hermetic packaging and refrigeration. In order for minimally processed foods to have a reasonable shelf life, modified atmosphere packaging has become an integral part of many minimal processing procedures.

Minimal processing  Limited processing of products to a level where they maintain the characteristics of fresh foods. Examples include industrial processes such as washing, sorting, cutting, trimming, slicing and dicing. Because a number of minimal processing technologies result in wounding of plant tissues and subsequent acceleration of deteriorative processes, controlled environmental conditions are critical requirements in the transportation, distribution, storage and retail display of these products. Modified atmosphere packaging has become an integral part of minimal processing.

Mint  Plants of the genus Mentha, leaves of which are used as spices. Mint leaves are often added directly to foods and beverages or during cooking of dishes and impart a cool, fresh flavour. The predominant flavour compound of mint is menthol. Species with food industry applications include peppermint (M. piperita), spearmint (M. spicata) and Japanese mint (M. arvensis).

Mint oils  Essential oils distilled from mint. The characteristic fresh, cool flavour and aroma of mint oils is due to the presence of the terpenoid, menthol. Mint oils are used as flavourings for sugar confectionery, such as mints and chewing gums, and in beverages, e.g. cordials.

Mints  Sweets or lozenges which may be hard, soft or covered in chocolate and are flavoured with either peppermint or spearmint.

Miraculin  Flavourless glycoproteins extracted from berries of the African miracle fruit plant (Richardella dulcifica), which act as flavour modifiers. After exposure to miraculin, the human tongue perceives sour foods and drinks subsequently ingested to be sweeter than they actually are. The effect lasts for up to an hour. Miraculin loses its flavour modifying properties when heated to temperatures above 100°C.

Mirex  Systemic organochlorine insecticide used for control of ants and chewing insects in some crops. Subject to the Stockholm Convention on Persistent Organic Pollutants and use for pest control purposes has been banned in most parts of the world, although high persistence means residues may still occur in the environment and in animals.

Mirliton  Alternative term for chayote.

Miso  Pastes made by fermenting usually cooked soybeans, but sometimes barley or rice, and salt. Aged in cedar vats for 1-3 years. Ingredients and length of ageing are varied to produce products differing in sensory properties. Used as the base for manufacture of soups and sauces, and for flavouring other foods.
Mixers Electric machines or devices for combining food ingredients by beating, mixing or whipping. There are two basic types of mixer - stationary and portable. Stationary mixers tend to be more powerful and can therefore handle heavier mixing jobs; they are usually equipped with an assortment of attachments including dough hooks, wire whisks, paddle-style beaters, and even citrus juicers, ice crushers, pasta makers, sausage stuffers and meat grinders. Portable mixers are small in size, due in part to their small motors, but are consequently easy to store. The term mixers is also applied to beverages, such as soda water, tonic waters, cola beverages, lemonade or fruit juices that can be combined with spirits to make beverages such as cocktails.

Mixes Blends of ingredients in dried form that can be reconstituted in a liquid, sometimes with the addition of other ingredients, to make the desired product. The reconstituted mixture may require cooking or be ready to eat. Products available in this form include cakes, soups and desserts.

Mixing Combining food ingredients together by hand or using electric machines (mixers).

Mixographs Instruments used to investigate the physical properties of dough.

Model foods Substances or systems that are formulated to have properties that mimic those of certain foods and so can be used to represent them in studies where sample uniformity is required. May also refer to specific foods that are representative of a broader category of foods and can therefore be used as a model of that category.

Modification Alteration of chemical structures, including food components. Includes modification of starch and proteins to improve their functional properties or biological activity. Examples include hydroxylation, hydroxypropylation, glycosylation and methylation.

Modified atmosphere packaging Packaging technique used primarily to extend shelf life of foods. Gas composition within the package is changed by altering levels of oxygen, nitrogen and carbon dioxide. This inhibits microbial growth, controls enzymic and biochemical reactions, reduces moisture loss and protects against infestation with pests. Used for packaging a wide range of foods.

Modified starches Starch that has been modified by chemical reaction or physical means in order to adapt it for a specific application or improve its general applicability, i.e. to increase stability. Chemical modifications include cross-linking, acetylation, phosphorylation, reaction with 1-octenylsuccinic anhydride, hydroxypropylation and oxidation. Physical modifications involve pregelatinization of starch by drying or heating.

Modori Formation of very brittle, heat-set gels on incubation of fish surimi pastes at 50-70°C. Gel structure is irreversibly destroyed and mechanical strength is reduced. Inhibited by addition of sugars, such as glucose, fructose and sucrose, dried egg whites, alcohols, such as n-butyl-, n-amyl- and n-
Moisture retention
Extent to which substances, including foods, are considered to be moist. May be an indicator of food quality.

Moisture Water or other liquid within a solid, condensed on the surface of an object or in the form of vapour. Moisture content is an important property of various foods, as an excess can promote decay, rotting or bacterial spoilage and impact on food safety.

Moisture content Level of moisture held in a substance, stated as a percentage of the wet or dry weight.

Moisture retention Extent to which substances, including foods, retain moisture, for example during processing and storage. May be used as an indicator of food quality.

Moisture sorption Process whereby moisture binds to another substance.

Moisture transfer Movement of moisture in stored products as a result of moisture and temperature changes.

Molasses Low purity, thick, brown syrups produced as a by-product of sugar refining, and including the syrups remaining after sucrose crystallization has been exhausted. Uses include as a feedstock for microbial fermentation. Molasses from cane sugar refining are also known as blackstrap molasses.

Molecular weight Sum of the atomic weights of the atoms in a molecule, usually measured in Daltons (abbreviation Da).

Molluscs A diverse group of invertebrate organisms belonging to the phylum Mollusca; includes gastropods (e.g. snails), bivalves (e.g. oysters) and cephalopods (e.g. squid). The majority of molluscs are of marine origin, but large numbers of species occupy freshwater and terrestrial habitats. Many species of molluscs are collected or cultivated for human consumption.

Mol. wt. Abbreviation for molecular weight.

Molybdenum One of the essential metal minerals, chemical symbol Mo. Component of xanthine dehydrogenases and sulfate oxidase in animals and also nitrogen-fixing enzymes in some microorganisms and plants. Dietary requirements for molybdenum are very low and deficiency diseases are rare.

Is found in vegetables, cereals, oilseeds, fish and water.

Momoni Condiments prepared from fermented fish which are used in parts of Africa, particularly Ghana. Used as flavourings in soups and stews, and also as a source of proteins.

Monascus Genus of fungi that produce the red, yellow and purple pigments, rubropunctatin and monascorubin, ankaflavin and monascin, and rubropunctamine and monascorubramine, respectively. Monascus purpureus ATCC 16365 is commonly used for pigment production. Traditionally, in Asia, Monascus spp. are grown on steamed rice to produce red coloured foods. Monascus colorants have not been universally approved for use in foods.

Monatin One of the high intensity natural sweeteners. An amino acid derivative ((2S,4S)-4-hydroxy-4-(3-indolylmethyl)-glutamic acid) isolated from root bark of the African plant Schlerochiton ilicifolius, which exhibits sweetness 1400 times greater than that of sucrose. Unlike other sweeteners, it has little aftertaste. Applications include chewing gums, low calorie foods and beverages, and tabletop sweetener compositions.

Monellin Heterodimeric high intensity sweet proteins isolated from berries of the African plant Dioscoreophyllum cumminsii. Consists of two covalently associated polypeptide chains (one of 44 amino acid residues, the other with 50 residues); the native conformation is essential for sweet taste. Conditions that induce protein denaturation, e.g. high temperatures or exposure to strong acids or alkalies, decrease sweetness intensity. The protein is tasteless below pH 2 and above pH 9, and its thermal instability limits its food applications. Purified monellin is 1500-2000 times as sweet as sucrose on a weight basis; synthetic monellin is 4000 times as sweet.

Monensin Polyether antibiotic and coccidiostat used to control coccidiosis in cattle, lambs and poultry. Also used to treat ketosis in dairy cows and in growth promotors for cattle. Residues in poultry meat and eggs may persist for several weeks post-treatment, but it is excreted more rapidly in cattle.

Monilia Former name for the genus Candida.

Moniliformin Low molecular weight mycotoxins produced by several Fusarium spp., mainly F. proliferatum and F. subglutinans, which are endemic in cereals, particularly corn. Acutely toxic for various animal species, including humans. Primarily acts as a cardiotoxic mycotoxin, and also exerts its effect on smooth muscle. Processing steps in the production of corn products generally reduce moniliformin concen-
Monilinia  Genus of fungi of the family Schlerotiniaceae. Monilinia fructicola, M. laxa and M. fructigena cause postharvest brown rot of stone fruits.

Monitor  Alternative term for the insecticide methamidophos.

Monkfish  Name applied to marine fish species of the genera Lophius or Lophoidees (angler fish) and Squatina (angelsharks). Widely distributed throughout the world. Marketed fresh, frozen or dried-salted and cooked by a variety of methods. May also be used as a source of fish oils and fish meal.

Monoacylglycerols  Types of glycerides, synonym monoglycerides. Composed of a glycerol molecule in which one of the hydroxyl groups has been acylated with a fatty acid substituent.

Monoamine oxidases  Alternative term for amine oxidases.

Monochloramine  Synonymous with chloramine. Chemical formula Cl-NH2. By-product of drinking water chlorination and is formed when ammonia is added to chlorinated water. Can be added to portable water distribution systems to maintain residual disinfection activity, and is also used in washes during cleaning of chicken carcasses to control microorganisms.

Monoclonal antibodies  Antibodies derived from a single antibody-producing cell, or produced artificially by a single clone and consisting of identical antibody molecules. Produced by fusing antibody-forming lymphocytes from mouse spleen with mouse myeloma cells. The resulting hybrid cells multiply rapidly and produce the same antibody as the parent lymphocytes. Monoclonal antibodies are widely used to detect and measure the amounts of particular antigens, or entities that can act as antigens.

Monocrotophos  Systemic insecticide and acaricide used to control a wide range of pests, including sucking, chewing and boring insects and spider mites on citrus fruits, vegetables, cereals and sugar cane. Classified by WHO as highly hazardous (Ib). Also known as azodrin.

Monoglycerides  Lipids composed of glycerol esterified to a single fatty acid, such as glycerol monooleate and glycerol monostearate (glycerol esterified with oleic acid and stearic acid, respectively). These compounds are present in naturally occurring fats and oils. Monoglycerides have many applications in the food industry, including uses as emulsifiers, inhibitors of staling in bread dough and cake mixes, encapsulators for flavourings, moisture barriers, and in manufacture of margarines.

Specific properties are determined by the nature of the fatty acid present. Also called monoacylglycerols.

Monolaurin  Monoglycerides formed by esterification of glycerol with lauric acid (dodecanoic acid). Monolaurin exhibits inhibitory activity against several foodborne pathogenic bacteria, including Listeria monocytogenes, and is used in food preservatives. Other uses include as mild surfactants and emulsifiers. Also called glycerol monolaurate.

Monooxygenases  Members of EC 1.13 and EC 1.14. Oxidoreductases that incorporate one oxygen atom from O2 into the compound oxidized.

Monophenol monooxygenases  EC 1.14.18.1. Also known as tyrosinases, phenolases, monophenol oxidases and cressolases, these enzymes can catalyse the reaction of catechol oxidases under certain conditions. Involved in enzymic browning in fruits, vegetables and cereals, but are useful for the oxidation of phenols during tea, coffee and cocoa processing.

Monosaccharides  General term for a single sugar unit comprising five or six carbon atoms in a ring conformation (furanose and pyranose, respectively).

Monosodium glutamate  Monohydrate sodium salt of L-glutamic acid used in flavour enhancers to provide umami flavour. Most commercial production of this additive is from glutamate produced as a result of fermentation by bacteria, including Micrococcus glutamicus. May cause adverse reactions including headache, nausea and chest pain in some individuals. Often abbreviated to MSG.

Monoterpenes  Monoterpenoids synthesized from isoprene and containing two isoprene units. May be acyclic, monocyclic or dicyclic.

Monoterpenoids  Class of terpenoids which includes monoterpenes and their oxygenated and hydrogenated derivatives. Occur naturally in a wide range of plant foods and derived products, including wines, beer, fruit juices and other fruit products. Many are aroma compounds and components of essential oils and flavourings.

Monounsaturated fatty acids  Unsaturated fatty acids containing a single double bond. Examples include oleic acid, palmitoleic acid and erucic acid, significant sources of which include olive oils, fish oils and rapeseed oils, respectively.

Montasio cheese  Italian hard cheese originally made from ewe milk but now made from unpasteurized cow milk. Rich and creamy, with a fruity flavour. The yellow-brown rind is smooth and springy in young cheese but becomes darker and harder with age. Interior is firm with small holes, becoming granular or brittle in mature cheese. Ripens in 3-18 months.
Morels Edible fungi of the genus *Morchella* are large ruminant animals (*Moose*) of high commercial importance belonging to the family Cervidae, which are hunted for their meat. Moose meat, from the US that is made from cow milk, is popular in the USA, a commonly consumed game meat in Sweden and also a traditional food for some ethnic groups, such as the James Bay Cree Indians in Canada. Since moose often feed in marginal wasteland environments, such as moose carcasses, meat and offal. Moose meat is sometimes referred to as venison.

**Mortierella** Genus of aerobic, rod-shaped Gram negative bacteria of the family Mortierellaceae. Occur in soil and water, and on plants and animal hides. Responsible for spoilage of fresh meat and fish.

**Morgenella** Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae. *Morganella morganii* is found in the faeces of humans, dogs, other mammals and reptiles. Certain species, especially *M. morganii*, can produce histamine in scombroid fish and fish products, which can cause scombroid poisoning in humans when consumed.

**Morin** Flavonol, with a structure similar to that of quercetin, which is a natural component of many plants and wines. Possesses antioxidative activity in lipids, antimicrobial activity and nitrite scavenging activity, but can act as a prooxidant for non-lipid food constituents. Potentially useful as an antioxidant in oils.

**Morinda** Genus of plants native to tropical Asia. Seeds of some species, especially *Morinda oleifera*, yield high quality oils used as cooking oils as well as lubricants. Other plant parts are also used as foods, fruits and leaves as vegetables and roots as a source of spices.

**Mortadella** Large, fully cooked, semi-dry sausages, originally made in the Bologna area of Italy. Mortadella is prepared from very finely chopped, cured pork and beef, with the addition of cubes of white fat; it is lightly spiced with aniseed and garlic, and smoked at high temperature before air drying. Other versions include German-style mortadella, which is prepared from high quality, finely minced meat with cubes of pork fat and pistachio nuts. Mortadella has one of the highest fat contents of all cooked sausages. Usually, it is sliced and served, but it may be added to pasta stuffings, sauces or sautes.

**Morning goods** Bakery products that are usually, but not always, eaten at breakfast (e.g. croissants, brioches).

**Morwong** Any of a number of marine fish species in the family Cheilodactylidae, widely distributed in the Pacific and Indian Oceans and parts of the Atlantic Ocean. Commercially important species include *Neodyunactylus macropterus* (morwong), *N. douglasi* (grey morwong) and *Cheilodactylus spectabilis* (banded morwong). Marketed fresh, usually whole, gutted or as...
fillets; sometimes sold as frozen fillets or in ready-to-cook packs.

**Moth beans** Seeds produced by *Phaseolus aconitifolius*. Grown as a food source particularly in India, where the seeds are eaten whole or split, often fried in oils; the green pods from the plant are also eaten as vegetables. Also known as mat beans, matki beans, mout beans and dew gram.

**Moths** Common name for mostly nocturnal insects of the order Lepidoptera. Adults or larvae may be pests of plants and stored foods. The potato tuber moth (*Phthorimaea operculella*) is an important pest of potatoes, the codling moth (*Cydia pomonella*) is a pest of walnuts and apples, and the Indian meal moth (*Plodia interpunctella*) is a pest of flour and dried fruits. Larvae of the emperor moth (*Imbrasia belina* Westwood) are an important food source in southern Africa.

**Motility** Ability to move independently and spontaneously. Can be applied to unicellular and multicellular organisms. With motile bacteria, motion is usually achieved by rotation of a single flagellum or multiple flagella on the bacterial surface. Some bacteria move without the aid of flagella using a process called gliding motility. Helical bacteria use rotation of an internal axial filament for self-propulsion. These locomotion methods allow bacteria to move towards attractive stimuli, such as nutrients, and away from harmful substances in the process of chemotaxis. Motility is important as one of the virulence factors for pathogens, aiding in colonization of host cells.

**Mottling** Blotchy discoloration of foods.

**Moufflon** Small, wild sheep (*Ovis orientalis*) which are believed to be the common ancestors of all domestic sheep. They are hunted for their meat.

**Moulding** Formation of an object out of a malleable substance. Also use of containers (moulds), usually distinctively shaped, to form food into a specific shape. Moulds can range in size from small, individual candy-size moulds to large pudding moulds and cheese moulds. The foods to be moulded (e.g. a gelatin-based dessert) are poured or packed into the mould and then left until they become firm enough to hold their shape.

**Moulds** Common alternative term for fungi.

**Mountain apples** Alternative term for Malay apples.

**Mousses** Creamy, frothy desserts typically made from fruit purees, whipped cream and/or beaten eggs, and set with gelatin. Savoury mousses are similar light-textured dishes made from meat or fish.

**Mouthfeel** Sensory properties relating to sensations produced in the mouth by foods during mastication. Mouthfeel is affected by a wide variety of food properties and ingredients, including viscosity, flavour, foaming, and content of fats.

**Moxidectin** One of the broad-spectrum anthelmintics used to control infections by parasites, predominantly heartworm infections, in cattle, sheep and goats, but not approved for use in dairy animals. Rapidly metabolized and excreted from treated animals.

**Mozzarella cheese** Italian soft cheese made from buffalo milk. A plastic, spun-curd cheese made by coagulating pasteurized milk at 32°C, cutting the curd, treating it with hot water (93°C) and kneading into a shiny lump. Pieces are then taken off, cooled, salted and marketed soon after.

**m.p.** Abbreviation for melting point.

**MPN** Abbreviation for the most probable number method, a technique for estimating the number of viable microorganisms suspended in a liquid. Sets of tubes containing growth medium are inoculated with successively smaller volumes of sample solution. Following incubation, the tubes are examined for microbial growth and the number of cells in the original sample is calculated from the pattern of growth, using probability tables. Also called the multiple tube method.

**MRL** Abbreviation for maximum residue limits.

**mRNA** Abbreviation for messenger RNA. RNA molecules derived from DNA by transcription that function as templates for synthesis of proteins (translation) in cells or for synthesis of complementary DNA (cDNA).

**MS** Abbreviation for mass spectrometry.

**Mucic acid** Member of the organic acids, synonym galacturonic acid. Occurs as an oxidation product of Botrytis cinerea and is found particularly in grapes infected with Botrytis cinerea.

**Mucilage** Gums produced as plant exudates, in particular those produced by seaweeds.

**Mucins** Glycoproteins secreted by animal mucous cells and glands. Found in saliva, and gastric and intestinal secretions.

**Mucoids** Glycoproteins or mucins with mucous-like properties. Also used to describe gummy or slimy bacterial colonies.

**Mucopolysaccharides** Synonym for glycosaminoglycans.

**Mucor** Genus of zygomycetous fungi of the family Mucoraceae. Occur on vegetable matter, soil and dung. Can cause spoilage of fresh fruits and vegetables, and their products. *Mucor racemosus* and *M. mucedo* may be responsible for spoilage of bread and meat, while other species may be parasitic to stored grains. *M. hiemalis* is used in the production of sufu and *M. racemosus* in the production of pozol. *Mucor* species
Mud crabs

Common name for marine and estuarine crabs of the genus Scylla, especially S. serrata. Widely distributed in the Pacific and Indian Oceans; also produced by aquaculture in Asia and Australia. Prize for the delicate, sweet flavour of the moist meat, found mainly in the claws. Cooked by steaming, poaching, pan frying or on a barbecue. Meat is eaten on its own or as an ingredient of soups or pasta fillings. Also known as mangrove crabs.

Muenster cheese

Alternative spelling of Munster cheese.

Muesli

Mixture of untoasted cereal flakes (e.g. oats, wheat and rye), dried fruits and nuts, often used as breakfast cereals. Can be sweetened or unsweetened.

Muesli bars

Fibre-rich cereal bars based on muesli ingredients.

Muffin cakes

Round cakes which may be leavened with yeasts or baking powders and sweetened with sugar. May be plain, or flavoured with fruits, e.g. blueberries, dried fruits, nuts, chocolate or savoury ingredients such as cheese.

Muffins

Term that has two different meanings. American muffins are small, round cakes which may be leavened with yeasts or baking powders and sweetened with sugar. They may be plain, or flavoured with fruits, e.g. blueberries, nuts or savoury ingredients such as cheese. Often eaten with breakfast or as an accompaniment at dinner. English muffins are thick, round bread products which are rapidly fermented and well aerated. Baked on a hot plate or griddle and often split and toasted before being eaten, sometimes with sweet or savoury fillings, such as jams, bacon or cheese.

Mugwort

Plants of Artemisia spp., the leaves of which are used as spices. In Asian cooking, leaves are added as an ingredient to stuffings and rice cakes, and tea flavourings. In Western countries, it has uses as flavourings for poultry or pork dishes.

Mulberries

Berries produced by plants of the genus Morus. The common or black mulberry (M. nigra) produces purple fruit similar in appearance to raspberries. The white mulberry (M. alba) is grown mainly as a food source for silkworms, but also for the fruits, which are dried before consumption; leaves are a potential source of natural food antioxidants. Mulberries are eaten as a dessert, added to tarts and pies, or made into jams and wines. Rich in potassium and vitamin C. The main acid is citric acid.

Mulberry leaves

Leaves of the white mulberry (Morus alba), extracts of which have antioxidative activity and are of interest as potential natural food antioxidants. Also valued for nutritional and health-promoting activities.

Mulching

Covering or surrounding of plants with a protective mulch. The mulch can comprise organic matter such as leaves, peat or straw, synthetic materials or living plants interplanted or undersown with a main crop (living mulches). Undertaken during the cultivation of crops in order to inhibit growth of weeds, and to prevent evaporation of moisture or freezing of the plant roots.

Mullet

Any of around 80 estuarine and marine fish species in the family Mugilidae, widely distributed in Atlantic and Pacific coastal waters; some species migrate inshore. Many species are important food fish, including Liza ramada (thin-lipped grey mullet), L. aurata (golden grey mullet) and Mugil cephalus (striped mullet; black mullet). Marketed fresh (whole, gutted or fillets) and as smoked or salted products. Roes of some species are popular as dry-salted products.

Multipacks

Packages containing several individual containers of foods or beverages that may be separated before consumption. Commonly used for dairy desserts, snack foods and carbonated beverages.

Mung beans

Pulses produced by Phaseolus aureus or Vigna radiata. Eaten boiled or in dhal, flour produced from the beans may also be used in baking or made into purridge. Contain little fat, but high levels of proteins and carbohydrates. Most commonly used pulses for production of bean sprouts. Also known as green gram.

Mung bean starch

Starch isolated from mung beans. Used in Asian cookery to make transparent noodles and savoury jelly products.

Munggo

Alternative term for black gram.

Munster cheese

French soft cheese made from pasteurized cow milk. The edible skin is sticky and orange in colour, while the soft interior has a mild, piquant flavour which becomes more pungent as the cheese is washed. Ripening occurs from the inside out. American versions of this cheese have a lighter coloured interior and a mild flavour. Alternative spelling Muenster cheese is used in some countries.

Muramidases

Alternative term for lysozymes.

Murex

Genus of gastropod molluscs resembling whelks. Found in tropical and sub-tropical coastal areas. Flesh of some species is consumed.

Muscadine grapes

Grapes produced by Vitis rotundifolia that have a characteristic musky flavour and are astringent and lacking in sweetness. Grown mainly as table grapes, but some are used in winemaking.
**Mussels**

Tissues composed of bundles of specialized cells which are capable of contraction and relaxation to create body movement. There are >600 muscles in an animal carcass; these vary widely in shape, size and activity. There are three types of muscle, namely skeletal, cardiac and smooth. The largest part of the musculature consists of skeletal muscles and it is this part of animal carcasses that is generally referred to as meat; organs comprised of cardiac or smooth muscle tend to be classified as offal. Muscle tissue also contains structural elements (collagen, reticulin and elastin).

**Mushrooms**

Fruiting bodies of various species of fungi. Eaten raw or used to add flavour to dishes, soups and sauces. Many species are gathered wild, but care must be taken as some are poisonous. The most commonly cultivated species is Agaricus bisporus; other types of commercial importance include shiitake, straw mushrooms, oyster mushrooms and winter mushrooms. Rich in phosphorus, magnesium, potassium, selenium and riboflavin, and low in fat.

**Muskmelons**

Fruits produced by Cucumis melo. Yellow or green skin with a raised network of a lighter shade. Flesh is green to orange, comprising mainly water, but with high levels of sugar, vitamin C and carotenes. Eaten as a dessert. Also known as netted melons or nutmeg melons, and include Galia melons.

**Mussel poisoning**

Toxic reaction following consumption of contaminated mussels. Especially refers to a severe and often fatal intoxication after eating mussels that have fed on red tide flagellates (particularly the dinoflagellates Gonyaulax) and accumulated certain alkaloids in their tissues.

**Mussels**

Any of a large group of marine and freshwater bivalve molluscs from the family Mytilidae. Distributed worldwide, but more common in cooler waters. Many species are valued for the delicate, sweet flavour and texture of their flesh. Important commercial species include Mytilus edulis (blue mussels), M. galloproviancilis (Mediterranean mussels) and Perna canaliculus (green-lipped mussels), all of which are cultured. Marketed live (whole with shells), and as fresh, smoked, canned, salted and semi-preserved products.

**Mustard**

Condiments prepared from dried ripe seeds (mustard seeds, also used to produce pungent spices) of Brassica nigra (black or brown mustard), B. juncea (brown mustard only) or Sinapis alba (white mustard or yellow mustard). For serving, mustard powder is added to water, salt, vinegar and/or other ingredients, e.g. wines.

**Mutton greens**

Leaves of the brown or Indian mustard plant (Brassica juncea) eaten as vegetables and used in manufacture of kimchies.

**Mustard seed oils**

Oils extracted from mustard seeds belonging to the genera Brassica or Sinapis. Used in the food and soap industries.

**Mutton seeds**

Globular seeds of black or brown mustard (Brassica nigra or B. juncea) or white or yellow mustard (Sinapis alba), which are odourless when whole and have a pungent flavour.

**Musts**

Fruit juices (especially those extracted from winemaking grapes) intended for alcoholic fermentation to produce wines.

**Mutagenesis**

Generation of mutations.

**Mutagenicity**

Capability of inducing mutations.

**Mutagens**

Chemical or physical agents which promote mutagenesis.

**Mutanolysins**

Enzymes produced by Streptomyces globisporus which are similar to lysozymes. Used in conjunction with or instead of lysozymes to hydrolyse bacterial cell walls prior to extraction of their contents, e.g. for identification purposes. Cell wall digestion is achieved by cleavage of β-1→4-N-acetylmuramyl-N-acetylglucosamine linkages of peptidoglycan.

**Mutants**

Include populations, organisms, genes and chromosomes that differ from the corresponding wild type by one or more mutations.

**Mutatorases**

Alternative term for aldose 1-epimerases.

**Mutations**

Detectable and heritable structural changes to the genetic material of a cell or organism, or the results of such changes. May occur by chemical changes to the DNA, e.g. substitution of one nucleotide for another, or physical damage such as breakage or rearrangement. Depending on where in the DNA sequence alteration occurs, a mutation may not be detected (silent mutation) or may be apparent from effects on the gene product. Mutations may be random, spontaneous or induced by mutagens.

**Mutton**

Meat from mature sheep, which are over one year old, including meat from ewes, rams, wethers and hoggets. Mutton tends to be cheaper than lamb, but also tends to be tougher, darker in colour, fattier and less delicately flavoured. It is the preferred meat for Muslims. Also known as sheep meat, sheep muscles, ram meat or ram muscles.

**Mutton birds**

Any of a number of shearwaters and petrels of the order Procellariiformes that breed on islands in Australasia. The young are harvested before fledging for their meat, oils and down (feathers). The flesh of the adult sea birds is said to resemble mutton when eaten.
Mutton sausages Sausages in which the main meat component is mutton.

Mycobacterium Genus of aerobic, rod-shaped Gram positive bacteria of the family Mycobacteriaceae. Occur in dairy products, soil and water, and in the diseased tissue of warm-blooded hosts. Mycobacterium avium subsp. paratuberculosis, which causes Johne’s disease in cattle, is suspected of causing Crohn’s disease in humans who consume contaminated milk.

Mycoplasma Genus of facultatively anaerobic Gram negative bacteria of variable form, species (e.g. Mycoplasma bovis) are the causative agents of mastitis in cattle.

Mycoprotein Commercially produced high-protein biomass of fungi. A major example of a mycoprotein is Quorn, which is produced using Fusarium graminearum.

Mycotoxicosis Disease of humans and animals resulting from the ingestion of mycotoxins in foods or feeds.

Mycotoxins Toxins, e.g. aflatoxins and ochratoxins, produced by fungi.

Mylar Lightweight but strong film made from polyethylene terephthalate.

Myocardial infarction Condition that occurs when the blood supply to part of the heart is interrupted, which can result in damage and/or death to heart muscles. Most commonly results from coronary heart diseases in which an acute thrombus (blood clot) forms in, and obstructs, a coronary artery affected by atherosclerosis. Risk factors for coronary artery disease and myocardial infarction include hyperli- paemia, hypertension, cigarette smoking, diabetes mellitus, male gender and family history of heart disease. Commonly known as a heart attack.

Myofibrillar proteins Salt-soluble proteins, including actins and myosins, which are the predominant type of proteins in muscle and are responsible for contraction, texture and water holding capacity. Degradation of these proteins is important for post mortem tenderization of meat.

Myofibrils Elongated contractile elements contained within skeletal and cardiac muscle fibres. Within them, thick filaments consisting almost entirely of myosin and thin filaments consisting almost entirely of actins are aligned parallel to each other. They overlap in certain regions producing a striated appearance. During muscle contraction, actin and myosin within the thick and thin myofilaments interact to form actomyosin, which causes shortening of the muscle fibres. Lateral shrinkage of the myofibrils occurs in meat post mortem. Fluid is expelled from the spaces between filaments and is drained by gravity, forming drip.

Myoglobin Purplish-red protein pigments found in muscles (meat). Myoglobin has one haem unit and one globin chain. In meat, myoglobin content differs between species and between different muscles. Colour lightness of meat is inversely correlated with myoglobin content. Meat colour is affected by oxidation state of myoglobin; the three major myoglobin derivatives are reduced myoglobin (purplish-red), oxymyoglobin (bright red) and metmyoglobin (brown/grey). Colour changes due to oxygenation of myoglobin is reversible. When meat is cured with nitrite, myoglobin is converted into the bright red pigment nitrosomyoglobin. Thermal denaturation of myoglobin to a brown pigment begins at about 65°C; consequently, the red colour of raw meat changes to brown on cooking.

Myosin Myofibrillar globulins that are the most abundant proteins in meat and the predominant salt-soluble muscle proteins. During muscle contraction, myosin combines with actins to form actomyosin. Myosin molecules comprise myosin heavy chains and myosin light chains, and are shaped like elongated rods with thickened regions at one end. Myosin is insoluble in water and only slightly soluble in acids; however, it is soluble in salt solutions or alkalies. Myosin gelation is a principal factor in obtaining good texture in meat products.

Myosin heavy chains Heavy chain isoforms of myosin. They constitute the head and tail of the myosin molecule, and play an important role in heat-induced gelation of myosin.

Myosin light chains Light chain isoforms of myosin that are found wrapped around the myosin heavy chains near to their head portions. The 2 main types are termed regulatory (18 kDa) and essential (16 or 25 kDa). They are similar in structure to calmodulin, but only some bind calcium.

Myrcene One of the acyclic monoterpenes, found in the essential oils of a variety of useful plants, such as lemon grass. Has a spicy, balsamic aroma. Myrcene-containing essential oils are widely used for flavouring foods.

Myricetin Member of the flavones found particularly in berries and wines. Myricetin occurs in both glycosylated and aglycone forms and has antioxidative activity.

Myristic acid One of the saturated fatty acids, with 14 carbon atoms; synonym, tetradecanoic acid. Major component of many animal fats, vegetable fats and oils.

Myristicin One of the alkenylbenzene group of aromatic compounds, synonym 5-methoxy safrole.
Myrobalans  The name given to the astringent fruits of several unrelated fruit-bearing plant species, including *Prunus cerasifera* (myrobalan plums or cherry plums), *Emblica officinalis* (emblic myrobalans), *Terminalia bellirica* (belliric myrobalans), *Terminalia chebula* (chebulic myrobalans) and *Terminalia arjuna* (arjun myrobalans).

Myrosinases  Alternative term for thioglucosidases.

Myrothecium  Genus of fungi of the class Sordariomycetes. Some species (e.g. *Myrothecium roridum*) may produce mycotoxins during growth on foods. Other species (e.g. *M. verrucaria*) may be used in the production of enzymes (e.g. cellulases, polygalacturonases and xylan degrading enzymes).

Myrrh  Flavourings isolated from gum exudates collected from plants of the genus *Commiphora* which are native to Africa and Arabia.

Myrtle  Common name for *Myrtus communis*, an evergreen tree with aromatic blue-black berries. Fruits and leaves are used as condiments, as a source of essential oils and in production of liqueurs.
Naegleria  Genus of amoebae of the family Vahlkampfiidae. Occur in damp soil, mud, water and sewage. Pathogenic to humans and animals. *Naegleria fowleri*, a water contaminant, is the causative agent of meningoencephalitis in humans.

Nan  Flat bread originating from northwest India made from white flour, leavened with sodium bicarbonate and baked in a tandoor.

Nanotechnology  A field of science which in its broadest sense covers development of materials and devices of nanometer-scale (1-100 nm). Nanotechnology applications of relevance to the food industry include: carbon nanotubes used in construction of biosensors and as adsorbents in solid phase microextraction; structured colloids and emulsions for encapsulation of food ingredients; and nanocomposites used in food packaging.

Nanofiltration  Form of filtration that uses semi-permeable membranes of pore size 0.001-0.1 μm to separate different fluids or ions, removing materials having molecular weights in the order of 300-1000 Da. Nanofiltration is most commonly used to separate solutions that have a mixture of desirable and undesirable components. An example of this is the concentration of corn syrups. Nanofiltration is capable of removing ions that contribute significantly to osmotic pressure, and this allows separation at pressures that are lower than those needed for reverse osmosis.

NAP  Abbreviation for the analytical technique neutron activation analysis and the auxin naphthaleneacetic acid.

NaCl  Chemical formula for sodium chloride.

NAD(P)  Abbreviation for nicotinamide adenine dinucleotide (phosphate).

NaOH  Chemical formula for sodium hydroxide.

Naphthalene  Aromatic hydrocarbon with a distinctive coal tar-like odour. Used as an insecticide and in the synthesis of dyes.

Naphthaleneacetic acid  A synthetic member of the auxins group of plant growth regulators, chemical name 2-(1-naphthyl)acetic acid. Used as a rooting agent, in plant tissue culture and to regulate the yield and quality of various fruits and vegetables.

Naphthol  Phenol that is a major metabolite of the insecticide carbaryl.

2-(1-Naphthyl)acetic acid  Chemical name for the plant growth regulator naphthaleneacetic acid.

Naphthylmethylcarbamate  Alternative term for the insecticide carbaryl.

Nanotechnology  A field of science which in its broadest sense covers development of materials and devices of nanometer-scale (1-100 nm). Nanotechnology applications of relevance to the food industry include: carbon nanotubes used in construction of biosensors and as adsorbents in solid phase microextraction; structured colloids and emulsions for encapsulation of food ingredients; and nanocomposites used in food packaging.

Napins  Storage proteins of rapeseeds (Brassica napus).

Naranjilla  Orange fruits with green-yellow flesh produced by *Solamum quitoense* or *S. angulatum*. The juicy pulp is used in beverages and sherbet. Also eaten out of hand, and used as an ingredient in desserts, jellies and marmalades. Rich in vitamin A and vitamin C. Alternative term for lulo and quito oranges.

Narazuke  Vegetables pickled in sake lees. Originally made from sake lees, a cross between aubergines, small melons and cucumbers. Also now made using carrots.

Naringin  Bitter glycoside present in citrus fruits. Also known as naringenin-7-O-rutinoside. Has antioxidative activity.

Naringinases  Commercial crude fungal enzyme preparations consisting of α-L-rhamnosidases and β-glucosidases. Used to degrade naringin, a bitter flavonoid found in citrus fruits, during extraction of fruit juices in order to reduce bitterness to acceptable levels.

Narirutin  One of the flavanones found mainly in citrus fruits. Also known as naringenin-7-O-rutinoside. Has antioxidative activity.

Nata  Thick, white, mucilaginous mat formed by fermentation of *Gluconacetobacter xylinus* grown on the surface of coconut water, coconut milk or...
other sugary fruit juices. Used in production of desserts, including nata de coco which is popular in the Philippines.

**Natural sweeteners**

Produced by natural colorants. Colorants, also known as food colourants, are used solely to impart colour to foods. These materials, like all food additives, are not nutritive. They should be used in as minimal a quantity as possible to maintain food safety.

**Natural colourants**

Colorants that exist in nature.

**Natural flavourings**

Flavour compounds, also essential oils, extracts and hydrolysates containing flavour compounds, that are derived from natural sources, such as plants, animal foods and edible yeasts. Usually they have little or no nutritive value but are used solely to impart flavour.

**Natural foods**

Foods produced using natural farming techniques (e.g. organic foods) and subjected to minimal processing. Free from artificial ingredients.

**Natural sweeteners**

Sweet-tasting substances that occur in nature. Saccharides, such as sucrose (sugar), d-glucose (dextrose) and fructose (laevulose) are the major natural sweeteners used by the food industry. Other natural sweeteners include sweet-tasting proteins (e.g. thaumatin), terpenoids (e.g. glycyrrhizin), steroidal saponins (e.g. polyposide A), dihydroisocoumarins (e.g. phyllodulcin) and flavonoids (e.g. neohesperidin).

**Navy beans**

Type of common beans (Phaseolus vulgaris).

**N compounds**

Compounds that contain the element nitrogen.

**NDGA**

Abbreviation for nordihydroguaiaretic acid.

**Near infrared**

Infrared radiation which has a wavelength between 0.7 and 2.5 μm. Near infrared (commonly abbreviated to NIR) is subdivided into very near infrared (0.7-1 μm) and short wave infrared (1.0-2.5 μm).

**Nectarines**

Fruits produced by Prunus persica var. nectarina. Similar to peaches in composition and flavour, but with a smoother skin and richer colour. Sweet, juicy flesh varies in colour from white to yellow, depending on variety. Varieties also differ in stone tenacity (clingstone or freestone). Rich in vitamin A, vitamin C and potassium. Eaten out of hand or in salads, and used as a garnish, in toppings and in various desserts.

**Neem**

Common name for Azadirachta indica, a tree native to tropical Asia. Neem plants contain various bioactive compounds and thus have been traditionally as medicinal plants. Neem seed oils, seed cake and, to a lesser extent, leaf extracts can act as insecticides and are used for preventing infestation of stored grain and vegetables. The antimicrobial activity of neem extracts may be exploited for controlling post-harvest spoilage of fruits and vegetables.

**Nematocides**

Pesticides used for control of nematodes that parasitize animals or infest crops. Generally fall into two major classes, fumigants and non-fumigants (contact), based on chemical and physical characteristics. Commonly used examples include methyl bromide and oxamyl.

**Nematodes**

Group of worms which are members of the phylum Nematoda. Occur in soil, and fresh and marine waters. Some are parasites of humans, animals and plants.

**Neocallimastix**

Genus of anaerobic fungi of the Neocallimastigaceae family. Grow on a range of simple and complex carbohydrates in the rumen of animals. Species (e.g. Neocallimastix patriciarum and N. frontalis) are used in the production of enzymes (e.g. xylan degrading enzymes and cellulases).

**Neohesperidin**

Flavonoid glycoside bitter compounds present in bitter oranges (Citrus aurantium). Exhibit poor water solubility, and are important flavour compounds in orange juices. The sugar component is a disaccharide, β-neohesperidose (2-O-alpha-1-rhamnopyranosyl-β-D-glucopyranose). Used as the raw material for manufacture of the sweetener neohesperidin dihydrochalcone.

**Neohesperidin dihydrochalcone**

Artificial sweeteners derived by hydrogenation of neohesperidin. 1500-1800 times sweeter than sucrose and stable in crystalline form, in solutions and at high temperatures. Possess a very light aftertaste and have a short delay to reach maximum sweetness perception. Have a synergistic sweetening effect when combined with sugar alcohols such as xylitol and isomalt, and with other sweeteners such as aspartame and acesulfame K. Applications include beverages, desserts and savoury foods. Also used as flavour enhancers in a wide range of foods.

**Neomycin**

Aminoglycoside antibiotic produced by Streptomyces fradiae. Used for treatment of colibacillosis in sheep, goats, swine, turkeys and cattle, with the exception of veal calves. Withdrawal periods vary with species and tolerance values are specified for kidneys, fats, livers, meat, milk and turkey skin with fat. Parenteral use in food-producing animals is not permitted in some countries.
Neopullulanases are EC 3.2.1.135. Glycosidases which hydrolyse pullulan to panose (6-α-D-glucosylmaltose). Useful for the production of maltooligosaccharides for use in foods as prebiotics and as non-cariogenic sweeteners. Can also hydrolyse amylases to maltose and catalyse transglycosylation reactions.

Neosartorya Genus of fungi of the family Trichocomaceae. Neosartorya fischeri, a heat resistant species, may be responsible for the spoilage of canned and bottled fruits.

Neotame Trade name for one of the artificial sweeteners, a derivative of a dipeptide composed of the amino acids aspartic acid and phenylalanine (N-(N-(3,3-dimethylbutyl)-L-α-aspartyl)-L-phenylalanine 1-methyl ester). Approximately 7000-10,000 times sweeter than sugar. A free flowing white crystalline powder which is water-soluble and heat-stable, and can be used in cooking, baking and frozen foods, as well as in tabletop applications. Can be used in combination with other non-nutritive or nutritive sweeteners. Although similar to aspartame, neotame is degraded differently in the human digestive system, avoiding problems caused by the presence of phenylalanine for people suffering from phenylketonuria. Also used as flavour enhancers. Marketed by The NutraSweet Company. Authorized for use in many countries worldwide.

Neoxanthin One of the xanthophyll carotenoids found in many fruits and vegetables, but particularly in spinach and other green leafy vegetables. Precursor of the plant hormone abscisic acid. Induces apoptosis in prostate cancer cells.

Nephelometry Technique used to determine the size and concentration of cells or particles in a solution by measuring the intensity of scattered light. Light scattering depends on the number and properties of the particles in the solution.

Neral Aldehyde; cis-citral. Volatile flavour compound found in plant essential oils.

Nerol Monoterpene alcohol. Volatile flavour compound found in many plant essential oils and involved particularly in the flavour and aroma of grapes and wines.

Neroli oils Yellowish essential oils derived from bitter orange blossoms by steam distillation. Have an intense aroma of orange blossom.

Net protein ratio Weight gain of a group of animals (e.g. rats) fed a test diet plus the weight loss of a similar group fed a protein free diet, and the total divided by the weight of the protein consumed by the animals on the test diet.

Neurological shellfish poisoning

Net protein utilization Commonly abbreviated to NPU. An index of the nutritional values of proteins. This quality ratio indicates the amount of dietary protein retained in the body under specific clinical conditions. Changes in body nitrogen levels following consumption of a dietary protein are compared with those following consumption of a protein-free diet for the same duration, and then the dietary nitrogen retained in the body is expressed as a proportion of nitrogen intake.

Nettings Nettings made with rubber thread which are used to enclose joints of meat, such as beef and ham, to prevent their disintegration during cooking. Health concerns are associated with possible formation of nitrosamines from vulcanizing agents used in formulating the rubber.

Nettles Plants of the genus Urtica, including stinging or common nettles (U. dioica) and small nettles (U. urens). Leaves are rich in vitamin C and can be used as a vegetable when young. Also used in herbal preparations and soups, and to make beer, wines and teas.

Neural networks Systems of computer programs and data structures which are modelled on the human nervous system and brain. Incorporate large numbers of processors operating in parallel, each with an individual sphere of knowledge which has been fed into it along with rules about relationships. Networks can use this information to recognize patterns in large amounts of data. Used in the food industry to model processes and predict the behaviour of foods under specific conditions. Also known as artificial neural networks.

Neural tube defects Congenital malformations of the spinal cord caused by the folds of the ectodermal neural plate failing to close properly in early embryonic development. Failures to close at the top result in anencephaly, which is always fatal; failures to close along the spine result in spina bifida, which can have either a reasonably hopeful or very poor prognosis depending on location and other characteristics of the opening. Supplements of folic acid begun before conception reduce the risk of neural tube defects developing in the fetus.

Neurodegenerative diseases Diseases characterized by the degeneration of nerve cells (neurons) in the central nervous system. Includes Alzheimer's disease, dementia, Parkinson's disease and Creutzfeldt-Jakob disease.

Neurological shellfish poisoning Food poisoning associated with consumption of shellfish containing neurotoxins produced by the dinoflagellate algae Pychodiscus brevis. Gastrointestinal and neurological symptoms normally occur within 3 to 6 hours of ingestion of contaminated shellfish.
Neurospora  
Genus of fungi of the family Sordariaceae. Neurospora spp. are responsible for spoilage of bread. N. intermedia is used as a starter for ont-jom and in the fermentation of bongkrek. N. crassa is industrially important for production of enzymes.

Neurotoxicity  
Property of being toxic to nervous system tissues.

Neurotoxins  
Toxins that act specifically or primarily on nervous system tissues (e.g. botulotoxins and saxitoxin).

Neutralization  
Process of making something chemically neutral, with a pH of approximately 7.

Neutron activation analysis  
Analytical technique in which samples are irradiated with a reactor, accelerator or isotopic neutron source. Radioactive nuclides are produced by the addition of neutrons to nuclei of specific atoms and these nuclei release energy in the form of gamma rays or electrons to convert back to a stable state. The radiation detected is a measure of the energy within the cells. Niacin is found in animal tissues, to produce energy within the cells. Niacin is largely present as niacytin, which is not biologically active. Rich sources of niacin include livers, kidneys, lean meat, poultry meat, fish, rabbit meat, cornflakes (enriched), nuts and peanut butter. Niacin can withstand reasonable periods of cooking, heating and storage. Canning, drying and freezing result in little destruction of the vitamin. In cereals, niacin is largely present as niacynit, which is not biologically available. Deficiency of niacin leads to pellagra (photosensitive dermatitis), depressive psychosis and intestinal disorders. Previously known as vitamin PP.

Niacinamide  
Synonym for niacinamide and nicotinic acid amide. The amide form of nicotinic acid which has niacin activity as a constituent of 2 coenzymes (nicotinamide adenine dinucleotide [NAD] and nicotinamide adenine dinucleotide phosphate [NADP]). These coenzymes act as intermediate hydrogen carriers in a wide variety of oxidation and reduction reactions. Nicotinamide can be formed in the body from the amino acid tryptophan; on average 60 mg of dietary tryptophan is equivalent to 1 mg of preformed niacin.

Nicotinamide adenine dinucleotide (phosphate)  
A coenzyme derived from niacin; commonly abbreviated to NAD(P).

Nicotine  
One of the alkaloids. The principal active ingredient in tobacco, and responsible for the addictive properties of cigarette smoking. Also found in lower quantities in foods belonging to the Solanaceae (nightshade) family, including tomatoes, potatoes, aubergines and peppers.

Nicotinamide  
A member of the vitamin B group found in plant tissues. Contributes, along with niacinamide, to niacin activity. Chemical name pyridine 3-carboxylic acid.

Nicotinic acid amide  
Synonym for nicotinamide.

Nigerose  
Disaccharide composed of two glucose residues linked via an α-1,3-glycosidic bond. Isomer of maltose.

Niger seeds  
Seeds from the plant Guizotia abyssinica, which is grown in India and Ethiopia as an oilseeds crop.

Nile perch  
Large freshwater fish species (Lates niloticus) widely distributed in lakes and rivers around Central Africa; a highly valued food fish. Fresh and frozen fillets are exported from Kenya, Tanzania and Uganda to markets in Europe, Israel and the USA.

Nile tilapia  
Freshwater fish species (Oreochromis niloticus, formerly Tilapia nilotica) of high commercial importance belonging to the cichlid family (Cichlidae). Widely distributed in rivers and lakes of Africa and also produced by aquaculture. Marketed fresh and frozen.

NIR  
Abbreviation for near infrared.

NIR spectroscopy  
Spectroscopy performed at wavelengths in the near infrared (NIR) region.

Nisin  
Polycyclic peptide bacteriocins synthesized by Lactococcus lactis. Classed as lantibiotics and contain the unusual amino acids lanthionine, methyllanthionine, dihydroalanine and dihydroamino-nobutyric acid. Used as preservatives in a variety of heat processed and low pH foods, such as processed cheese, meat and meat products, fish, and canned fruits and vegetables. Exhibit broad spectrum inhibition of Gram positive bacteria including...
Nitrates

important foodborne pathogens and clinically relevant antibiotic resistant bacteria.

Nitrates

Salts of nitric acid found in many animal and plant foods as a result of use of nitrate fertilizers, the nitrification process in the soil, or use of sodium nitrate or potassium nitrate food additives. Health risks are associated with conversion of nitrates into nitrites in the gastrointestinal tract. Contamination of drinking water with nitrates from chemicals used in agriculture is a particular concern.

Nitric acid

Strong acid that forms nitrates with metals, carbonates, hydroxides or oxides. Powerful oxidizing agent. Used in digestion or extraction of samples during analysis. Commercially utilized in production of fertilizers, explosives and dyes.

Nitric oxide

Gas (chemical formula NO) produced by reduction of nitric acid, nitrates or nitrites, or oxidation of ammonia.

Nitrification

Conversion of ammonia or other N compounds into nitrates or nitrites.

Nitrites

Salts of nitrous acid formed by reduction of nitrates. Can be oxidizing agents or reducing agents. Authorized as food additives for preservation of meat and cheese. Health risks are associated with formation of nitrosamines from nitrites in the presence of amines.

Nitrofurans

Antibiotics banned from use in animal food production in many countries due to concerns that long term exposure in humans, as a result of consuming contaminated products, constitutes an increased risk factor for developing cancer. Includes furazolidone, nitrofurazone and nitrovin.

Nitrofurazone

Broad-spectrum synthetic nitrofuran antibiotic that is banned for use in food animals in many countries due to the potential for residues exhibiting carcinogenicity to occur in edible tissues and milk. Illegal use may be indicated by the presence of semicarbazide, a metabolite of the drug, in foods.

Nitrogen

Colourless and odourless gas that constitutes approximately three-quarters of the Earth's atmosphere by volume. The common form is dinitrogen (chemical symbol N₂). Constituent of proteins, amino acids, and many other groups of chemicals, e.g. amines, alkaloids and purines.

Nitrogen compounds

Compounds that contain the element nitrogen.

Nitrogen dioxide

Brown gas with the chemical formula NO₂.

Nitrogen monoxide

Alternative term for nitric oxide.

Nitrogen solubility index

One of the physicochemical properties. Defined as the nitrogen content of an aqueous extract of a sample obtained under standard conditions expressed as a percentage of the sample nitrogen content. Particularly applied to the characterization of proteins.

Nitrosamines

Nitroso compounds with strong carcinogenicity formed by reaction of amines with nitrogen oxides or nitrites.

Nitrosation

Reaction of secondary amines or alkylureas present in ingested foods with nitrites, forming nitroso compounds, such as nitrosamines, which may be carcinogenic. Methylguanidine, a compound present in several foods, is converted to a potent mutagen after nitrosation in the stomach. Can be inhibited by some dietary components, such as tocopherols and various phytochemicals.

Nitroso compounds

Organic compounds containing the nitroso group, many of which are mutagens.

N-Nitrosodiethylamine

Volatile nitrosamine with mutagenic activity. Found in a range of foods, sometimes as a result of indirect contamination, e.g. migration from rubber or packaging materials, or as a result of formation during processing.

N-Nitrosodimethylamine

Volatile nitrosamine with mutagenic activity; commonly abbreviated to NDMA. Found in a range of foods, sometimes as a result of indirect contamination, e.g. migration from rubber or packaging materials or as a result of formation during processing.

Nitrosomonas

Genus of Gram negative bacteria of the family Nitrosomonadaceae, occurring in soils and water. Oxidizes ammonia to nitrites. The type species, Nitrosomonas europaea, is utilized for biological nitrogen removal from waste water, including food factories effluents.

Nitroso pigments

Pigments formed during curing of meat by the reaction of nitric oxide (synthesized by conversion of nitrites used in curing agents) with metmyoglobin or myoglobin. Responsible for the pink colour of cured meat.

N-Nitrosopyrrolidine

Volatile nitrosamine with mutagenic activity. May be formed in a range of foods, including bacon, during processing.

Nitrosylmyoglobin

The haem pigment of nitric-cured meat. Formed by reaction of metmyoglobin with nitric oxide. Contributes to the red colour of cured meat, such as ham.

Nitrous acid

A weak acid with the chemical formula HNO₂. Used as a mutagen and in tests of the resistance of bacterial spores. Implicated in the formation of nitric oxide in the gastrointestinal tract.

Nitrous oxide

Colourless gas with the chemical formula N₂O, also known as dinitrogen oxide. Used as a mild anaesthetic (laughing gas).
Nivalenol  Trichothecene produced by *Fusarium* spp. (e.g. *F. nivale*) during growth on foods such as *wheat*, *rye*, *barley*, *corn* and *millet*.

Nixtamalization  Traditional process used to improve the nutritional quality of *corn*. Nixtamalization involves *cooking* and *steeping* *corn* in a lime solution, washing the *corn* (nixtamal) and stone grinding nixtamal to form a *corn* dough or masa. Masa is used to produce nixtamalized products (e.g. *corn* *tortillas*, *tortilla chips*, *corn chips* and *taco shells*).

N-Lite D  Trade name (of National Starch) for a waxy *dextrins*.

NMR  Abbreviation for *nuclear magnetic resonance*.

NO₂  Chemical formula for *nitrogen dioxide*.

*Nocardioides*  Genus of aerobic, rod-shaped or filamentous *Gram positive bacteria* of the family Nocardiaceae. Occur in soil. Some species are causative agents of *mastitis in cattle*; outbreaks are uncommon, however, and have typically been reported on dairy farms with poor *hygiene* and management conditions. Other species may be used in the production of *biosurfactants*. A range of *Nocardioides* species are used in biotechnological applications for production of a variety of *enzymes* and in *bioconversions*.

*Nocardiopsis*  Genus of alkalophilic *bacteria* of the family Nocardiopsaceae. Found in soil. Type species is *Nocardiopsis dassonvillei*. Producers of a number of *enzymes*, including *proteinases*, *glycosidases*, *pectate lyases*, *milk clotting enzymes* and *amylases*.

N-Oil  Trade name (of National Starch) for *tapioca*-derived *dextrins* that are used as *fat substitutes* in a wide range of *low fat foods*. Provide a creamy, fat-like *texture* to foods such as *salad dressings*, *sauces*, *spreads* and *ice cream*.

Nomilin  One of the *limonoids* with anticarcinogenic activity found in *citrus fruits*. Contributes to *bitterness* of *citrus juices*. Can be added to foods as a flavour compound or bittering agent.

Nomograms  Graphical plots in the form of line charts which may be used to solve particular types of *equations*. Scales for the variables involved in the formula are presented in a way such that corresponding values for each variable are on a straight line intersecting all scales. Thus, when values for two variables are known, the value of a third can be read from its scale.

Nonachlor  Component of the organochlorine insecticide *chlordane*. May accumulate in animal tissues and *milk*, where it persists for long periods.

Nonanal  Aldehyde important for the *flavour* and *aroma* of many foods.

Nonanone  Methyl ketone that is important for the *flavour* and *aroma* of many foods including *dairy products*, *fruits* and *vegetables*.

Nonenal  Aldehyde important for the *aroma* of many foods. Also involved in formation of *cardboard* off flavour in *beer*.

Nonenzymic browning  Food *browning* process promoted by heat treatment, which includes a wide range of reactions, such as the *Maillard reaction*, *caramelization*, chemical *oxidation* of *phenols* and *madeirization*.

Noni  Fruits of *Morinda citrifolia* which have a pungent *aroma* when *ripening*. Used to produce *fruit juices* approved as *novel foods* by the European Commission. Also called *Indian mulberries*, *cheese fruit* or *vomit fruit*.

Noni juices  Traditionally prepared in the Hawaiian and Tahitan islands by ageing *noni* fruits (*Morinda citrifolia*; *Indian mulberries*) in closed vessels for several weeks, prior to consumption as a cure-all folk medicine. Now commercially available globally in *health beverages*. *In vitro* studies suggest they can provide a range of health promoting effects, such as *radical scavenging activity*. Little clinical data exist to support such claims, but noni juice contains high levels of *fibre*, *vitamin C* and various *phytochemicals*. Pure noni juice has a bitter *flavour*, and commercial products usually contain other ingredients, such as *grape juices*.

Nono  *Nigerian fermented milk* product.

Nonreducing sugars  *Sugars* that do not have a free carbonyl group (ketone or aldehyde) and therefore are not able to act as *reducing agents*.

Nonstarch polysaccharides  *Components of dietary fibre*. Occur in 2 forms - insoluble and soluble. Both types are found in many *plant foods*. Thought to provide a range of health benefits.

Nonthermal processes  Processing techniques that do not require heat. Usually refers to food *pasteurization* and *sterilization* treatments that do not employ heat during processing. Examples include: *high pressure processing* (inactivates vegetative *microorganisms*); ultrasonication (inactivates *vegetative bacteria* and reduces heat resistance of *bacterial spores*); high voltage electric pulse treatment (*electroporation*; inactivates vegetative microorganisms); ionizing radiation treatment (inactivates *pathogens*); high intensity light pulse treatment (*in-
Noradrenaline One of the catecholamines. It produces a wide range of physiological effects within the body, including vasoconstriction, increases in heart rate and blood pressure, and release of glucose from energy stores. These effects are part of the fight-or-flight response that enables the body to respond to stressful situations. In animals, the release of catecholamines as a result of preslaughter stress may be associated with poor meat quality. Also known as norepinephrine.

Norbixin One of the dicarboxylic carotenoid pigments present in seeds of the shrub Bixa orellana. The main water soluble component of the natural orange colorant, annatto.

Norflurazon Selective pyridazinone herbicide used for pre-emergence control of annual and perennial grasses and broad-leaved weeds around crops, including fruits and nuts. Classified by WHO as unlikely to present acute hazard in normal use.

Norharman β-Carboline formed from tryptophan during heating. Demethylated analogue of harman, its co-mutagen.

Nori Dried seaweed product obtained from red algae in the genus Porphyra (particularly P. tenera and P. yezoensis). Popular in Japan, where it is often consumed in toasted form. Good source of vitamin B₁₂, dietary fibre and certain minerals; may possess anticarcinogenicity.

Norisoprenoids C₁₃ butene cyclohexene degradation products formed by the cleavage of carotenoids. Important aroma compounds in fruits, wines and honeys. Includes both α- and β-ionones and β-damascenone.

Noroviruses Enteric viruses of the family Caliciviridae, which cause viral gastroenteritis. Foodborne transmission is usually associated with consumption of contaminated water, molluscs or ready to eat foods. Person-to-person transmission is possible. Also known as Norwalk-like viruses or small round structured viruses.

North American Free Trade Agreement The North American Free Trade Agreement (NAFTA) is a trilateral regional pact that calls for the gradual removal of tariffs and other trade barriers on most goods produced and sold in North America. NAFTA, which became effective in Canada, Mexico and the USA on 1 January 1994, built upon a 1989 trade agreement between the USA and Canada that eliminated or reduced many tariffs between the two countries. NAFTA called for immediate elimination of duties on half of all US goods shipped to Mexico and the gradual phasing out of other tariffs over a period of about 14 years. The treaty also protected intellectual property rights and outlined the removal of restrictions on investment among the three countries. Mandates for minimum wages, working conditions and environmental protection were added later as a result of supplemental agreements signed in 1993.

Northern blotting A method for analysing RNA. RNA is separated by electrophoresis, transferred to a chemically reactive matrix (e.g. nitrocellulose) on which it binds covalently in a pattern identical to that on the original gel, and detected by complementary labelled probes (RNA or single-stranded DNA) that hybridize to specific RNA sequences.

Noroegia cheese Norwegian semi-hard cheese similar to Gouda cheese.

Norwalk-like viruses Alternative term for noroviruses.

Norwalk viruses Small round structured viruses of the genus Norovirus and family Caliciviridae. Responsible for acute gastroenteritis in humans. Transmitted by the faecal-oral route via contaminated water and foods (e.g. shellfish and salads).

Norwegian semi-hard cheese A type of cheese made with cheeses such as Gouda cheese and family Caliciviridae. Also known as Dublin Bay prawns, langoustines and scampi.

Nostoc Genus of filamentous cyanobacteria of the family Nostocaceae. Occur naturally in damp habitats as green to black gelatinous colonies. Some species produce high levels of phycobiliproteins, making them a potential source of natural pigments for use in foods. Several species, e.g. Nostoc flagelliforme, are eaten in various countries, including China. N. commune is rich in dietary fibre and has been used in functional foods.
Nuclear magnetic resonance Spectroscopy

Nucleases EC 3.1.11-EC 3.1.16 (exonucleases) and EC 3.1.21-EC 3.1.31 (endonucleases). Esterases that cleave the phosphodiester bonds between nucleotide subunits of nucleic acids.

Nucleic acids Polymers of nucleotides in which the 3' position of one nucleotide sugar is linked to the 5' position of the next by a phosphodiester bond. The two major types are DNA and RNA.

Nutricial (of FMC BioPolymer) for cellulose gels consisting of microcrystalline celluloses and guar gums. Used as fat substitutes in a variety of low fat foods, including salad dressings, processed cheese, dairy beverages and frozen desserts. Improves the mouthfeel, opacity and consistency of these foods.

Nutricinal Aerated confectionery products made with honeys or sugar, egg whites and starch syrups. Often contains nuts, dried fruits and/or cherries and may be either chewy or brittle in consistency.

Nutraceutical foods Alternative term for functional foods.

NutraSweet Registered brand or trade name of the low calorie sweetener aspartame.
Nutritional assessment. Nutritional needs may vary according to age, gender, physical activity levels and state of health. Various sets of reference values have been established to provide guidance on nutrient recommendations, including dietary reference intakes (DRI) and dietary reference values.

Nutrients Essential dietary factors, such as vitamins, minerals, amino acids and fatty acids, that are required by the body but cannot be synthesized in the body in adequate amounts to meet requirements, so must be provided by the diet. Nutrient deficiency can cause poor growth, deformity, malfunctioning and sterility. A range of characteristic deficiency diseases is recognized in humans.

Nutrigenetics The study of how a person’s genetic makeup affects their response to diet or specific nutrients. It aims to identify the effect of genetic variants on responses to nutrients and to relate this to the risk for various diseases. Has the potential to provide a basis for personalized nutrition recommendations based on the individual’s genotype in order to prevent diseases before their clinical manifestation. It has been applied in certain rare monogenic diseases, such as phenylketonuria (PKU).

Nutrigenomics The study of how the diet or specific nutrients interact with genes to affect health and risk of developing various diseases. Understanding gene-nutrient interactions provides a basis for personalized nutrition recommendations based on an individual’s genotype in order to prevent diseases before their clinical manifestation.

Nutrition Science of the relationship between foods, nutrients and health. A major aspect considered is the way by which an organism absorbs and utilizes food components. The study of nutrition involves identification of individual nutrients that are essential for growth and maintenance of the individual, interrelationships among nutrients within individual organisms, and quantitative requirements of organisms for specific nutrients under various environmental conditions in order to optimize health.

Nutritional assessment Assessment of the nutrient requirements or nutritional status of a person using appropriate methods.

Nutritional labelling Information appearing on labelling or packaging of foods relating to energy and nutrients in the food. The information which must or may be given, and the format in which it must appear, is governed by law in most countries.

Nutritional status State of the body in terms of the consumption, utilization and stores of nutrients.

Nutritional values Indications of the potential contribution that a food or food component can make towards appropriate nutrition. Includes measures of the efficacy and quality of dietary constituents, such as bioavailability and protein values, and nutritional characteristics of foods and food components such as calorific values and glycaemic load. Nutritional values of foods may be affected by cultivation conditions, handling and storage practices, and processing.

Nuts Fruits consisting of an edible kernel within a shell, the thickness and hardness of which varies among types. Kernels have a high fat content and are often used as the source of nut oils. They are also rich in fibre, vitamin E, folic acid and a range of minerals. Nuts are generally available shelled or unshelled; shelled nuts are sold in many forms including raw, blanched, roasted and flavoured. They are eaten out of hand or used in a variety of sweet and savoury dishes. Commonly consumed nuts include walnuts, pistachio nuts, pine nuts, cashew nuts and almonds. Some foods known as nuts are not true nuts, e.g. Brazil nuts are really seeds and peanuts are legumes.

Nylon Family of strong, elastic polyamides materials, which vary from moderately flexible to strong, tough and rigid products. Can be shaped when heated into forms such as sheets, bristles and fibres. Resistant to greases and oils. Used widely in food packaging applications and for the immobilization of enzymes and microorganisms.

Nypa Genus of palms. The nipa palm (Nypa fruticans) is the source of a sugar-containing sap.

Nystose Fructooligosaccharide comprising three fructose residues and a glucose residue. Produced by hydrolysis of inulin or from sucrose via the action of fructosyltransferases.

Nyufu Type of fermented tofu.
O₂ Chemical symbol for oxygen gas.

O₂ absorbers Abbreviation for oxygen absorbers.

Oak Hard, durable wood, usually with a distinct grain, obtained from oak trees, which belong to the many species within the genus Quercus. Used to impart a distinctive aroma and flavour to foods by various methods, including smoking (e.g. for meat products and fish), storing and/or ageing in oak barrels (e.g. for wines and spirits), and addition of oak wood supplements or extracts. The term is also used to describe the smoky flavour and aroma characteristics of wines and spirits aged in oak barrels.

Oat bran Outer layer found under the hull of the oat grain which forms the milling fraction.

Oat fibre Indigestible material derived from oats, which comprises both soluble fibre and insoluble fibre. Used in snack foods, bakery products and meat extenders. Consumption is reported to reduce serum cholesterol levels.

Oat flakes Whole kernels of oats that are processed by steaming, flattening through rollers and flaking (to retain most of their nutritional value) into quick cooking oats. Flakes are white to golden in colour and are used in breakfast cereals, bakery products and for further processing into muesli.

Oat flour Ground oat grains from which their outer layers have been removed. Used as an ingredient in bakery products and snack foods.

Oat gums Gums produced from oats that are composed predominantly of (1→3)(1→4)-β-D-glucan (β-glucans). Used as thickeners in foods.

Oatmeal Rolled or ground oats. Also refers to porridge made from rolled or ground oats.

Oat oils Oils extracted from oats. Highly unsaturated and containing high levels of linoleic acid.

Oatrim Trade name for fibre-rich fat substitutes made from hydrolysed oat flour and oat bran containing 5% β-glucans soluble fibre. Imparts a creamy mouthfeel to a range of foods, including bakery products, salad dressings, confectionery and dairy products.

Oats Edible starchy grain derived from plants belonging to the genus Avena, particularly A. sativa, A. sterilis and A. strigosa, used as a cereal food. A rich source of vitamin B₃; also rich in protein and high in fat.

Oat starch Starch isolated from oats.

Obesity Condition in which body wt. is excessive due to the accumulation of body fat. Commonly defined as a body mass index of ≥30 kg/m²; in contrast to overweight (25-29.9 kg/m²). Associated with increased risk of developing a range of diseases, such as cardiovascular diseases, adult-onset diabetes and some forms of cancer. Lifestyle interventions to prevent or reverse obesity include adoption of a wt. loss diet, increased physical activity and/or consuming functional foods designed for this purpose.

Obesumbacterium Genus of strictly aerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae. Obesumbacterium proteus, a common contaminant of brewers yeasts, is responsible for producing off odour and nitrosamines in fermenting beer worts.

Oca Common name for Oxalis tuberosa, the stem tubers of which are eaten like potatoes. The oxalic acid present in some cultivars can be removed by sun drying or freeze drying. Also known as ibríba, cuiba and New Zealand yams.

Ochratoxin A Most toxic of the known ochratoxins. Produced by Aspergillus ochraceus and Penicillium verrucosum. Consumption of contaminated foods (e.g. cereals, oleaginous seeds, poultry meat, grapes, wines, pulses and green coffee) gives rise to human exposure. Potentially carcinogenic to humans, and also nephrotoxic and weakly mutagenic. Contaminated feeds have a major impact on the poultry industry, producing reduced wt. gain, poor feed conversion, reduced production of eggs and poor quality of egg shells.

Ochratoxins Mycotoxins produced by certain species of Penicillium (e.g. P. viridicatum) and Aspergillus (e.g. A. ochraceus) during growth on foods and feeds (e.g. wheat, rye, barley, oats, corn and peanuts). Nephrotoxic and carcinogenic in humans and animals (e.g. cattle and swine) when ingested in contaminated foods and feeds.
Octadecanoic acid  Synonym for stearic acid, one of the fatty acids that occur naturally in the form of glycerides in animal fats and vegetable fats.

Octadecenoic acid Synonym for oleic acid, an unsaturated fatty acid that occurs as the glyceryl ester in fats and oils. One of the major fatty acids in cow milk.

Octanal Aldehyde contributing to the flavour of many foods. Formed by lipid oxidation.

Octanoic acid Synonym for caprylic acid, a saturated fatty acid that occurs in milk and coconut oils.

Octanol Alcohol with a strong odour. Manufactured by the action of concentrated NaOH on castor oils. Has good demulsifying and wetting power; used as a foam reducing agent. Also known as octyl alcohol or capryl alcohol.

Octanone Methyl ketone important for the flavour of foods, especially mushrooms.

1-Octen-3-ol Chemical of the alcohols class (molecular formula C8H16O) present as one of the flavour compounds in many foods, beverages and spices, including mushrooms in which it was originally discovered. Approved as a flavouring and imparts a mushroom-like, earthy, green, savoury, umami flavour.

Octopine Guanidino amino acid that is formed as a product of glycolysis in cephalopods, where it may be used as an indicator of quality and freshness.

Octopus Any of a number of eight-armed cephalopod molluscs from the order Octopoda. Widely distributed in shallow marine waters. Many species are consumed, particularly in Japan and Mediterranean countries. Marketed fresh and frozen; also as smoked and canned products. Ink sacs found in all species contain a black liquid that is sometimes used in food colourants or flavourings.

Octyl gallate One of several esters of gallic acid which are used as antioxidants in foods. Octyl gallate (E311) is often combined with BHA and BHT. Unstable at high temperatures.

Odour Alternative term for aroma.

Odour activity values Ratio of the concentration of aroma compounds present in a product to the odour threshold values.

Odour threshold values Levels at which perception of increasing concentrations of aroma compounds begins. The concept of odour threshold is useful in defining aroma purity, estimating the necessary amount of starting material, serving as a reference point in describing intensity and aroma quality, and evaluating which components present are important in contributing to a characteristic aroma.

OECD Abbreviation for Organization for Economic Cooperation and Development.

Oedema Excessive accumulation of tissue fluid in body tissues, leading to swelling. Popularly known as dropsy. Causes of oedema include heart failure, kidney failure, liver failure and malnutrition. Diuretic drugs can relieve symptoms by causing the patient to pass more urine. Allergic reactions may be accompanied by local oedema.

Oenococcus Genus of Gram positive, anaerobic, coccoid lactic acid bacteria of the family Leuconostocaceae. Oenococcus oeni is used as a starter culture in winemaking, where it carries out malolactic fermentation. Produces esterases and tannases which are important to wine flavour.

Oenocyanins Infrequently used term for anthocyanins that occur in red grape skins. Used as natural colorants in foods.

Oenological properties Properties of ingredients such as winemaking grapes, musts and wine yeasts which are of relevance in relation to winemaking.

Oestadiol Female sex hormone, one of the major oestrogens. Found at varying levels in a range of foods. Implants of oestradiol-containing growth promoters can be used to improve the growth performance of food animals and the characteristics of their carcasses, but this practice is banned in some countries due to concerns over the safety of the meat produced.

Oestrogeonic activity Having an action similar to oestrogens. Exhibited by some dietary components, particularly the phytoestrogens, isoflavonoids, lignans and coumestans, which are present in a wide variety of plant foods, including beans, cereals, grain, fruits and vegetables.

Oestrogens Group of steroid hormones derived ultimately from cholesterol, in which carbon atoms 1 to 6 are in the form of an aromatic ring. Natural oestrogens are produced predominantly in the ovaries and are responsible for development of female secondary sexual characteristics and regulation of the menstrual cycle. Alternative spelling estrogens.

Oestrone One of the oestrogens, systematic name 3-hydroxyoestra-1,3,5(10)-trien-17-one. Produced by reduction of the androgen androstenedione or by oxidation of 17β-oestradiol. Alternative spelling estrone.

Offal Animal foods described collectively as by-products of animal slaughter. Offal includes all parts of the carcass that are cut away when the carcass is dressed, such as the intestines, kidneys and livers. In many cultures, edible portions of offal are consid-
ered as delicacies. Kidneys, livers, **brains, hearts** and **sweetbreads** (pancreas and thymus) are often eaten, but other organs may be associated with cultural limits or taboos. Religious traditions often regard offal as unclean and, accordingly, place restrictions on consumption of offal. As carcass organs can form the foci of infection, routine veterinary inspection of offal at **slaughterhouses** is used to identify and exclude diseased animals from the food chain.

**Off flavour** Taints perceived in the mouth upon tasting a product. Off flavours are negative attributes, and affect the **eating quality** of foods; they may also indicate that a food is spoiled.

**Off odour** Taints perceived in the nose when foods are smelled. Off odours are negative attributes, and affect the **eating quality** of foods; they may also indicate that a food is spoiled.

**Ogi**  West African fermented condiments used to season **soups** or stews. Typically made from fermented **castor beans, melon seeds or sesame seeds**.

**Ohmic heating** Thermal processing of foods using energy produced in the form of heat when a current passes through an electrical resistance. In this form of electric resistance heating, the food itself acts as a conductor between a ground and a charged electrode. The food may be immersed in a conducting liquid. Heating is accomplished according to Ohm's law, where **conductivity** of the food determines the current that will pass between the ground and electrode. Ohmic heating can be used as a **cooking** technique, and also for **pasteurization** and **sterilization**.

**Oil expellers** Equipment used in extraction of **vegetable oils** from **oilseeds**. Oils are pressed from the source material using pressure from an auger, which turns inside a barrel. The barrel is closed except for a single hole through which the extracted oil drains. Expellers remove larger proportions of oil from **seeds** than can be achieved with hydraulic batch presses. Also known as continuous screw presses.

**Oil palms** Palm trees, **Elaeis guineensis**, native to tropical Africa. Yield **palm oils** from the fleshy endosperm of its **seeds** and **palm kernel oils** from the seed kernels.

**Oils** Lipid-rich, viscous substances derived from animal, vegetable or mineral sources that are liquid at room temperature and insoluble in water.

**Oilseed proteins** Proteins derived from **oilseeds**, which have desirable **functional properties** and nutritional characteristics and may reduce the risk of certain diseases. May be used as **food supplements**.

**Oilseeds** Seeds, e.g. **sesame seeds**, **sunflower seeds** and **soybeans**, from which **vegetable oils** may be extracted. The oilseed cake or meal which remains after oils have been extracted is often used as a livestock feed, since it is rich in protein.

**Oily fish** Fish that contains **oils** throughout the fillet, unlike **white fish**, which contains oils only in the liver. Oil contents can be as high as 30%. Include **mackerel, salmon, sardine, pilchards, kippers, herring** and fresh (but not canned) **tuna**. Rich source of **ω-3 fatty acids**, which provide a range of health benefits, including reduced risk from **cardiovascular diseases**. May also contain environmental pollutants, such as **methylmercury and dioxins**. Hence, it is recommended that boys, men and older women can eat 4 portions of oily fish per week before the risks begin to outweigh the benefits, but that girls and women of childbearing age should restrict their weekly intake to 2 portions.

**Okadaic acid** Polyether toxin produced by certain dinoflagellate **algae** that can accumulate in **bivalves**. Causative agent of **diarrhoetic shellfish poisoning**.

**Okara** Fibre-rich by-product remaining after extraction of **soymilk** from **soybeans**. Also rich in high quality **proteins**. Used in **soups**, vegetable dishes, **sausages** and **bakery products**.

**Okra** Common name for **Abelmoschus esculentus**. Good source of **vitamin A** and **vitamin C**. Immature pods are eaten as **vegetables**, pickled or used to thicken **soups** and stews. Also known as okro, lady's fingers, gumbo and bindi.

**Oleandomycin** Macrolide antibiotic produced by **Streptomyces antibioticus**. Used for growth promoting purposes in **swine, chickens and turkeys**. Distributes widely in the tissues of animals following administration. **Tolerance** values are specified for edible tissues.

**Oleanolic acid** Positional isomer of **ursolic acid**, One of the **triterpenoids** found in various foods, including **herbs** (e.g. **sage, ginseng** and Chinese hawthorn), **olive oils, table olives, garlic and raisins**. Demonstrates **antitumour activity**, cardioprotective effects and strong **antiviral activity**, particularly against the **human immunodeficiency viruses**.

**Olefins** Hydrocarbons containing one or more carbon double bond(s) whose names have the suffix -ene, e.g. ethene, but-1-ene, but-2-ene (the number designates the position of the double bond, between C1 and C2 and between C2 and C3, respectively). Simple ole-
fins have only one double bond. Synonymous with alkenes.

**Oleic acid** Monounsaturated fatty acid of 18 carbon atoms with the systematic name cis-Δ⁹-octadecenoic acid. Prepared by hydrolysis of **animal fats**, such as **tallow**, or **vegetable oils**, such as **olive oils**, **sunflower oils** and **soybean oils**.

**Olein** One of the **triglycerides**, in which **glycerol** is esterified with three molecules of **oleic acid**. A natural component of **fats** and **oils**, e.g. **palm olein**, which is used as a cooking oil and for **blending** with other oils. Olein has been employed widely in the food industry in **stabilizers** and in solvents for **flavourings** and fat-soluble **vitamins**. Synonymous with triolein and glyceryl trioleate.

**Oleomargarines** Highly unsaturated fractions of **tallow** which have a low **melting point** and are separated by **fractionation**. Used in manufacture of **margarines**.

**Oleoresins** Extracts of oil-soluble components of plant materials, usually **spices**. Produced by direct contact of the spices with highly hydrophobic organic solvents, e.g. hexane. The organic solvents can then be evaporated to concentrate the extract. Used as **flavourings** by the food industry. Oleoresins are cheaper to produce than **essential oils** and easier to use than spices, but do not have the full **flavour** profile of essential oils.

**Oleosins** Alkaline **proteins** found in the oil bodies of plant **seeds**.

**Olestra** Generic name for calorie-free, thermally stable **sucrose polyesters** that have been used as **fat substitutes** in certain foods in the US. Olestra is a mixture of hexa-, hepta- and octa-esters of **sucrose**, formed by reaction between sucrose and **fatty acid esters** obtained from edible **fats** and **oils**. As olestra is neither metabolized nor absorbed by the body, it can reduce the intake of energy from dietary **fats**. As a result of studies showing that olestra could cause digestive disturbances and also absorb fat-soluble **vitamins** and **carotenoids**, it was subject, for a while, to specific labelling conditions, limitation to specific food applications (certain **snack foods**), and to fortification (with vitamins A, D, E and K). These conditions have subsequently been lifted, and olestra now has approval for use in specified food applications in the US. Also known under the trade name Olean, marketed by Procter and Gamble.

**Oleuropein** One of the **phenols** present in **olives** and **olive oils**, responsible for their **bitterness**. Before consumption, olives are debittered by **hydrolysis** of oleuropein, e.g. by **fermentation** or NaOH treatment.

**Olfactometry** Measurement of the olfactory properties of a substance. Often used in conjunction with **gas chromatography** in analysis of gaseous components.

**Oligo-1,6-glucosidases** EC 3.2.1.10. **Glycosidases** which hydrolyse 1,6-α-D-glucosidic linkages in **isomaltose** and **dextrins** produced from **starch** and **glycogen** by **α-amylases**. Also known as isomaltases, some preparations can catalyse the reaction of sucrose α-glucosidases.

**Oligonucleotide probes** Alternative term for **gene probes**.

**Oligonucleotides** Short fragments of single-stranded DNA, typically up to 20 **nucleotides** in length.

**Oligopeptides** Peptides composed of a small number of **amino acids** linked by peptide bonds.

**Oligosaccharides** Compounds comprising between three and ten **monosaccharides** linked by glycosidic bonds. Synthesis is by limited **hydrolysis** of **polysaccharides** or via addition of monosaccharides, a process catalysed by **glycosyltransferases**.

**Oligouronides** Oligosaccharides containing residues of **uronic acids**, such as glucuronic acid and **galacturonic acid**. May be produced by **hydrolysis** of **pectins** or **polyuronides**.

**Olive oil mills effluents** Waste water produced during **processing** of **olive oils** which have high levels of organic aliphatic and **aromatic compounds** and often represent an environmental problem in areas where olive oil is produced.

**Olive oils** Oils that are rich in monounsaturates and are derived from the mesocarp of fruits of the olive tree, *Olea europaea*. Virgin olive oil is produced from the first pressings of ripe **olives**, while other grades are produced from subsequent pressings and then refined. Used in **cooking** or in **salad dressings**.

**Olive pomace oils** Oils extracted from the solid residues (**pomaces**) remaining after pressing **olives** for virgin olive oils. Chemical **solvents** are used (usually hexane), together with heat, to extract the remaining oils from the pomace.

**Olives** Fruits produced by *Olea europaea* with fleshy pulp and stony kernels. Change from green to black as they mature. Used as table olives or a source of **olive oils**. Table olives (black and green) are pickled in **brines**. Olives are sometimes pitted (stone removed) and stuffed with vegetables, such as **pimento peppers** and **onions**, or other foods.

**Omelettes** Eggs which have been beaten, sometimes with **seasonings** and other ingredients such as **milk**, and fried. May be plain or filled with savoury or sweet **fillings**, e.g. **cheese** or **jams**.
Omethoate  Organophosphorous pesticide used to control insects and mites infesting fruits, hops, cereals, potatoes, ornamentals and other crops. Classified by WHO as highly hazardous (WHO Ib).

Omija  Raspberry-like fruits produced by Schizandra chinensis, also called the five taste tree. Used in oriental medicine and also in fruit punch and fruit tea.

Onigusa  Japanese name for red seaweeds of the genus Gelidium. Found in intertidal or subtidal areas in many parts of the world; normally found in greater abundance in exposed coastal areas. Primarily used as a source of agar for processing of food and beverages. Some species are consumed in fresh, dried, pickled or jelly forms, particularly in Asian countries.

Onions  Underground bulbs of Allium cepa, composed of fleshy leaf bases, and varying in size, shape, colour and flavour according to variety. Not rich in nutrients, but a good source of flavour in cooking. Fresh and dried onion products are used in sauces and a variety of dishes, including soups, stews and salads, and are essential ingredients of pickles and chutneys. Available also canned, pickled and frozen.

Ontjom  A tempeh-like fermented product made usually from press cake of peanuts, although other starting materials, such as okara, can be used. Neurospora sitophila is used to ferment ontjom, giving an orange-red covering to the product. Deep-fried slices are consumed as side dishes. Also known as oncom.

Oocysts  Spherical cysts which form around two conjugating gametes in the sporozoa of certain protozoans. Extremely resistant to adverse environmental conditions.

Oolong tea  Type of tea in which the tea leaves have been partially fermented, rather than not fermented (as in green tea) or fully fermented (as in black tea).

Opacity  Degree of obstruction an item produces to the appearance of a product, including clarity, colour, reflectance, turbidity and fluorescence.

Orange juice concentrates  Orange juice concentrates are produced by compression of orange peel that are composed predominantly of D-limonene but may also contain other aroma compounds, including octanal, myrcene, linalool, decanal, sinensal, ethyl butyrate and valencene. Composition of the essential oils is dependent on the species of orange from which they are produced.

Orange juice beverages  Beverages based on orange juices, orange extracts or comminuted oranges.

Orange essential oils  Essential oils produced by compression of orange peel that are composed predominantly of D-limonene but may also contain other aroma compounds, including octanal, myrcene, linalool, decanal, sinensal, ethyl butyrate and valencene. Composition of the essential oils is dependent on the species of orange from which they are produced.

Orange juice beverages  Beverages based on orange juices in combination with other ingredients.

Orange juice concentrates  Orange juices which have been concentrated, commonly used for preparation of reconstituted orange juices or fruit juice beverages.
Orange juices  Fruit juices extracted from oranges (Citrus sinensis). Rich in vitamin C.

Orange peel  Outer skin or rind of oranges composed of the coloured flavedo (or zest) and the inner white albedo (or pith). Used to make candied peel, as a garnish or to add flavour to bakery products and a range of dishes.

Orange roughy  Deepwater marine fish species (Hoplostethus atlanticus), widely distributed in the Atlantic, Pacific and Indian Oceans. Increasingly targeted as a food fish, particularly off the coast of New Zealand. Flesh is prized for its firm texture and delicate, shellfish-like flavour. Marketed fresh and frozen.

Oranges  Citrus fruits of 3 main types - sweet, loose skinned and bitter. The juicy pulp may or may not contain seeds according to cultivar. All are rich in vitamin C, some B vitamins and minerals. The sweet orange (Citrus sinensis) has the highest commercial production and is used for fresh and extraction of orange juices. These include navel, Valencia and blood oranges. Loose skinned oranges include mandarins and tangerines. Bitter oranges, also Seville or sour oranges, are too sour to eat raw, and are used in making marmalades, food flavourings, liqueurs, such as c either, and candied peel.

Orange wines  Fruit wines made using oranges or orange juices as starting material. Many different types of oranges are used. Usually consumed as an aperitif or dessert wine.

Orbignya  Genus of palms including the cohune palm (Orbignya cohune) and the babassu palm (O. phalerata). Fruits are used as a source of palm oils and food.

Oregano  Common name for Origanum vulgare and other members of this genus native to Europe (O. syri- acum, O. compactum and O. onites but not O. majorana which is the source of the spice marjoram), the leaves of which are used as spices. Mexican oregano is produced from Lippia spp. which are cultivated predominantly in the Americas. Carvacrol is the main aroma compound of oregano.

Oregano oils  Essential oils extracted from oregano. Rich in phenols. Possess antimicrobial activity and are used to protect packaged foods, e.g. fish or meat, from spoilage. Also possess antioxidative activity.

Oreochromis  Genus of freshwater fish belonging to the family Cichlidae, many of which are of commercial importance. Found in lakes and rivers across Africa. Include tilapia, with the most important species in commercial terms being Oreochromis niloticus (Nile tilapia) and O. mossambicus (Mozambique tilapia).

Organic acids  Organic compounds consisting of one or more substituents with the chemical formula -CO(OH). Examples include fatty acids, citric acid and acetic acid. Include carboxylic acids.

Organic compounds  Compounds based on a skeleton of one or more carbon atoms. In their simplest forms, carbon atoms are bound to each other and to hydrogen (e.g. hydrocarbons); these include paraffins and olefins. More complex organic compounds have one or more hydrogen atoms substituted with other elements or groups, e.g. halogens, nitrogen, sulfur, hydroxyl groups, as in organic halogen compounds, organic nitrogen compounds, organic sulfur compounds and alcohols, respectively. Carbon atoms may form linear structures and ring structures; a hydrocarbon ring comprising six carbon atoms and six hydrogen atoms is known as a benzene ring and organic compounds containing this structure or derived from it are known as arenes or aromatic compounds.

Organic foods  Foods produced by organic farming methods, i.e. without the use of chemical fertilizers or pesticides, and without any additives. The aim is to provide high quality, healthy food free from chemical residues. In the case of livestock, strict attention is paid to animal welfare, growth promoters are banned and use of veterinary drugs is kept to a minimum. Organic foods are regarded as a healthy, environmentally friendly option by the consumer, but future market growth is uncertain due to problems associated with high prices and provision of consistent quality.

Organic halogen compounds  Organic compounds which contain one or more carbon atoms linked via covalent bonding to one or more halogen atoms (F, Cl, Br, I). This group includes organochlorine compounds, polybrominated biphenyls and chlorofluorocarbons.

Organic nitrogen compounds  Organic compounds containing one or more carbon atoms linked via covalent bonding to nitrogen. Amino acids, purines, pyrimidines and alkaloids are all examples of these compounds.

Organic pet foods  Pet foods (mainly dog foods and cat foods) made from organic ingredients. Organic products include dried pet foods, bones, offal preparations, pet treats, moist foods and vegetarian items. Tend to be more expensive than their conventional counterparts.

Organic sulfur compounds  Organic compounds which contain one or more sulfur atoms, either linked directly to a carbon atom via covalent bonding or indirectly via an oxygen atom. Examples include thiols, methionine and allicin.
Organochlorine insecticides

Class of

Organochlorine compounds Organic compounds comprising chlorine-containing organic compounds. Includes organochlorine insecticides.

Organobromine compounds Organic halogen compounds containing one or more carbon-bromine bonds. Include polybrominated biphenyls such as polybrominated diphenyl ethers, which are flame retardants sometimes found as contaminants in environmental matrices, including fish.

Organochlorine compounds Organic compounds which contain one or more carbon-chlorine bonds. Examples include organochlorine insecticides, organochlorine pesticides and solvents, such as chloroform and methylene chloride.

Organochlorine insecticides Class of insecticides which are used widely for control of insects on crops and in food storage areas. May persist for long periods in the environment and in animal tissues. Some of the highly persistent products, such as aldrin, DDT and endrin, are subject to the Stockholm Convention on Persistent Organic Pollutants, and their use has been discontinued in many countries.

Organochlorine pesticides Major class of pesticides comprising chlorine-containing organic compounds. Includes organochlorine insecticides.

Organoleptic evaluation Alternative term for sensory analysis.

Organoleptic properties Alternative term for sensory properties.

Organophosphorus insecticides Class of insecticides which are widely used for control of insects in crops and food storage. Act as inhibitors of cholinesterases.

Organophosphorus pesticides Major class of pesticides comprising phosphorus-containing organic compounds. Include organophosphorus insecticides and acaricides, and some antifungal agents.

Organotin compounds Organic compounds which contain one or more atoms of tin. Uses include pesticides and fungicides. Regarded as contaminants of foods, since some organotin compounds have been shown to be toxic when tested in animal models. Examples include butyltins and triphenyltin (fentin).

Original gravity Amount of extract (soluble material) present in worts, as calculated from the amount of non-fermented extract left in the finished beer, together with the amount of extract equivalent to the quantity of ethanol present in the beer.

Ornithine Non-protein amino acid derived from L-arginine by hydrolysis. Intermediate of the urea cycle in terrestrial vertebrates. Has an amino propane side chain and is also termed 2,5-diaminopentanoic acid.

Orotic acid Synonym for vitamin B₁₃. An intermediate in the biosynthesis of pyrimidines, and growth factor for some microorganisms.

Ortanique Cross between oranges and tangerines with a distinctive acid-sweet flavour, very juicy flesh and thin skin. Flesh is deep orange in colour with few or no seeds.

Orthocide Alternative term for the fungicide captan.

Oryzaephilus Grain beetles of the order Coleoptera. Some (e.g. Oryzaephilus surinamensis and O. mercator) are pests of stored cereal grains (e.g. wheat, rice and barley).

Oryzanols Ferulic acid esters of terpene alcohols commonly prepared from rice bran oils but which have also been extracted from corn oils and barley oils. Used predominantly as antioxidants.

Oryzenin Glutelin which is one of the main storage proteins in rice.

O₂ scavengers Abbreviation for oxygen scavengers.

Osldalin Steroidal saponins and the main active sweet component of rhizomes of the fern Polypodium vulgare. Osldalin is glycosylated with two disaccharide units of 2-O-α-L-rhamnopyranosyl-β-D-glucopyranose. Also known as polyposide A.

Osmalality Concentration of osmotically active particles in a solution, measured in osmoles of solute/kg of solvent.

Osmolarity Concentration of osmotically active particles in a solution, measured in osmoles of solute/litre of solution.

Osmoregulation Regulation of osmotic pressure, especially in the body of a living organism.
**Osmosis**  Passage of water through a differentially permeable membrane, from a region of low concentration of solutes to one of higher concentration. Osmosis stops if the pressure of the more concentrated solution exceeds that of the less concentrated solution by an amount known as the **osmotic pressure** between them.

**Osmotic dehydration**  Alternative term for **osmotic drying**.

**Osmotic drying**  Water removal preservation technique based on the water and solubility activity gradient across a cell's semi-permeable membrane. Involves immersing high moisture foods in an osmotic solution, usually of sugar or salt. Water flows out of the material, and solute may flow in, depending on the conditions. Osmotic drying with osmotic syrup recycling requires less energy than convection drying. At relatively low process temperatures (up to 50°C), it improves product **colour** and **flavour** retention. Application tends to be restricted, such as to fruits, vegetables and fish, as simultaneous solute transfer into the foods can affect product quality.

**Osmotic pressure**  Pressure generated by water or other solvents flowing between two solutions of differing concentration through a semi-permeable membrane. Also the pressure needed to stop or oppose this force so as to prevent normal osmosis or undertake reverse osmosis.

**Osmotic stress**  Stress exerted on an item when under osmotic pressure.

**Osteoporosis**  Weakening and brittleness of the bones, resulting in them becoming liable to fracture. Generalized osteoporosis occurs most commonly in the elderly, and in women following the menopause; it can also result from long-term steroid therapy, infection or injury. The role of nutrition in the prevention and treatment of the disease is not clear, but increased intakes of calcium and vitamin D have been suggested to be beneficial. Regular exercise has an important positive impact on osteoporosis, stimulating bone metabolism.

**Ostiekop cheese**  Slovak plasticized, smoked cheese made from ewe milk.

**Ostriches**  Large, flightless, fast-running African birds (Struthio camelus) belonging to the Struthionidae family. In recent years, popularity of ostrich meat has increased in many countries; consequently, ostrich farming has expanded greatly and is now popular in many European and Scandinavian countries as well as in Africa.

**Ostrich fern**  Common name for Matteuccia struthiop teris. The tightly curled tips of the young fronds are the fiddleheads, which are eaten as a vegetable in salads or in soups. Also called the fiddlehead fern.

**Ostrich meat**  Meat from ostriches. Ostrich carcasses contain a large proportion of lean meat, the majority of which is found in the 10 major muscles of the legs and thighs. Meat from the thigh region is darkest in colour whilst meat from the iliobibialis cranialis is a bright red colour. Ostrich meat has a low fat content compared with other red meats. Ostrich meat products include sausages, salami, steaks, meat mince, burgers and biltong.

**Ouzo**  Aniseed flavoured spirits produced in Greece. Usually drunk mixed with, or accompanied by, water.

**Ovalbumins**  Predominant proteins in the whites of eggs (egg whites) produced by poultry including chickens, ducks, geese and guinea fowl.

**Ovens**  Enclosed chambers or compartments in which foods are cooked or heated, for example during baking and roasting.

**Overrun**  A term describing the amount of air incorporated into foods such as ice cream. Ice cream overrun is calculated as the percentage difference in volume between an amount of ice cream mix and the amount of ice cream produced from it.

**Overweight**  Condition in which a person's body wt. exceeds a standard or reference value due to excessive stores of fat. In general, adults with a body mass index of between 25 and 29.9 kg/m² are categorized as overweight. Both overweight and obesity are associated with an increased risk of developing a range of diseases, such as cardiovascular diseases, adult-onset diabetes and some forms of cancer. Lifestyle interventions to prevent or reverse overweight include adoption of a wt. loss diet and/or increased physical activity.

**Overwrapping**  Packaging technique in which several packs or multipacks are wrapped together often with cellophane or other plastics films to form a single unit.

**Ovine**  Affecting, resembling or relating to sheep.

**Ovomucins**  Sulfated glycoproteins found in egg whites which are responsible for their gel structure. Possess antiviral activity and act as trypsin inhibitors.

**Ovomucoid**  Heat resistant glycoproteins found in egg whites. Show activity as trypsin inhibitors.

**Ovotransferrin**  Glycoproteins found in egg whites. Possesses antimicrobial activity. Also known as conalbumin.

**Oxacillin**  Semisynthetic isoxazolyl penicillin with resistance to β-lactamases. Used to treat bacterial infections in food-producing animals. Maximum
<p>Residue limits (MRL) are specified for milk, meat, livers, kidneys and animal fats.</p><p>Oxalates Salts and esters of oxalic acid. Present at high concentrations in fruits and vegetables, e.g. potatoes, spinach, rhubarb, plums, tea and some nuts, where they are regarded as antinutritional factors. High concentrations of oxalates in urine are associated with formation of renal stones.</p><p>Oxalic acid Organic acid comprising two carboxylic acid groups which has many industrial applications including clarification of fats and oils, and acid hydrolysis of starch to produce sugar syrups. Present as oxalates in fruits and vegetables, e.g. spinach, beets and strawberries, where they are considered to be antinutritional factors due to their involvement in formation of renal stones.</p><p>Oxaloacetic acid Organic acid which is an intermediate in the citric acid cycle where its reaction with acetyl-CoA produces citrate-CoA which is hydrolysed to citrate. Also known as oxosuccinic acid.</p><p>Oxamyl Contact and systemic insecticide, acaricide and nematicide used to control chewing and sucking insects, spider mites and nematodes in a wide range of fruits and vegetables. Classified by WHO as highly hazardous (WHO Ib).</p><p>Oxen Adult castrated male cattle, particularly those used as draft animals. In broader use, the term is used to describe all domesticated bovine animals kept for draft purposes, and for meat or milk production.</p><p>Oxidants Chemicals that are capable of causing the oxidation of other chemicals, i.e. they donate oxygen or remove electrons.</p><p>Oxidases EC 1.-.3. Oxidoreductases that catalyse reactions in which oxygen (O2) acts as an acceptor.</p><p>Oxidation Addition of oxygen to a compound, for example using oxidizing agents. Also includes reactions in which atoms in the reacting materials lose electrons, frequently together with the removal of hydrogen ions. Oxidation-reduction reactions always occur simultaneously; if one reactant is oxidized, another must be reduced.</p><p>Oxidation reduction potential Alternative term for redox potential.</p><p>Oxidative stability Extent to which a substance can withstand the stress of oxidation.</p><p>Oxidative stress A state characterized by excess free radicals or a decrease in antioxidants levels which can result in cellular damage. Oxidative stress is involved in various diseases, such as neurodegenerative diseases and atherosclerosis, and may also promote accelerated ageing. Many factors can lead to oxidative stress, including exposure to alcohol, drugs, excessive physical activity, poor nutrition, trauma, cold or toxins.</p><p>Oxides Chemical compounds containing oxygen. Examples include many salts, nitric oxide (NO) which is an important biological signalling molecule, and cholesterol oxides. Superoxides and peroxides are reactive oxygen species.</p><p>Oxidizing agents Chemical additives capable of oxidation which are themselves reduced during the process, i.e. they gain electrons. Food industry oxidizing agents include chlorine dioxide, which is used as an antimicrobial agent for disinfection of drinking water, and iodates, which are used as dough conditioners.</p><p>Oxidoreductases EC 1. Enzymes that catalyse oxidation-reduction reactions between an oxidant (electron acceptor) and a reductant (electron donor). This group includes dehydrogenases, oxidases and reductases.</p><p>Oxolinic acid One of the quinolones. Used for treatment of bacterial infections in cattle, swine, chickens and farmed fish. Maximum residue limits (MRL) are specified for fish flesh with skin, and for meat, livers, kidneys, animal fats with or without skin, and eggs from the other animals. Not for use in cattle producing milk for human consumption.</p><p>Oxtail The skinned tail of all categories of cattle. Oxtail has a high percentage of bone running through the middle and has a high fat content. The tails of older animals contain greater proportions of meat than those of younger animals. It is usually sold jointed into pieces. Small pieces of oxtail are often used to prepare oxtail soups or stocks, whilst larger pieces may be cooked by braising. Oxtail requires long, slow cooking to extract the best flavour.</p><p>Oxygen Element with an atomic weight of 16 and an atomic mass number of 8. Most common form of free oxygen is the diatomic species, molecular oxygen (O2). Oxygen is the most abundant element of the Earth (air is composed of approximately 20% O2). Essential for respiration in animals and aerobic microorganisms, produced by photosynthesis and is a common substituent of organic compounds, including biopolymers, such as proteins and polysaccharides. Reaction of foods with oxygen (oxidation) is a common cause of food spoilage, e.g. oxidation of fats and oils causes rancidity, and presence of oxygen may allow growth of aerobic food spoilage microorganisms.</p><p>Oxygen absorbers Materials which reduce the oxygen contents of food containers and maintain them at a very low level. This inhibits the growth of microorganisms and insects, and oxidative chemical reactions, increasing the stability and shelf life of the
Oxygenases

Oxygenases  EC 1.13-EC 1.14. Enzymes that catalyse the incorporation of molecular oxygen from $O_2$ into the compound oxidized. Dioxygenases (which contain Fe) incorporate two atoms of oxygen, while monoxygenases incorporate only one atom.

Oxygen scavengers  Alternative term for oxygen absorbers.

Oxymyoglobin  Bright red pigments which represent the reduced form of myoglobin. In oxymyoglobin, oxygen is bound to the ligand, and the haem group of myoglobin is in the ferrous ($Fe^{2+}$) state. When fresh meat is cut and a new surface is exposed to oxygen, the surface colour changes from dark purple to bright red; this colour change, associated with oxymyoglobin formation, is known as bloom.

Oxytetracycline  One of the tetracyclines. Used for treatment and control of a wide range of bacterial infections in cattle, swine, sheep, poultry, fish, lobsters and honey bees. Residues may persist in foods derived from these animals and withdrawal times vary with species and formulation. Use in lactating dairy cattle, veal calves and poultry producing eggs for human consumption is generally not permitted. Synonymous with terramycin.

Oxytocin  Peptide hormone (nine amino acids) synthesized in the posterior pituitary gland. Stimulates uterine smooth muscle to induce uterine contractions and promote labour. Also induces secretion of milk in response to a suckling stimulus.

Oyster mushrooms  Mushrooms of the genus Pleurotus.

Oyster nuts  Seeds produced by Telfairia pedata. Used as a source of oils or eaten roasted. Similar in flavour to almonds.

Oyster plant  Alternative term for salsify.

Oysters  Common name for marine or freshwater bivalve molluscs in the family Ostreidae; distributed worldwide. Prized for flavour and texture of flesh, which ranges from creamy beige to pale grey in colour. Many species are commercially important, including Ostrea edulis (flat oysters), Crassostrea gigas (Pacific oysters) and C. virginica (blue point oysters). Marketed live (in shell), fresh (shucked), frozen, dried, smoked and semi-preserved.

Oyster sauces  Sauces used in Oriental dishes, particularly in Chinese dishes. Prepared by proteolysis of oysters tissues.

Ozonation  Application of ozone ($O_3$), usually produced by electrical discharge or using UV light, to items such as foods to reduce counts of microorganisms and/or delay ripening. Food industry uses include the purification of drinking water, disinfection of process water, washing of fresh produce, sanitation of food plant equipment and extension of produce shelf life.

Ozone  Form of oxygen comprising three oxygen atoms ($O_3$). This gas is a strong oxidizing agent with broad spectrum antimicrobial activity and the ability to delay ripening in fruits and vegetables by reacting with the ethylene that they produce. Used within the food industry for disinfection, water treatment and shelf life extension. Also known as triatomic oxygen.
Pachysolen  Genus of yeasts of the family Saccharomycetaceae. *Pachysolen tannophilus* is used in the production of xylitol from hemicellulose hydrolysate and in the production of ethanol.

Pacific hake  Marine fish species (*Merluccius productus*, *M. gayi gayi* or *M. gayi peruanus*) of high commercial importance. Widely distributed in the eastern Pacific Ocean. Marketed fresh and frozen and cooked in a number of ways, including steaming, boiling and frying. Also used in fish meal production.

Pacific mackerel  Marine fish species (*Scomber japonicus*) from the mackerel family (Scombridae); distributed in the Indo-Pacific. Commercially important food fish (especially in Japan). Flesh has high fat content with a strongly distinctive savoury flavour. Marketed fresh, frozen, smoked, salted and occasionally canned. Also known as chub mackerel.

Pacific ocean perch  Marine fish species (*Sebastes alutus*) found in offshore waters of the North Pacific region. Important commercial food fish. Marketed fresh or frozen (whole or fillets); livers are used as a source of vitamin-rich oils.

Pacific salmon  General name referring to any of the six species of salmon (cherry, chinook, chum, coho, pink and sockeye salmon) occurring in the North Pacific Ocean. All are highly valued food fish.

Pacific whiting  Marine fish species (*Merluccius productus*) from the hake family (Merluccidae), found in the northeastern Pacific Ocean. A commercially important food fish; usually marketed frozen, as flesh quality rapidly deteriorates following capture. Also known as Pacific hake.

Packaging materials  Substances used to make packs. Packaging for foods is commonly made from a variety of materials, including glass, plastics, rubber, wood and paper, which are formed into a range of container types. The type of material chosen depends on the product to be packaged and the intended use.

Packed bed bioreactors  Bioreactors generally comprising a vessel filled with immobilized cells or immobilized enzymes. Media or substrate solution, respectively, flows through the vessel in one direction, and no mixing of the reactor contents usually occurs. Can be used for continuous or batch bioconversions or enzymic reactions. Also known as plug-flow bioreactors.

Packaging  Enclosure or wrapping of products. Functions include product containment for handling, transportation and use, preservation, optimization of product presentation, hygiene and to facilitate product dispensing and use. The term covers retail (primary), grouped (secondary) and transport (tertiary) forms.

Packaging films  Packaging materials in the form of thin sheets which can be wrapped round a product. Films can be made from synthetic materials, such as plastics, or natural substances, such as whey proteins.

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Padi straw mushrooms

Alternative term for the edible fungi *Volvariella volvacea*.

**Paecilomyces** Genus of mitosporic fungi of the family Trichocomaceae. Occur in soils, foods, fruit juices and plant debris. Some species (e.g. *Paecilomyces variotii*, a thermophile) may be responsible for the spoilage of foods (e.g. oilseeds, cereals, bread, meat and cheese). *Paecilomyces* spp. produce industrially important enzymes.

**Paenibacillus** Genus of facultatively anaerobic Gram positive bacteria of the family Paenibacillaceae. The type species is *Paenibacillus polymyxa*. Members can fix nitrogen, produce antimicrobial compounds and synthesize hydrolytic enzymes. Endospore-forming *Paenibacillus* spp. can survive HTST pasteurization and are important spoilage bacteria in milk. *P. larvae* is a pathogen of honey bees and causes an infectious disease called American foulbrood. *P. larvae* spores can contaminate honeys.

**PAH** Abbreviation for polycyclic aromatic hydrocarbons or polynuclear aromatic hydrocarbons.

**Pak choi** Type of Chinese cabbage (*Brassica chinensis*) cultivated originally in the Far East and South East Asia but becoming popular in Western countries. Used widely in stir fried dishes and soups, eaten as a cooked vegetable or used raw in salads. Also known by various other names, including bok choy and white mustard cabbage.

**Pakoras** Indian snack foods consisting of pieces of spiced meat and/or vegetables enclosed in batters and deep fried.

**Palatability** Sensory properties relating to the extent to which a food is acceptable to eat. Determinants include flavour, texture and aroma. Some foods can be made more palatable by selective processing. Breadmaking, for example, improves the palatability of flour.

**Palatinit** Obsolete trade name for *Isomalt*.

**Palatinose** Commercial name for the disaccharide *isomaltulose*. Isomer of sucrose produced by bacterial transglucosylation.

**Pale soft exudative defect** Commonly abbreviated to PSE defect, a condition affecting meat, especially pork. It is often related to animal stress or genetic disorders, but may also occur as a result of poor meat handling and storage. This defect is associated with accelerated post mortem muscle metabolism and a low pH value in meat. A linear relationship exists between myosin denaturation and drip loss or surface lightness within the PSE quality class. Excessive colour variation, poor water binding capacity and decreased water holding capacity occur in PSE meat, making it unsuitable for further processing.

**Halothane sensitivity** tests have been used to screen breeding swine for porcine stress syndrome, a genetic disorder which enhances susceptibility to stress, with the aim of reducing the propagation of the PSE defect in breeding herds.

**Palmarosa** *Cymbopogon martini* or East Indian geranium, a plant whose leaves are used as spices. Palmarosa essential oils are also used as flavourings, having a sweet rose-like aroma with herbaceous undertones due to the presence of the aromatic alcohols geraniol and nerol.

**Palm hearts** Young apical shoots (also called cabbages) of palms, used as a vegetable. Long and slender, with a delicate, artichoke-like flavour. Available fresh in some countries; otherwise, sold canned in water. Used in salads or in cooked dishes. Also known as hearts of palm.

**Palm oil** Saturated fatty acid containing 16 carbon atoms. Present as glyceride esters in many fats and oils, including palm oils, from which it is commonly obtained.

**Palm kernel oils** Oils produced from the kernels of the fruits of oil palms, *Elaeis guineensis*, usually by solvent extraction. Classified as lauric oils. Used in the manufacture of margarines, cooking fats and confectionery.

**Palm oil mills effluents** Organic waste water produced during processing of palm oils. Have high carbon contents and low nitrogen contents and often represent an environmental problem in areas where palm oil is produced.

**Palm oils** Oils derived from the fleshy portion of the fruits of oil palms, *Elaeis guineensis*. Rich in carotenes, which are often removed to give the oil a paler colour. Used as cooking oils, in the manufacture of margarines and as ingredients in processed foods. In addition, they are also used widely in non-food applications, such as the manufacture of soaps and candles, in personal care products and as a feedstock for biodiesel.

**Palm olein** Olein isolated from palm oils.

**Palms** Tropical evergreen plants of the family Palmae or Arecales with a variety of uses. Products made from plant parts include palm oils, sago, starch, sugar, palm wines and spirits. Fruits and palm hearts of some species are eaten. Commercially im-
Palm stearin  Stearin isolated from palm oils.

Palm wines  Alcoholic beverages made by fermentation of juices tapped from the stems of several species of palms.

Palmyra  Species of palms (Borassus flabellifer) which yields edible fruits and whose inflorescence (complete flower head) is a source of palm wines, sugar and vinegar. Alternative spelling is palmyrah.

Palmyrah  Alternative spelling for palmyra.

Palytoxin  Potent marine toxin produced by zoanthids of the genus Palysla. Detected in a range of sea foods, including fish, crabs and seaweeds. Can cause food poisoning and even death in people eating contaminated products.

Pancakes  Thin, flat cakes made by frying batters in a pan or on a greased griddle and cooked on both sides until brown.

Pancreas  An elongated, tapered organ located in the abdomen; it is mainly composed of exocrine tissue but includes islets of endocrine cells. The exocrine tissue secretes juices that contain enzymes for digestion, while the endocrine cells produce insulin and glucagon to regulate blood glucose levels. Animal pancreases form a part of edible offal and are known by butchers as gut sweetbreads.

Panreatins  Mixed hydrolases prepared from pancreas tissues. Useful for production of vegetable protein hydrolysates, casein phosphopeptides and powdered milk infant formulas in which the casein is pre-digested, and also for liquefaction of fish proteins and meat residues.

Paneer  Indian cheese-like product made by acid coagulation of heated buffalo milk. White in colour with a spongy body and sweet, mildly acidic and nutty flavour. Used in the preparation of many products, including curries, vegetable dishes and sweets.

Panettone  Rich Italian yeast cakes made with candied fruits, eggs and butter. Traditionally eaten on festive occasions.

Panning  Method used to make coated sugar confectionery. Used to make two types of product, i.e. hard centres, such as nuts or dried fruits, covered with chocolate, or chocolate or similar centres coated with sugar. In both cases, the coatings are applied to the centres while they are tumbled in a pan or drum. Temperature control is used to harden chocolate coatings, while sugar coatings are hardened by moisture reduction.

Panose  Oligosaccharide comprising three glucose residues, with one glucose residue α-1,6- linked to maltose (α-1,4-linked glucose disaccharide). Produced by hydrolysis of pullulan or via the action of glycosyltransferases on maltose.

Pans  Metal containers, usually broad, flat and shallow, in which foods are cooked. Also, open containers in which panning of confectionery is performed.

Pantoea  Genus of facultatively anaerobic, rod-shaped, motile, pigment-producing Gram negative bacteria of the Enterobacteriaceae family. Occur on plants, fruits and seeds, and in soil and water. Also isolated from wounds, blood and urine of humans and animals. Pantoea dispersa produces chitinases and is also used in a commercial biofertilizer. P. agglomerans is an effective preharvest biocontrol agent for postharvest diseases of citrus fruits and pome fruits.

Pantothenic acid  Member of the vitamin B group. Chemically, pantothenic acid is the β-alanine derivative of pantoi acid, and is required for the synthesis of coenzyme A (involved in the metabolism of fats, carbohydrates and amino acids) and of acyl carrier protein (involved in the synthesis of fatty acids). Dietary deficiency is unknown; it is widely distributed in all living cells, the best sources being livers, kidneys, yeasts, and fresh vegetables. Royal jelly is also a rich source. Approximately 50% of pantothenic acid in grains is lost by milling, up to 50% in fruits and vegetables is lost during canning, freezing, and storage, and from 15 to 30% in meat is lost during cooking or canning. Pantothenic acid is reasonably stable in natural foods during storage, provided that oxidation and high temperatures are avoided.

Papads  Traditional Asian snack foods made from a mixture of black grain meal, salt, oils and spices, which is deep fried or toasted.

Papain  EC 3.4.22.2. A cysteine endopeptidase from the latex of papayas with broad specificity, but with a preference for amino acids bearing a large hydrophobic side-chain at the P2 position. Many other plants contain proteinases which are homologues of papain. Uses include tenderization of meat, stabilization of beer, coagulation of milk in cheese-making and hydrolysis of whey, fish proteins and plant proteins.

Papaya nectars  Fruit juice beverages made by addition of water and/or sugar, and optionally other ingredients, to papaya juices.

Papayas  Fruits produced by Carica papaya, a member of the pawpaw family. Vary in size, shape and colour. Rich in vitamin A, vitamin C and potassium. Flesh is yellow to orange, with a large number of small black seeds in the centre. Both flesh and seeds are edible. Unripe fruits are sometimes eaten as a vegetable; ripe fruits are eaten as desserts, or used to
make **soft drinks, jams, or ice cream.** Leaves, **stems** and fruits of the plant contain the enzyme **papain,** used in **tenderization of meat** and **clarification of beer.** Also called **pawpaws** in the UK and fruta bomba in Cuba.

**Paper** Material manufactured in thin sheets from **wood** pulp or other fibrous substances. Used widely as a medium for writing and printing, as a packaging material, as a wrapping material and as an absorbent.

**Paperboard** Thick, stiff **cardboard,** which is composed of many layers of **paper** or compressed paper pulp. Also known as pasteboard.

**Paper chromatography** Chromatography technique performed on blotting paper or filter paper. Components of the sample are separated as a result of interactions between them, the paper and the solvent or mobile phase. Largely superseded by **thin layer chromatography.**

**Paprika** Spices and **red colorants** obtained by grinding dried seed pods of the sweet pepper **Capsicum annuum.** Red coloration is produced from a mixture of approximately 20 **carotenoids,** though predominantly from **capsanthin** and capsorubin esters. Often used to enhance the **colour** of foods based on **tomatoes.**

**Paps** Thin gruel made from **corn flour** and traditionally used as **weaning foods** or **breakfast foods** in Nigeria.

**Parabens** **Esters** of **alcohols** (usually **methanol,** **ethanol** or **propanol**) and **p-hydroxybenzoic acid.** These **hydroxybenzoic acid esters** are used as **preservatives** in foods and cosmetics. In 2004, **propylparaben** was excluded from the list of permitted **food additives** in the EU, due to concerns over possible **oestrogenic activity.**

**Paracoccus** **Genus** of aerobic, coccus or rod-shaped **Gram negative bacteria** of the family Rhodobacteraceae. Occur in soil and **meat curing brines.** Some species are producers of **carotenoids.** **Paracoccus denitrificans** is responsible for **spoilage** of foods and beverages (e.g. **carrot juices,**), and is used in the **denitrification** of **drinking water** and **beet-root juices.**

**Paraffins** Aliphatic **hydrocarbons** in which all carbon atoms are saturated with hydrogen atoms. Compounds in this class have the suffix **-ane,** e.g. methane, propane and hexane.

**Paralytic shellfish poisoning** Foodborne illness caused by consumption of **shellfish** or juices from cooked shellfish that contain either concentrated **saxitoxin** (an alkaloid neurotoxin) or related compounds. Often abbreviated to SP.

**Paralytic shellfish toxins** Toxins responsible for **paralytic shellfish poisoning,** including C1/2 and B1 toxins, **gonyautoxins** 1-4, neosaxitoxin and **saxitoxin.**

**Paraoxon** Neurotoxic metabolite of the insecticide **parathon.**

**Paraquat** Non-selective contact herbicide used to control broad-leaved weeds and grasses around a wide range of plants, including **fruits,** **vegetables,** **tea** and **sugar beets.** Also used as a desiccant for **pineapples,** **sugar cane,** **soybeans** and **sunflowers.** Classified by WHO as moderately hazardous (WHO II).

**Parasites** Organisms which live in (endoparasites) or on (ectoparasites) organisms of another species (host), from which they obtain **nutrition** and/or protection. Typically detrimental to the host.

**Parasiticol** Alternative name for **aflatoxin B**.

**Parasol mushrooms** **Edible fungi** of the genus **Leiopiota.**

**Parathas** Unleavened **bread** made with whole **wheat flour,** pan fried in **ghee** or cooking oil, and often stuffed with **vegetables,** such as boiled **potatoes,** **radishes** or **cauliflowers,** and/or **panear.**

**Parathion** Non-systemic organophosphorus insecticide and acaricide used to control sucking and chewing **insects** (including soil insects) and **mites** in a wide range of **fruits,** **vegetables** and **cereals.** Classified by WHO as extremely hazardous (WHO Ia).

**Parathion-methyl** Non-systemic insecticide and acaricide used to control chewing and sucking **insects** on a wide range of **fruits,** **vegetables** and **cereals.** Classified by WHO as extremely hazardous (WHO Ia). Also known as metasphos and methylparathion.

**Paratyphoid** Infectious disease caused by **Salmonella**. **Paratyphus A,** B or C. **Bacteria** are spread in the faeces of patients or carriers, and outbreaks occur as a result of poor **sanitation** or unhygienic food handling practices. After an incubation period of 1-10 days, symptoms, including **diarrhoea,** mild fever and a pink rash on the chest, appear and last for about a week.

**Parbendazole** One of the **anthelmintics** that has been employed to control gastrointestinal **nematodes** and lungworms in cattle, sheep and swine. Use has been limited due to evidence of **teratogenesis.** Normally excreted rapidly from animals.

**Parboiling** Partial **cooking** of foods by **boiling** briefly in water before cooking by some other means, such as **frying** or **roasting.** Dense foods can be parboiled to allow them to be added at the same time as quick cooking ingredients in **meals** such as stir fry dishes. This means that all the ingredients will com-
complete cooking at the same time. Also refers to the process of soaking and pressure steaming of rice before milling to gelatinize the starch and infuse some of the nutrients from the bran into the kernel.

Parching Drying of goods such as grain or starchy vegetables through application of intense heat.

Parchment paper Waterproof, grease-resistant, stiff translucent paper treated to resemble parchment. Produced by passing ordinary paper through a zinc chloride or sulfuric acid solution. Used in sheets or as bags to wrap foods.

Parma ham Italian ham originating from the province of Parma. Considered the true prosciutto. The meat is not smoked, but merely seasoned salt-cured and air-dried, giving a product that has pink-brown, firm and dense flesh. Usually eaten thinly sliced and raw, often as an appetizer with melons, but sometimes used in cooking. Rind may be used to flavour soups.

Parmesan cheese International name for Parmigiano Reggiano cheese, an Italian hard grating cheese that is made from cow milk. Milk used for Parmesan cheese is heated and coagulated after most of the cream has been separated and removed. The curd is cut, heated to 53°C with stirring and cooked at up to 55°C before pressing in cheesecloth-lined moulds. Cheese is salted in brine for 1 month and matured for up to 2 years in very humid conditions.

Parmigiano Reggiano cheese Italian hard grating cheese made from unpasteurized cow skim milk. Has a sticky, hard, yellow-orange rind and a piquant flavour. Used in toppings for dishes including soups, pasta meals and salads. The international name for this cheese variety is Parmesan cheese.

Parottas Unleavened bread eaten in southern India. Made using maaida which is mixed with eggs and made into a dough. Dough is covered in ghee and then beaten into a very thin layer and rolled into spirals which are then flattened and cooked on a hot griddle until golden brown. Usually eaten with spicy meat dishes.

Parsley Common name for Petroselinum crispum. Leaves are used as spices directly to flavour foods and sauces, having a fresh green herbaceous character. Parsley seed oils and leaf oils prepared from P. sativum are also used as flavourings. Parsley seed oils have a less herbal character than the spice but are similar in flavour to vegetable seed oils, such as celery seed oils.

Parsnips Common name for Pastinaca sativa. As well as being used as animal fodder, roots are cooked as vegetables or used in soups, stews or to make wines. Rich in potassium, with good contents of vitamin C.

Parthenocarpy Production of fruits without fertilization, either spontaneously or by application of auxins. Seedless fruits are formed.

Particulate foods Liquid or dried products containing discernible particles.

Partitioning Separation technique based on differences between solvents and solutes (for example in size, charge, hydrophobicity), which leads to the preferential accumulation of solute in one solvent phase. Uses include with proteins (including enzymes), pigments and phytochemicals. Examples include three-phase partitioning and aqueous two phase systems.

Partridge meat Meat from partridges, short-tailed medium-sized birds of the genera Alectoris and Perdix belonging to the Phasianidae family. Birds are generally hunted as game, but sometimes farmed. Meat is pale and tender with a slight gamy flavour, and is marketed fresh and frozen. It can be cooked in a variety of ways, including roasting and grilling, or is used as an ingredient of soups and stews. Meat from older birds is often braised.

Partridges Short-tailed medium-sized game birds of the genera Alectoris and Perdix belonging to the Phasianidae family. Partridges are hunted for their meat and to a lesser extent farmed for their meat and eggs.

Parovoviruses Enteric viruses of the family Paroviridae, which can cause viral gastroenteritis. Several outbreaks have been associated with the consumption of contaminated shellfish.

Paselli Trade name for a range of fat substitutes derived from potato starch and tapioca, and marketed by AVEBE America Inc. An example is Paselli SA2, which is based on maltodextrins derived from potato starch, has good pH, temperature and freezing stability, and is used in a wide range of low fat foods including low fat ice cream, other frozen foods, low fat mayonnaise and butter substitutes.

Passion fruit juices Fruit juices extracted from passion fruits (Passiflora edulis).

Passion fruits Fruits produced by Passiflora edulis (purple passion fruits) or P. flavicarpa (yellow passion fruits); purple fruits are more common. Good contents of carotenes, niacin and vitamin C. When ripe, the skin becomes wrinkled. The flesh is yellow with small black edible seeds. Used as desserts, in jams and marmalades, or to flavour beverages, ice cream and sherbet. Also known as granadillas.

Pasta Dried, unleavened dough product made from durum wheat semolina and water and sometimes eggs and milk. The dough is partially dried in hot air
and then dried more slowly at a lower temperature. Formed into a variety of shapes, including ribbons, cords and tubes, which were originally developed for their ability to retain heat or maintain adherence of sauces. Also known as alimentary pastes.

**Pasta filata cheese** Italian term that translates literally to spun paste cheese. Such cheese, also known as stretched curd cheese, is made using a special technique that involves soaking curd in hot whey or water, kneading and stretching it to the required consistency, and moulding it whilst immersed. Cheeses may then be aged, brined or smoked. Examples include mozzarella cheese, Provolone cheese and Caciocavallo cheese.

**Pasta sauces** Sauces for spaghetti and other types of pasta. Many are tomato-based (such as Bolognese, which also includes beef mince) but others may be milk-, cream- or cheese-based and include ingredients such as mushrooms, ham and onions. May also be purees of certain vegetables, nuts, herbs and spices, e.g. pesto.

**Pasteurma** Traditional Middle Eastern dry cured meat products, commonly made from beef, but also prepared from camel meat. They are intermediate moisture products produced from meat by salting, pressing, marination in spices or covering with a spice-based paste, and air drying. Also known as pastirma, bastirma, basterma or basturma.

**Pastes** Processed foods in the form of a creamy mass for use in cooking or further processing (e.g. tomato pastes, confectionery pastes). Also suitable for spreading on products such as bread or crackers in a similar manner to pates and spreads.

**Pasteurella** Genus of facultatively anaerobic, coccoid or rod-shaped Gram negative bacteria of the family Pasteurellaceae. Species of this genus are found in both animals and humans. *P. multocida* is a commensal and opportunistic pathogen of food animals, wildlife and pets, and a zoonotic cause of human infection arising from contact with these animals.

**Pasteurellosis** Disease in humans and animals caused by infection with *Pasteurella* spp. Manifests itself as haemorrhagic septicaemia and pneumonia in cattle, swine, sheep and poultry.

**Pasteurization** Process of making milk and other liquids (such as beer, wines and fruit juices) safe for consumption by destruction of most of the microorganisms present in them. Certain enzymes that would otherwise decrease shelf life are also inactivated by the process. Pasteurization is achieved by application of moderately high temperatures for a short period of time. Variants of the process include HTST pasteurization and LT LT pasteurization. Nutritional values of treated products are not greatly reduced by application of this process, nor are lactic acid bacteria destroyed. Cold pasteurization may be accomplished by radiation and/or chemical methods. Pasteurization precedes the drying of many liquid food products.

**Pasteurized milk** Milk that has been heated to a specific temperature for a specified length of time to kill off microorganisms that could cause spoilage or poisoning. This treatment can be carried out at a high temperature for a short time (HTST pasteurization; 72-80°C for 15 seconds) or at a lower temperature for a long time (LTLT pasteurization; 62-65°C for up to 30 minutes). Since pasteurization destroys phosphatases but not peroxidases, a phosphatase test is used to test the efficacy of the process.

**Pasteurizers** Equipment used in pasteurization of milk and other liquid foods to destroy most of the microorganisms present by application of heat.

**Pastila** Alternative term for pastilles.

**Pastilles** Small round sweets often coated with sugar that can be sucked or chewed and are sometimes medicated. Also known as pastila.

**Pastiness** Sensory properties relating to the extent to which the consistency of a substance is perceived as being pasty or thick.

**Pasting properties** Functional properties relating to the ability of an item to act in a paste-like manner. Pasting properties of starch, e.g. gelatinization temperature, transparency, viscosity and retrogradation, have an important effect on the cooking and processing of foods.

**Pastirma** Alternative spelling for pasturma.

**Pastrami** Highly seasoned meat products prepared from flat pieces of lean meat. Commonly made from beef, but may also be prepared from poultry meat or fish. The meat is dry cured using salt or saltpetre; seasonings used may include allspice, cinnamon, cloves, coriander seeds, garlic, ground pepper and red peppers. Beef pastrami is often served in rye bread sandwiches.

**Pastries** Sweet bakery products made with paste-like dough.

**Pastry** Product made using flour, water, fats and sometimes sugar and flavourings, that is baked, leavened using steam, and used as a crust for products such as pies and tarts. May also be glazed or iced.

**Patagras cheese** Semi-hard cheese made in Cuba and Argentina from cow milk. Resembles Gouda cheese and Emmental cheese in sensory properties.

**Patatin** One of the major storage proteins of potatoes (molecular weight approximately 40 kDa), ac-
counting for 30-40% of total soluble protein. Exhibits esterase activity.

Patents Official documents issued by a governmental agency granting an inventor or inventors sole rights to use or sell an invention or process described in a patent application for a defined length of time. The patent application includes a written description of the invention, claims which define the scope of exclusivity, and also drawings and diagrams where appropriate. Many processes, pieces of equipment and materials developed for and used in the food industry are covered by patents. These include genetically modified crops and processes used in their production.

Pates Savoury fish products or meat products, which are prepared from finely comminuted or mashed foods. Additional ingredients may include blood, animal fats, dairy products, egg products or soy products. Pates may be smooth or coarsely textured. Preparation may or may not include moulding. Some pates are prepared with a pastry crust. Pates may be served hot or cold, often as an appetizer or first course. Varieties include fish pates, liver pates and terrines.

Pathogenesis Cellular events and reactions which occur during the process of disease development.

Pathogenic bacteria Bacteria that cause disease.

Pathogenicity Quality or degree of being capable of causing disease.

Pathogenicity islands Large distinct chromosomal elements found in pathogens, which encode virulence-associated genes.

Pathogenic microorganisms Alternative term for pathogens.

Pathogens Microorganisms that cause disease. Also known as pathogenic microorganisms.

Patis Fermented fish sauces prepared from juices of small marine fish.

Patisserie products Small, decorative cakes and pastries originating from France.

Patties Meat products consisting of small, round, flattened cakes of meat mince.

Patulin Carcinogenic mycotoxin produced by various fungi, especially Aspergillus and Penicillium spp. Occurs in fruit juices produced from fruits contaminated with P. expansum.

Pauas Alternative term for abalones, widely used in New Zealand.

Pawpaws Alternative term for both papayas and papaws. Members of the cherimoya family, also known as the banana of the north, which is not grown commercially. It has a greenish skin that contains a pale yellow pulp full of seeds. The pulp has a custard-like consistency and sweet, banana-like flavour. Contain vitamin A, some B vitamins and traces of minerals. Eaten fresh or used in marmalades, puddings and beverages.

Pb Chemical symbol for lead.

PCB Abbreviation for polychlorinated biphenyls.

PCR Method for amplifying DNA sequences using two oligonucleotide primers that flank the sequence of interest and which are complementary to different strands of the DNA sequence. The method involves repeated cycles (typically 20-30) of denaturation, primer annealing and strand elongation using heat-stable polymerases. Each newly synthesized DNA strand serves as the template for a subsequent round of synthesis, resulting in exponential amplification of the sequence of interest. May also be used to amplify messenger RNA (mRNA) following reverse transcription to complementary DNA (cDNA). Abbreviation for polymerase chain reaction.

Pea beans Type of common beans (Phaseolus vulgaris).

Peaches Fruits produced by Prunus persica or Persica vulgaris. Similar to nectarines in composition and flavour, but with a downy skin. Classified according to stone tenacity (clingstone or freestone) and flesh colour (white or yellow). Rich in vitamin A, vitamin C, calcium and potassium. Eaten fresh, canned, frozen or dried. Also processed into jams, juices and wines, and used in various dishes.

Peach juices Fruit juices extracted from peaches.

Peach nectars Fruit juice beverages made by addition of water and/or sugar, and optionally other ingredients, to peach juices.

Peach pulps Soft mass prepared from the flesh of peaches by mashing. Used in the manufacture of various foods and beverages, including ice cream, fruit juice beverages, desserts, yoghurt and milkshakes.

Peach purees Food produced by straining, mashing or blending the flesh of peaches to a smooth consistency. Used in a variety of beverages, e.g. fruit juices, and in foods, including infant foods.

Pea flour Alternative term for pea meal.

Peanut meal Flour produced from peanuts. Rich in protein and fibre. Used as a protein supplement in a
range of products, including milk beverages, bread and biscuits.

Peanut milk High-protein beverages based on aqueous extract of peanuts to which sugar may be added.

Peanut oils Alternative term for groundnut oils.

Peanut pastes Products similar to peanut butter made by mashing boiled peanuts.

Peanut products Products which contain peanuts as the main ingredient.

Peanut proteins Proteins found in peanuts, the main ones being arachin, conarachin I and conarachin II. Responsible for the allergenicity of peanuts.

Peanuts Seeds produced by the leguminous plant Arachis hypogaea. Up to six seeds develop in the underground pods which are harvested by hand or mechanical means. Seeds are rich in proteins, minerals, vitamin E and vitamin B complex. As well as being eaten out of hand, roasted, boiled or raw, peanuts are used in cooking and in products such as confectionery, snack foods, peanut butter and salads. A high-protein meal made from peanuts has been incorporated into a range of foods as a protein supplement. The seeds are also the source of groundnut oils. These contain a high proportion of unsaturated fatty acids; uses include cooking and manufacture of margarines. Peanuts are also known as groundnuts, American groundnuts and monkey nuts.

Pea protein concentrates High-protein products made from peas. High nutritional quality and good functional properties make them suitable for many uses in the food industry, such as manufacture of edible films, and inclusion in infant foods and protein supplements. Flatulence factors and antinutritional factors that can become concentrated in these pea protein products must be removed during processing.

Pea proteins Proteins found in peas, including legumin, vicilin, convicilin and albumins. Protein fractions extracted from peas are purified to yield pea protein isolates and pea protein concentrates.

Peanut butter made by mashing boiled peanuts.

Pearl barley Whole barley kernels with the husk and part of the bran layer removed by polishing. Often added to soups.

Pearling As well as referring to the formation of pearl shaped items, this term relates to the removal of indigestible hulls, aleurone and germ layers from cereals by abrasion. With respect to barley, three successive pearlings removes all of the hull and most of the bran layer, leaving what is termed pot barley. Two to three additional pearlings, followed by sizing with a grading wheel, produces pearl barley. Also known as attrition milling and abrasive debranning.

Pearl millet Millet kernels from which the husk and bran layer have been removed by polishing. Also a type of millet (Pennisetum typhoides).

Pears Pome fruits produced by plants of the genus Pyrus. Common or European pears are P. communis; Asian pears are members of the species P. pyrifolia. Generally, European pears are bell-shaped with soft flesh and Asian pears are round with crunchy flesh. A great many cultivars are grown commercially. Good source of dietary fibre, vitamin C and potassium. Eaten fresh or canned. Used as dessert fruits, cooked in dishes, in jams or processed into fruit juices and fruit nectars. Juice from some cultivars is fermented to produce perry.

Peas Common name for Pisum sativum, a widely cultivated legume. Good source of protein and vitamin C. Green or immature seeds are cooked as a vegetable, canned or frozen. Dry or mature seeds are cooked, used in soups or other dishes, or rehydrated and canned as processed peas. In some cultivars, including snow peas, snap peas and sugar snap peas, the pod is also eaten.

Pea starch Starch isolated from peas.

Pecan nuts Type of hickory nuts produced by Carya pecan or C. illinoensis. Kernels have a high oil content. Eaten out of hand and also in a range of sweet and savoury dishes, the most famous being pecan pie, one of the popular desserts in the USA.

Pecan oils Oils extracted from pecan nuts. Rich in unsaturated fatty acids, with only small amounts of saturated fatty acids. Possess the characteristic sweet aroma of pecan nuts. Blends with other vegetable oils have been suggested as bases for margarines and shortenings.

Pecorino cheese Name for all Italian hard cheeses made from ewe milk. Types include Pecorino Romano from the Rome area, Pecorino Sardo cheese from Sardinia and Pecorino Siciliano from Sicily. The rind is pale straw to dark brown in colour depending on age, and the interior is white to pale yellow with small eyes. Pecorino Romano is larger than other Pecorino cheeses and takes 8–12 months to mature, after which it has a salty flavour with a fruity tang. Pepato is spiced with peppercorns.

Pecorino Sardo cheese Hard cheese made in Sardinia from ewe milk (Pecorino is a name given to all Italian hard cheeses made from ewe milk). Rind is pale straw to dark brown in colour, depending on age. Interior is white to pale yellow with small eyes. Flavour is salty with a fruity tang which becomes stronger as ripening proceeds.
Pectate lyases EC 4.2.2.10. Pectic enzymes which catalyse the eliminative cleavage of pectates to oligosaccharides with 4-deoxy-α-D-gluc-4-enuronosyl groups at their non-reducing ends. Can act on other polygalacturonides but do not act on pectins. Also known as pectate transeliminases. These lyases are thought to be involved in postharvest decay of fruits by bacteria and fungi, causing tissue degradation of cell walls, and softening and rotting of plant tissues.

Pectate transeliminases Alternative term for pectate lyases.

Pectic enzymes Group of enzymes that catalyse degradation of pectic polymers in the cell walls of plants. These enzymes are involved in the ripening of fruits, and have a number of uses in the processing of fruits and vegetables. The group comprises polygalacturonases, pectinesterases, pectate lyases and pectin lyases.

Pectic substances Pectins and poly saccharides derived from them, such as polygalacturonic acid, polyglucuronic acid and polyuronides.

Pectinases Alternative term for polygalacturonases.

Pectinatus Genus of obligately anaerobic, rod-shaped Gram negative bacteria of the family Acidaminococcaceae. Pectinatus cerevisiophilus and P. frisingensis are both associated with beer spoilage.

Pectinesterases EC 3.1.1.11. Hydrolyse the methyl ester groups of pectins, resulting in deesterification. The enzymes act preferentially on a methyl ester group of a galacturonate unit next to a non-esterified galacturonate unit. Found in various fruits, where they are involved in ripening. Used for clarification and reduction of the viscosity of fruit juices, as well as the production of low-sugar jams and jellies. Also known as pectin methylesterases.

Pectin lyases EC 4.2.2.10. These pectic enzymes catalyse the eliminative cleavage of pectins to form oligosaccharides with terminal 4-deoxy-6-O-methyl-α-D-galact-4-enuronosyl groups. Used for clarification and reduction of the viscosity of fruit juices, and for softening the tissues of fruits and vegetables. Potentially useful in the bioremediation of waste water from the processing of fruit juices.

Pectin methylesterases Alternative term for pectinesterases.

Pectins Polysaccharides present in all plant cell walls. Composed of chains of α-(1→4) linked D-polygalacturonate interspersed with (1→2)-L-rhamnose residues, usually found in a partially methyl esterified form. Also has side chains composed of neutral sugars. Major sources of pectins include citrus peel and apple pomaces. Pectins are hydrocolloids and form gels via cooling or enzymic action. Used as gelling agents, stabilizers and thickeners in beverages and semi-solid foods, such as jams and jellies.

Pectolytic enzymes Alternative term for pectic enzymes.

Peed Indian sweet made using khoa as the base material. There are regional variations in its manufacture techniques, with consequent effects on sensory and compositional properties. Generally, khoa and sugar are heated to the desired texture and then divided into portions (usually round balls) that are packed in paperboard boxes lined with greaseproof paper.

Pediocins Bacteriocins produced by several strains of Pediococcus spp. that are bactericidal against a wide range of Gram positive bacteria. Plasmid encoded pediocin A, synthesized by P. pentosaceus (FBB-61 and L-7230), has a wide host range against Gram positive bacteria. Pediocin AcH, synthesized by P. acidilactici H, is a plasmid encoded, hydrophobic, inhibitory protein with a molecular weight of 2700 Da that also has bactericidal potency against Gram positive bacteria. Some Gram negative bacteria can be made susceptible to pediocin AcH when they are sublethally stressed. Antibacterial activity of pediocin AcH is through destabilization of cytoplasmic membranes. Pediocin PA-1, synthesized by P. acidilactici PAC 1.0, is a plasmid encoded protein with a molecular weight of 16,500 Da. It is a broad spectrum bacteriocin that shows particularly strong activity against Listeria monocytogenes, and is used as one of the food preservatives. Both pediocin AcH and PA-1 are ribosomally synthesized. Bactericidal efficiency of pediocins varies greatly under different conditions.

Pediococcus Genus of Gram positive, facultatively anaerobic, coccolid lactic acid bacteria of the family Lactobacillaceae. Pediococcus acidilactici and P. pentosaceus are used as starters in the manufacture of fermented meat products and vegetable products (e.g. sauerkraut). P. inopinatus, P. dextranicus and P. damnosus may be responsible for spoilage of beer and wines. Certain Pediococcus species produce diacetyl, which gives a buttery aroma to some wines (e.g. Chardonnay) and some styles of beer.

Peel Rind of fruits and vegetables. A source of essential oils that may be used as flavourings, dietary fibre, pectins, vitamins and minerals. Peel from some sources, e.g. citrus peel, is used in foods and beverages, eaten candied or chocolate coated, processed into marmalades or incorporated into garnishes. The term also refers to a spade-like de-
vice used for moving loaves of bread or pizzas into or out of ovens.

**Peeling** Removal of the outer covering, or peel, from fruits or vegetables using knives or special peelers. Also commonly removal of the shell from hard boiled eggs.

**Pekmez** Traditional Turkish concentrated fruit juice based product usually made from grape juices, but also from other fruit juices.

**Pelargonium** Genus of plants which includes geraniums, essential oils from which may be used in foods and beverages as flavourings or antimicrobial agents.

**Pelmeni** Dumplings filled with meat or fish traditionally eaten in Russia.

**Pelschenke values** Scores that provide estimates of the potential breadmaking strength of wheat in relation to its gluten quality.

**Pelt 44** Alternative term for the fungicide thiophanate-methyl.

**Pemmican** Meat products consisting of small, pressed cakes of pounded dried meat, fat and fruits. The meat is mixed to a paste with melted fat and the other ingredients, before shaping into cakes and drying in the sun. Pemmican was originally made by North American Indians, but has subsequently gained popularity as a useful food for travellers, including Arctic explorers.

**Penamellera cheese** Spanish semi hard cheese made from cow milk, goat milk or ewe milk. A natural rind cheese with a nutty flavour and meaty aroma. The interior is dense with some small holes.

**Penetration** Process of entry and permeation into an item. Penetration tests are widely used as a simple way to determine yield stress of a product.

**Penetrometers** Instruments used for measuring the firmness of foods, especially fruits, on the basis of the depth of penetration of a probe under a known load.

**Penetrometry** Technique for measuring the firmness of foods, especially fruits, based on the depth of penetration by a probe under a known load.

**Penicillic acid** Mycotoxin produced by Aspergillus ochraceus and Penicillium viridicatum. May occur in a wide range of foods susceptible to spoilage by these fungi, including barley, corn, rice, cheese and fish.

**Penicillinas** Alternative term for β-lactamases.

**Penicillin G** Natural penicillin antibiotic produced by *Penicillium chrysogenum*. Active against Gram positive bacteria. Used for treatment of bacterial infections in all farm animals, particularly for control of mastitis in dairy cows and for treating infections of the gastrointestinal system and urinary and respiratory tract. Residues in milk and muscle tissues are rarely detectable beyond 5 days from the final treatment. Also known as benzylpenicillin.

**Penicillins** Group of antibiotics widely used to treat bacterial diseases in animals and constituting the most important group of antibiotics. Classified in four distinct groups: natural penicillins (including penicillin G); penicillinase-resistant penicillins (including cloxacillin and oxacillin); aminopenicillins (including amoxicillin and ampicillin); and extended spectrum or anti-pseudomonal penicillins (including piperacillin and carbenicillin).

**Penicillium** Genus of mitosporic fungi of the family Trichocomaceae. Widespread, being found in soil, decaying vegetation and the air. Some species, e.g. *Penicillium digitatum*, *P. expansum* and *P. implicatum*, can cause food spoilage, and some are capable of causing food spoilage at refrigeration temperatures. Some species produce mycotoxins, e.g. ochratoxin A, citrinin and patulin. Certain species are used in production of organic acids and penicillins, while others are used in cheesemaking, e.g. *P. camemberti* (Brie cheese, Camembert cheese) and *P. roqueforti* (Roquefort cheese, Stilton cheese).

**Penitrems** Tremorgenic mycotoxins produced by *Penicillium* spp. One of the most potent penitrems, penitrem A, is produced by several *Penicillium* species including *P. crustosum*, a ubiquitous spoilage fungus which is found in a wide variety of foods.

**Pentalan** Synonym for valeraldehyde. Organic compound present in many foods that has an unpleasant odour and a low odour threshold value. One of the main compounds that can cause off odour in sake.

**Pentane** One of the paraffins. Saturated aliphatic hydrocarbon composed of five carbon atoms and used as a solvent.

**Pentanedione** Ketone which occurs in the flavour compounds of foods and beverages, including beer, coffee and fermented dairy products. Also widely used as an analytical reagent, e.g. in the determination of formaldehyde. Synonym for acetylacetone.

**Pentanoic acid** Synonym for valeric acid. Volatile fatty acids comprising five carbon atoms and a single
carboxylic acid group. Contributes to the aroma of mature cheese. Uses include as a reactant in production of aroma compounds and flavourings. Also one of the main malodorous pollutants from livestock houses.

**Pentanol**  
Synonym for amyl alcohol. One of the higher alcohols, comprising five carbon atoms and a single alcohol group. Of importance in the flavour compounds fraction of alcoholic beverages. Forms part of the toxic fusel oils fraction of spirits. Used as a solvent and as a substrate for production of the flavouring amyl acetate.

**Pentosanases**  
Enzymes that hydrolyse pentosans. Includes xylan degrading enzymes and hemicellulases which are used in breadmaking for improving dough properties and loaf vol., and for extending bread shelf life. Also includes endo- and exo-arabanases (α-N-arabinofuranosidases), which are used in production of fruit juices.

**Pentosans Polysaccharides**  
Formed from pentoses. Found mainly in fibrous plant tissues, e.g. almond shells and cereals. Pentosan composition of cereals, such as wheat and rye, may influence grain texture.

**Pentoses Monosaccharides**  
Comprising five carbon atoms. Examples include the aldoses, ribose, arabinose and xylose, and the ketose, xylulose.

**Peonidin**  
One of the anthocyanidins, systematic name 3,4’,5,7-tetrahydroxy-3’-methoxyflavylium chloride. Glycosides of this compound are plant pigments which are present in red grapes, purple-flesh sweet potatoes and black rice. Name is derived from peonies, plants with violet-red flowers from which peonin, the 3,5-diglucoside of peonidin, has been obtained.

**Peppercorns**  
Whole dried berries from *Piper nigrum* or *Schinus molle* (black and red peppercorns, respectively). Used as culinary spices to impart a warm, aromatic flavour to foods.
Perilla seeds Oil-rich seeds produced by plants of the genus *Perilla*, especially *P. frutescens*.

Perishability Extent to which an item is perishable, i.e. having a short shelf life or deteriorating quickly during storage.

Perishable foods Foods with a short shelf life, such as milk, eggs, meat, fish and many fruits and vegetables.

Periwinkles Any of a number of small marine gastropod molluscs; abundant on rocky shores along Atlantic coasts. Several species are popularly consumed, including *Littorina littorea* (common or edible periwinkles), *L. obtusata* (smooth periwinkle), *L. irrora* (gulf periwinkles) and *L. angulifera* (southern periwinkles). Usually marketed fresh (in shell, cooked or uncooked).

Permeability Ability of items such as membranes or other barriers to permit fluids to flow through them. Permeability is an important indicator of membrane functionality, and is expressed as a volume flow of liquid through a unit area of membrane at some defined transmembrane pressure. Permeability of food packaging materials is important in relation to product shelf life. Modified atmosphere packaging of foods can involve use of films with various gas permeability coefficients.

Permeation Passage of fluids through items such as membranes, food packaging materials or other barriers, or, in chemical terms, the diffusion or penetration of ions, atoms or molecules through a permeable substance. In the food industry, knowledge of the level of permeation of gases through functional barriers such as packaging materials is important in relation to product shelf life.

Permethrin Non-systemic pyrethroid insecticide used for control of a wide range of insect pests in fruits and vegetables; also used to control biting insects in animal rearing establishments. Classified by WHO as moderately hazardous (WHO II).

Permissible levels Recommended limits for the amounts of particular contaminants (e.g. residues of veterinary drugs, heavy metals) that may be permitted in certain foods.

Pernod French aniseed-flavoured aperitifs, originally formulated as a substitute for absinthe.

Peroxidases Includes EC 1.11.1.7 and other members of subclass EC 1.11.1. These oxidoreductases are involved in ripening of fruits, enzymic browning and degradation of lignin by white-rot fungi. Industrial applications include use in time temp. indicators, such as those used for investigating inhibition of microorganisms during the thermal processing of low-acid foods, detection of phenols, cross-
linking of biopolymers, and bioremediation of processing effluents. In addition, the degree of inactivation of peroxidases can be used as an indicator of the extent of blanching in vegetables.

**Peroxidation** Formation of peroxides as a result of the action of oxygen. Lipid peroxidation refers to the oxidative degradation of lipids, in which free radicals take electrons from the lipids in cell membranes, resulting in cell damage. Plant and animal systems maintain complex systems of multiple types of antioxidants to protect cells. Examples include vitamin C, vitamin E, superoxide dismutases, peroxides and catalases.

**Peroxides** Compounds containing either the peroxide ion, e.g. sodium peroxide, or covalently bonded dioxygen (R-O-O-R), the simplest being hydrogen peroxide. Organic peroxides may be formed via autoxidation reactions or by direct oxidation, processes involved in the development of rancidity of fats and oils.

**Peroxide values** Measure of the number of millimoles of peroxide absorbed by 1000 g of oil or fat, used as an indicator of rancidity. As fats decompose, peroxides are formed. Chemically, peroxides are capable of causing the release of I from KI. Therefore, the amount of I released from KI added to a fat is a rancidity test. The more peroxide present, the more I released; hence, the higher the peroxide values.

**Peroxynitrite** Powerful oxidant with the formula ONOO⁻, formed by reactions between superoxides and nitric oxide. Causes oxidation damage in human cells. Food components that act as peroxynitrite scavengers may provide health benefits.

**Perry Cider**-like alcoholic beverages made by fermentation of pear juices, commonly prepared from special cultivars of pears.

**Persimmon juices** Fruit juices extracted from persimmons (*Diospyros kaki*).

**Persimmons** Fruits produced by *Diospyros kaki*. Contain moderate amounts of vitamin C, carotenes and sugars. Most varieties are orange in colour when ripe, with the appearance of tomatoes. Some varieties have an astringent taste, especially when unripe, due to high levels of tannins. Non-astringent fruits are eaten out of hand, cooked, candied or made into jams or jellies.

**Persipan** Product which is often used as an alternative to marzipan and is similar in composition, but is made using apricot kernels instead of almonds.

**Persulfates** Salts of peroxodisulfuric acid which are strong oxidizing agents. Ammonium persulfate and potassium persulfate are permitted food additives. Ammonium persulfate is a bakery additive, with uses including bleaching agents for starch and food preservatives. Potassium persulfate is used in defoaming agents. Alternative names include peroxy sulfates and peroxydisulfates.

**Peruvian carrots** Alternative term for arracacha.

**Peruvian parsnips** Alternative term for arracacha.

**Pervaporation** Membrane separation technique in which a liquid feed mixture is separated by partial vaporization through a non-porous, selectively permeable membrane. A vapour permeate and a liquid retentate are formed. Partial vaporization is achieved by reducing the pressure on the permeate side of the membrane (vacuum pervaporation) or, less commonly, by sweeping an inert gas over the permeate side (swep gas pervaporation). Vacuum pervaporation at ambient temperature using hydrophilic membranes is used to dealcoholize wines and beer, whereas hydrophobic membranes are used to concentrate aroma compounds such as alcohols, aldehydes and esters.

**Pesticides** Chemical substances used to kill plants, animals or other organisms that interfere with agricultural production or are harmful to humans. Major groups include herbicides (for control of unwanted plants), insecticides (for control of insect pests), fungicides (for control of pathogenic or spoilage fungi) and rodenticides (for control of rats, mice and other rodents). Many are non-specific and may be too toxic to organisms that are not considered pests. Some persist for long periods in the environment and can accumulate in the food chain. Residues in foods may represent a health risk to consumers.

**Pesto Sauces**, often served with pasta, the major ingredients of which are basil, garlic, nuts and olive oils.

**Pests** Organisms (typically rodents, insects and pathogens) that are regarded as harmful to humans, animals or plants.

**PET** Abbreviation for polyethylene terephthalate.

**Pet birds** Birds kept by humans for companionship or as a hobby. Housed in cages, on perches or in aviaries. Include parrots, budgies, cockatiels, canaries, finches, doves, pigeons and birds of prey. Eat a wide range of specially formulated bird foods.

**Pet chews** Chewy snack foods for dogs and cats. Usually given as pet treats rather than as an essential part of the animal’s diet. However, many contain health promoting ingredients, claiming to improve energy levels, wt. control, joint flexibility, coat shininess, digestion and the immune system. Dental chews are also widely available for dogs, improving dental health and breath freshness. Usually made from animal parts, such as tendons and cows’ ears, but vegetarian and...
**Pet fish**

**fish** versions also exist. Available in many shapes, including flat strips, twists and knots.

**Pet fish** Fish kept by humans as pets. Housed indoors in tanks and aquariums or outdoors in ponds. Goldfish are popular pet fish. Others include koi, tropical fish, scavengers, cichlids and brackish water fish. Eat a wide range of specially formulated and natural fish foods.

**Pet food additives** Ingredients added to pet foods to improve their physicochemical properties, sensory properties, shelf life and consumer appeal. Most pet food additives have been approved for use in human foods; however, regulations governing their use vary from country to country. Include anti-caking agents, drying agents, anti-gelling agents, lubricants, humectants, stabilizers, thickeners, sweeteners, texturizers, preservatives, antioxidants, flavourings and colorants.

**Pet foods** Foods specially formulated for pets. Include dried pet foods, canned pet foods, intermediate moisture pet foods, mixer pet foods and pet treats. May be fortified with vitamins and minerals. Also available are organic, vegetarian, raw and nutraceutical pet foods and premium products, which may also be fit for human consumption.

**Pet foods industry** An extension of the human food industry, whose focus is pets. Traditionally provided a convenient means by which slaughterhouse wastes unfit for human consumption could be turned into profit. However, the industry now provides markets for high quality pet foods, often containing ingredients suitable for humans. Dominated by a few major global companies, but many smaller companies catering to niche markets also exist. Private label companies also play a key role.

**Petitgrain oils** Essential oils extracted by steam distillation from the leaves and young branches of the bitter orange tree, Citrus aurantium. Used in flavourings for many foods, especially confectionery products.

**Pet nutrition** Study of the impact of pet foods and their components on pet health. A major factor influencing the design and formulation of commercial pet foods.

**Petroselinic acid** Monounsaturated fatty acid comprising 18 carbon atoms obtained from parsley seed essential oils. Systematic name cis-6-octadecenoic acid.

**Pets** Animals kept by humans for companionship, in contrast to those kept for economic reasons, such as livestock or working animals. Typical pets include cats, dogs, pet fish, pet birds, hamsters, gerbils, rats, mice, pet rabbits, arthropods and reptiles. Often eat specially formulated pet foods.

**Pet treats** Pet foods, mainly for dogs and cats. Dog treats include chews, dental sticks, dog ears, dried catfish skins, chocolate-style drops and products resembling cakes for humans. Cat treats include catnip leaves, biscuits, nibbles and tartar control products. Nibbles and chocolate-style drops also exist for hamsters, gerbils and pet rabbits. Some pet treats contain high levels of sugar and fats, so should be given sparingly.

**Petunidin** One of the anthocyanidins (flavonoids and red/blue pigments, the colour of which is pH dependent), systematic name 3,3’,4’,5,7-pentahydroxy-5’-methoxyxyflaviyium chloride. Glycosides of petunidin are plant pigments that are present in crops, including red grapes, blackberries, blueberries, purple fleshe sweet potatoes and black rice. Name is derived from blue petunia, a flowering plant from which the pigment petunin, the 3,5-diglucoside of petunidin, is obtained.

**PFGE** Abbreviation for pulsed field gel electrophoresis.

**pH** Measure of the degree of acidity or alkalinity of a substance. pH (an abbreviation for potential of hydrogen) is defined as the negative logarithm of the hydrogen ion concentration. The scale ranges from 0 (very strongly acid) to 14 (very strong alkaline). A neutral solution, such as pure water, at 25°C has a pH of 7.

**Phaeodactylum tricornutum** Species of microalgae of the family Phaeodactylaceae. Used in biotechnology for the production of polyunsaturated fatty acids, enzymes and pigments.

**Phaeophytins** Brown pigments produced by removal of magnesium ions from chlorophylls using limited hydrolysis. Present in green vegetables as degradation products of chlorophylls; degradation is accelerated by cooking or processing and thus may cause browning in vegetables or vegetable products.

**Phaffia** Genus of yeasts of the order Cystofilobasidiales. Phaffia rhodozyma (anamorph of Xanthophyllomyces dendrorhous) may be used in the production of astaxanthin, which is added to animal feeds to confer a reddish colour to fish flesh, poultry meat and egg yolks.

**Phages** Alternative term for bacteriophages.

**Phalsa** Small, round, dark-purple or nearly black fleshy fruits with a pleasantly acidic fibrous flesh. Botanical name is Grewia subinæqualis or G. asiatica. Native to India and Nepal, but also found in Australia. May be eaten fresh as a dessert, or made into syrups for use in the manufacture of soft drinks.
Phaltan  Alternative term for the fungicide folpet.

Phane  Product made from caterpillars of the emperor moth (Imbrasia belina Westwood) which feed on the mopane tree (Colophospermum mopane). Caterpillars are cooked after removal of the stomach contents and then either eaten immediately or as a snack after salting and drying. Consumed as a delicacy in Botswana and other parts of southern Africa.

Phanerochaete  Genus of fungi of the family Corticiaceae. Phanerochaete chrysosporium (white rot fungus) is used in the production of industrially important enzymes, particularly ligninolytic enzymes (e.g. lignin peroxidases).

Pharmacological properties  Properties of drugs and, in particular, the ways in which they interact with living systems. Includes their uses, composition, reactions, beneficial effects, pharmacokinetics, pharmacodynamics, therapeutic values and medical toxicology.

Phase behaviour  Activity of the various components of a mixture; of primary importance for food formulation and processing. For example, examination of the phase behaviour of fat mixtures (palm kernel oils, cocoa butter and anhydrous milk fats) can aid in the understanding of softening and bloom formation in compound coatings. Information regarding the phase behaviour properties of biopolymer systems may be useful in the design of new low fat foods.

Phaseolins  One of the major types of storage proteins (7S) of common beans (Phaseolus vulgaris).

Pheasant meat  Meat from pheasants, medium-sized, long-tailed sedentary game birds belonging to the Phasianidae family. Birds are hunted as game and also reared commercially for meat production. Meat is lean and dry, and is marketed fresh and frozen. Meat from female pheasants tends to be juicier and more tender than that from males; flavour of wild pheasant meat tends to be stronger than that of farmed birds. For optimum meat flavour and texture, it is recommended that pheasants are hung before cooking. The main method of cooking is roasting, or braising for older birds, but meat is also used in stews and soups.

Pheasants  Medium-sized, long-tailed sedentary game birds belonging to the Phasianidae family; there are several species. Pheasants are hunted for their meat. They are also reared commercially for pheasant meat production. Meat from female pheasants tends to be juicier and more tender than that from male pheasants. Flavour of wild pheasant meat tends to be stronger than that of farm-raised birds.

Phellinus linteus  Species of edible fungi of the family Hymenochaetaceae. Used for their medicinal properties in Asia and thought to have antitumour activity. Extracts used as functional ingredients in foods and beverages.

Phenanethrene  Polycyclic aromatic hydrocarbon consisting of three condensed benzene rings which is present in coal tar. Used in the manufacture of pigments. Detected as a contaminant in foods, including cheese, sea foods and cooked meat.

Phenethyl alcohol  Synonym for phenylethanol.

Phenethyl isothiocyanate  Also known as isothiocyanic acid. One of the isothiocyanates in Cruciferae (e.g. watercress) with anticarcinogenicity. Inhibits growth of lung, ovarian and breast cancer cells. Causes cell cycle arrest and induces apoptosis.

Phenobarbital  Barbiturate that is used mainly as an anticonvulsant drug for the treatment of all forms of epilepsy (except absence seizures) in animals.

Phenoxides  Alternative term for catechol oxides, laccases and monophenol monoxygenases.

Phenolic compounds  Alternative term for phenols.

Phenols  Group of organic compounds comprising at least one benzene ring that is covalently bonded to one or more hydroxyl groups. Phenols have wide distribution and applications, and are available in synthetic or natural forms, e.g. lignans and catechols. Uses include as disinfectants (cresols), in manufacture of azo dyes and plastics, and as flavourings (vanillin), antioxidants (sesamol and NDGA) and pigments (curcumin). Some phenols, e.g. chlorophenol, are also considered to be toxins.

Phenotype  Observable characteristics of an organism, either in total or with respect to particular traits, resulting from the interaction of the genotype and the environment.

Phenothoate  Broad spectrum, non-cumulative, organophosphorous pesticide. Classified by WHO as moderately hazardous (WHO II).

Phenylacetaldehyde  Aromatic aldehyde which has a sweet, floral aroma resembling hyacinths or lilacs. Occurs naturally in a wide range of foods and beverages. Applications include in aroma compounds and flavour compounds used in foods.

Phenylacetic acid  Volatile aromatic organic acid. Used in flavourings for foods such as bakery products, ice cream and sugar confectionery. Also a substrate for synthesis of other flavour compounds. Alternatively called α-toluuic acid and benzencacetic acid.

Phenylalanine  Essential amino acid with an aromatic side chain which is obtained in the diet from proteins, such as ovalbumins, lactalbumins and...
Phenylalanine ammonia-lyases

**phenylalanine ammonia-lyases** EC 4.3.1.24, formerly 4.3.1.5. Lyases which deaminate L-phenylalanine to form trans-cinnamate and ammonia. The reverse reaction can be used for production of L-phenylalanine, a precursor of **aspartame**. Involved in accumulation of **flavonoids** in **apples** and **enzymic browning** in **fruits**, and are markers of environmental stress in plant tissues, e.g. **chilling injury** and wounding.

Phenylethanol An aromatic alcohol, synonym **phenethyl alcohol**. This aroma compound has rose-floral characteristics and is present in several foods and beverages including **tomatoes**, **grapes** and **wines**, and in **essential oils** of orange blossom, rose and hyacinth. Used in food **flavourings** for imparting a mildly floral **flavour**. Synonymous with phenethyl alcohol.

Phenylketonuria Genetic disease (commonly abbreviated to PKU) in which patients are unable to metabolize the amino acid **phenylalanine**, a normal dietary constituent. The amino acid and its derivatives accumulate in the body and prevent proper **cognitive development**. The gene responsible for phenylketonuria is recessive, so a child is affected only if both parents are carriers of the defective gene. Infants with the disease need a special **diet** that contains little phenylalanine, which should be maintained until at least adolescence. A low phenylalanine diet is often recommended throughout life in combination with a specially designed formula to ensure adequate intakes of other **amino acids**.

2-Phenylphenol Organic compound consisting of 2 linked **benzene** rings and a phenolic hydroxyl group. Used primarily as a fungicide, particularly on **citrus fruits**, but also as a food preservative (E231). Also known as ortho-phenylphenol and biphenyl-2-ol.

Phenylpropanoids Plant **phenols** with C3 side chains. Include **flavonoids**, **coumarins**, **stilbenes** (e.g. **resveratrol**) and many **flavour compounds** (e.g. **eugenol**). Found in various **plant foods**, including **fruits**, **vegetables** and **essential oils** of **herbs** and **spices**. Possess **anticarcinogenicity** and **antioxidative activity**.

Pheromones Substances secreted by a species, which are recognized by members of the same species. Used for intraspecies communication, e.g. for attraction.

Phloretin One of the dihydrochalcone **flavonoids**. Particularly abundant in **apples**. Possesses **antioxidative activity** and may reduce risk of **cardiovascular diseases** and **cancer**.

Phloroglucinol Phenolic phlorotannin with the systematic name 1,3,5-benzenetriol. Antioxidative compound present in **wines**, **seaweeds** and other **plant foods**. May be involved in wine **ageing** and enzymic browning of **fruits** and **vegetables**. Also widely used as a laboratory reagent and in industrial chemical syntheses.

Phloxine Red **xanthene dyes** used as food **colorants**. Also known as Food Red No. 104.

**pH meters** Instruments for measuring the **pH** of a solution.

Phoenix Genus of **palms** that includes the date palm **Phoenix dactylifera**, the wild date palm **P. sylvestris** (used as a source of **sugar**) and the **sago** producing palm **P. acaulis**.

Pholiota Genus of edible **fungi** of the family Strophariaceae. Edible species include **Pholiota adiposa** and **P. nameko**, which is a common ingredient in **miso soups**.

Phoma Genus of **fungi** of the Ascomycota phylum. Some species (e.g. **Phoma herbarum** and **P. sorghina**) may cause spoilage of **fruits** (e.g. **melons**, **papayas** and **bananas**), **vegetables** (e.g. **beets**), **cheese** and **cereals** (e.g. **sorghum**, **barley**, **corn** and **rice**).

Phorate One of the organophosphate **pesticides** effective against a wide variety of **insects**, **mites** and some **nematodes**. Used particularly on **corn**, **potatoes** and cotton. Classified by WHO as extremely hazardous (WHO Ia).

Phosalone Non-systemic organophosphorus insecticide and acaricide used primarily for control of **insects**, particularly on **pome fruits** and **stone fruits**. Classified by WHO as moderately hazardous (WHO II). Also known as zolone.

Phosmet Non-systemic organophosphorus insecticide and acaricide which has been used to control sucking, chewing and boring **insects** on a range of **crops**. Also used as an animal ectoparasiticide. Classified by WHO as moderately hazardous (WHO II). Also known as imidan.

Phosphamidon Systemic organophosphorus insecticide and acaricide which has been used to control sucking, chewing and boring **insects** and **mites** on a wide range of **crops**. Banned or restricted in various countries. Classified by WHO as extremely hazardous (WHO Ia).

Phosphatases Members of group EC 3.1.3, these **esterases** hydrolyse phosphomonoesters, releasing
Phosphoglycerides Phosphate esters of glycerides.

Phospholipases Includes EC 3.1.1.32 (phospholipase A1), EC 3.1.1.4 (phospholipase A2), EC 3.1.4.3 (phospholipase C) and EC 3.1.4.4 (phospholipase D). These lipases hydrolyse phospholipids; phospholipases A1 and A2 hydrolyse sn-1 and sn-2 acyl esters, respectively, while phospholipases C and D cleave either side of the phosphodiester bond. Widespread in occurrence and thought to affect the integrity of biological membranes. Phospholipase D has been linked to chilling injury and decay in some fruits, whilst phospholipase C acts as a virulence factor in certain bacterial pathogens. Used industrially for production of emulsifiers, novel lecithins and other structured phospholipids with nutritional applications. Also used in cheesemaking, degumming of vegetable oils and for improving the softness of bread. Also known as lecithinas. Phospholipase B is included under lysophospholipases.

Phospholipids Lipids comprising a glycerol or sphingosine backbone esterified to two fatty acids and phosphoric acid or a phosphoric acid ester. Examples include phosphatidic acid, phosphatidylserine, phosphatidylinositol, phosphatidylethanolamine and lecithins.

Phosphopeptides Peptides containing one or more serine or threonine residues esterified to a phosphate group.

Phosphorescence Luminescence that persists after the cause of excitation has been removed.

Phosphoric acid Synonym for orthophosphoric acid. Acid produced by reaction of phosphates with sulfuric acid or by oxidation of phosphorus followed by addition of water. Permitted food additive that is used to acidify fruit juice beverages and cola beverages, and as a substrate for phosphates.

Phosphorus Mineral element with the chemical symbol P. Forms three different types of crystal structure, termed white, red and black phosphorus which also differ with respect to physical properties and reactivity.

Phosphorylases Members of EC 2.4. Enzymes that transfer glycosyl groups from donor compounds to inorganic phosphates.

Phosphorylation Addition of phosphate groups to molecules (e.g. proteins). A form of post-translational modification that occurs in vivo, altering activity of enzymes. May affect virulence of foodborne bacteria. Plays several important roles in

Phosphatides Salts or esters of phosphatidic acid.

Phosphatidic acid Simplest phospholipids, composed of glycerol esterified to two fatty acids and phosphoric acid. Also called diacylglycerol-3-phosphate. Inhibition of phosphodiesterases are classed as monoterpens. Substrates for these enzymes include the food additives trisodium phosphate, potassium phosphates, and polyphosphates.

Phosphatidylcholine One of the phospholipids and a major component of lecithins. Sometimes also referred to as lecithin.

Phosphatidylethanolamine Phospholipid produced by esterification of phosphatidic acid to ethanolamine.

Phosphatidylinositol Phospholipid formed by esterification of phosphatidic acid to inositol.

Phosphatidylinerine Phospholipid formed by esterification of phosphatidic acid to serine.

Phosphine Fumigant gas produced from phosphorus or metal phosphides.

Phosphodextrins Phosphate esters of dextrins.

Phosphodiestersases Family of hydrolases which catalyse the hydrolysis of phosphodiester bonds. Substrates for these enzymes in class EC 3.1.4.- include cyclic nucleotides, lecithins (phospholipases C and D), and sphingomyelin. Phosphodiesterases acting on nucleic acids, whose phosphate-sugar backbones are linked via phosphodiester bonds, are classed as nucleases. Involved in various physiological processes, and used for production of guanosine monophosphate (GMP) and inosine monophosphate (IMP), nucleotides used as flavour compounds. Inhibition of phosphodiesterases by polyphenols present in red wines has been linked with cardioprotective effects.

Phosphoglucomutases EC 5.4.2.2 (phosphoglucomutases) and EC 5.4.2.6 (β-phosphoglucomutases). The former isomerases convert α-D-glucose 1-phosphate to α-D-glucose 6-phosphate. Also catalyse, although more slowly, the interconversion of 1- and 6-phosphate isomers of many other α-D-hexoses, and the interconversion of α-D-ribose 1-phosphate and 5-phosphate. The latter convert β-D-glucose 1-phosphate to β-D-glucose 6-phosphate.
Phosphotransferases

**Human metabolism.** Oxidative phosphorylation involves the conversion of ADP to ATP.

**Phosphotransferases** EC 2.7. Transfases that mainly transfer phosphates from a donor to an acceptor that may be an alcohol (EC 2.7.1), a carboxyl group (EC 2.7.2), a nitrogenous group (EC 2.7.3) or a phosphate group (EC 2.7.4). Other subgroups include diphosphotransferases (EC 2.7.6), nucleotidyltransferases (EC 2.7.7) and protein kinases (EC 2.7.10 to 2.7.13 and 2.7.99).

**Phostoxin** Compound used, typically in pellet form, for the fumigation of foods and feeds in storage. Comprises aluminium phosphide, which releases phosphine gas on contact with moisture. May be added directly to feeds and raw commodities (e.g. cereals, coffee beans and nuts) stored in bulk, or used without direct contact to treat these commodities in smaller quantities or after processing. Brewers' rice, malt and corn grits for beer manufacture are the only processed foods for which direct contact with the pellets is permitted. Finished products fumigated with Phostoxin must be aerated for 48 hours before they are offered to consumers.

**Phosvitin** Phosphoproteins found in egg yolks. Possess antioxidative activity.

**Photobacterium** Genus of facultatively anaerobic, coccoid or rod-shaped Gram negative bacteria of the family Vibrionaceae. Occur in sea water, the gastrointestinal tract of fish and marine animals, and the luminous organs of certain fish and cephalopods. Photobacterium phosphorum may be responsible for the spoilage of fish and fish products.

**Photocolorimetry** Colorimetry technique in which results obtained using a colorimeter are recorded permanently using photography.

**Photodensitometry** Technique used to determine the density of a substance by examination of photographic negatives. Used in combination with chromatographic techniques, such as thin layer chromatography, and gel electrophoresis to quantitate separated components. Also used widely in medicine, where it is known alternatively as radiographic absorptiometry, to assess bone mineral changes.

**Photolysis** Cleavage of one or more covalent bonds in a molecule due to the absorption of energy from light or some other form of electromagnetic radiation (e.g. UV radiation or X-rays).

**Photometry** Science of visual radiation and the theory of its measurement. Luminous quantities can be measured by the human eye, while radiant quantities are measured by devices sensitive to electromagnetic energy. Photometric measurements are performed using photometers equipped with photoelectric cells of various types and sensitivities.

**Photooxidation** Oxidation reactions initiated by the presence of light.

**Phoxim** Organothiophosphate pesticide used in veterinary medicine to control mites, lice and other parasites. Classified by WHO as moderately hazardous (WHO II).

**Phthalic acid** Aromatic organic acid with the systematic name benzene-1,2-dicarboxylic acid. Used for manufacture of pigments and phthalic acid esters.

**Phthalic acid esters** Esters of phthalic acid which have uses as plasticizers, e.g. in food packaging materials. Migration from the packaging materials into packaged foods or beverages can occur.

**Phulka** Puffed unleavened Indian bread made from wheat flour and similar to tortillas. Eaten warm as an accompaniment to curries.

**Phycocyanin** One of the light harvesting pigments produced by cyanobacteria, e.g. *Spirulina platensis*. Used in natural colorants for foods such as chewing gums and ice cream. Blue in colour. Also exhibits antioxidative activity.

**Phycoerythrin** One of the light harvesting pigments, this one produced by red algae, cyanobacteria and cryptomonad algae. Used in natural colorants to provide red colour.

**R-phycoerythrin** Red phycobiliprotein pigment found in certain red algae that consists of two polypeptide chains each linked covalently to an open-chain tetrapyrrole chromophore. Phycoerythrins are useful as colorants in foods.

**Phyllophora** Genus of red seaweeds occurring on rocky coastlines around the world. Some species are utilized by the food industry as a source of carrageenans.

**Phylloxine** Synonym for vitamin K₁. Fat-soluble vitamin found in all green plants. Especially abundant in alfalfa and green leafy vegetables. Essential for production of prothrombin, and several other proteins involved in the blood clotting system, and the bone protein osteocalcin. Deficiency causes impaired blood coagulation and haemorrhage.

**Phyllophora** Genus of plant-eating insects of the family Phylotheridae. *Phylloxera vitifoliae* is a serious grapevine pest.

**Physical activity** Any form of exercise or movement that results in the expenditure of calories. Includes sports as well as lifestyle activities. Regular physical activity, combined with a healthy diet, is associated with a number of health benefits, including control of body weight, reduced risk of overweight and obesity.
and prevention of several diseases. Numerous products are available that are claimed to enhance exercise performance, including sports foods, sports drinks, performance drinks and sports supplements.

Physical properties Characteristics of substances that do not involve a chemical change, such as density, electrical properties, mechanical properties and optical properties.

Physicochemical properties Characteristics of chemical systems determined by application of physical principles, i.e. the physical properties of chemical compounds. Also used to collectively refer to a combination of properties pertaining to physics and chemistry.

Physics The study of systems and their interactions with one another, in terms of the interrelationship between matter and energy, without reference to chemical change. Traditionally divided into the study of mechanics, electricity and magnetism, heat and thermodynamics, optics and acoustics. More modern aspects include quantum mechanics, relativity, nuclear physics, particle physics, solid-state physics and astrophysics.

Physiological effects Effects that products or their components have on human physiological processes.

Physiology Study of the function of biological processes within living organisms. Broken down into the study of the function of particular organs. The concept of homeostasis, the regulation of the internal environment within certain parameters, is central to this science.

Phytases EC 3.1.3.8 (3-phytases) and EC 3.1.3.26 (4-phytases). Enzymes that dephosphorylate phytates. Antinutritional factors found in beans and bran products. Can be used to increase the nutritional properties of beans and cereal products by increasing the bioavailability of phosphorus and other minerals.

4-Phytases EC 3.1.3.26. Phosphoric monoester hydrolases which catalyse hydrolysis of myo-inositol hexakisphosphate (phytic acid) to release 1d-myoinositol 1,2,3,4,5-pentakisphosphate and phosphate. Used for reducing contents of phytates, which are considered antinutritional factors, in foods, particularly cereals, nuts and legumes and products prepared from them, to improve their nutritional values. Also known as 6-phytases and phytate 6-phosphatases.

Phytates Salts or esters of phytic acid containing inositol and phosphates as the base. Especially abundant in the outer layer of cereals, in dried legumes and some nuts as both water-soluble salts (sodium and potassium) and insoluble salts of calcium and magnesium. Phytates may decrease absorption of calcium, zinc and iron from the intestine.

Phytic acid Hexaphosphoric acid ester of inositol present mainly in cereal grain, nuts and legumes.

Phytoalexins Organic nitrogen compounds produced by plants in response to infection or injury, which exhibit antimicrobial activity.


Phytochrome Protein bound pigment of plants which regulates flowering in response to light.

Phytoene One of the carotenoids. High amounts found in sweet potatoes, oranges, grapefruit, peppers, tomatoes, papayas, grapes, saffron and tea. Possesses anticarcinogenicity.

Phytoestrogens Non-steroidal, non-nutrient compounds occurring naturally in plants which possess oestrogenic or anti-oestrogenic activity via binding to oestrogen receptors. Examples include isoflavonoids and lignans, which are present in tea, coffee, cereals, fruits, vegetables (especially soybeans) and alcoholic beverages.

Phytofluene One of the carotenoids found in orange and red fruits and vegetables, especially tomatoes.

Phytohaemagglutinins Lectins produced by plants and present in beans, particularly red kidney beans. Cause agglutination of mammalian erythrocytes and leukocytes, influence the transport of proteins across cell membranes and have mitogenic effects. Responsible for the poisoning that may occur if certain beans are eaten raw. Levels are greatly reduced by cooking.

Phytohormones Chemicals produced by plants which regulate plant physiology. Produced in various parts of the plant and generally have no specific target organs, but act on various plant tissues.

Phytophthora Genus of parasitic microorganisms of the group Oomycetes and the order Peronosporales in the stramenopile taxonomic group. Responsible for several diseases of fruits and vegetables. Phytophthora infestans causes late blights of potatoes, P. syringae and P. cactorum cause storage rots of apples and pears, P. citrophthora causes storage rot of citrus fruits, P. fragariae causes red root rot of strawberries, P. palmivora causes rot of coconuts and betel nuts, and P. sojae causes root rot in soybeans.

Phytostanols Hydrogenated phytosterols found naturally in only small amounts in plants, but produced commercially by hydrogenation of naturally occur-
Phytoestrogens

Phytoestrogens are phytoalexins that, due to their hypocholesterolaeic activity, are used in functional foods and beverages, generally in the form of stilbenes.

Phytoestrogens are steroid alcohols present in plants, particularly in oils and waxes. They have hypocholesterolaemic activity and are thus used in functional foods, such as specially formulated margarines and spreads. Examples include vitexin and isovitexin.

Picante cheese

Picante cheese is hard or semi-hard spicy cheese made in Portugal from mixtures of goat milk and ewe milk. Also called Picante da Beira Baixa cheese.

Picatannol

Picatannol is a hydroxylated stilbene analogue of resveratrol found in various foods, including red wines and blueberries. It protects DNA from oxidation damage, but may act as an oestrogen receptor agonist under certain conditions.

Pichia

Pichia is a genus of yeast-like ascomycetous fungi of the family Saccharomycetaceae. Occur in tree exudates, faeces and skin. Species may cause spoilage of wines, sauerkraut and delicatessen foods. Pichia farinosa and P. fermentans are involved in cocoa fermentation. The anamorphs of some Pichia spp. are Candida spp. P. pastoris is used as an expression system in molecular biology. Species of the obsolete genus Hansenula have been reclassified into the Pichia genus.

Picking

Picking is an alternative term for harvesting. Generally refers to manual, rather than mechanical, gathering of crops.

Pickled cheese

Pickled cheese is cheese that is ripened in brines. Curd is cut into pieces that are put into containers filled with brine or salty whey and left to ripen for several months. Examples of this type of cheese include Feta cheese, Domati cheese, Brinza cheese and Kareish cheese. Also known as brine ripened cheese.

Pickled cucumbers

Pickled cucumbers are alternative term for cucumber pickles.

Pickled eggs

Pickled eggs are products prepared by pickling hard boiled eggs in solutions usually of vinegar mixed with flavourings. As well as eggs from chickens, duck eggs and quail eggs are commonly used.

Pickled onions

Pickled onions are small onions (commonly pearl onions) pickled in vinegar mixture or brines. Used as a condiment or garnish.

Pickles

Pickles are foods preserved by pickling in liquids such as vinegar or brines, usually containing spices to enhance flavour. Can be made from vegetables, fruits, meat, eggs or nuts. Popular pickled foods include sauerkraut, cucumber pickles and chutneys.

Pickling

Pickling is the preservation of foods in a pickling liquid such as vinegar or brines, often containing spices. Foods commonly preserved in this way include vegetables, fruits, meat, eggs or nuts. Pickles can be of various flavours, and can be sweet, savoury or spicy.

Picloram

Picloram is a selective systemic herbicide used for control of many annual and perennial broad-leaved weeds around monocotyledonous plants. May be used as a plant growth regulator. Classified by WHO as unlikely to present acute hazard in normal use. Also known as tordon.

Pidan

Pidan is alkali-treated preserved duck eggs. Prepared by storing fresh duck eggs under a mixture of caustic soda, burnt straw ash and slaked lime for several months, until the egg whites and egg yolks coagulate and become discoloured. Also known as Chinese eggs or thousand year eggs.

Pie fillings

Pie fillings are sweet or savoury preparations used as fillings for pies. Prepared fillings based on ingredients such as fruits, meat or vegetables and containing seasonings and other additives are available commercially.

Pies

Pies are bakery products consisting of a pastry case filled with either a sweet or savoury mixture and baked until the crust is crisp. May be topped with pastry or an alternative such as mashed potatoes, or may have no top.

Pigeon meat

Pigeon meat is meat from wild and domesticated pigeons. Among the various cuts from pigeon carcasses, breast meat constitutes the largest portion followed by the wings, back, neck, thighs and drumsticks. Pigeon meat is relatively fatty and has a higher energy value than chicken meat; it is also darker in colour than chicken meat.

Pigeon peas

Pigeon peas are seeds produced by Cajanus cajan. Grow in long, twisted pods and are usually greyish in colour. Young seeds are eaten as a vegetable, but mature seeds are often dried and split, eaten as dhal in India. Green pods may also be used as vegetables and seeds can be germinated to produce sprouts. May be used instead of soybeans to make tempeh. Also known as red gram.

Pigeons

Pigeons are various stout bodied, fruit- or seed-eating birds belonging to the Columbidae family; there are many species. Pigeons are hunted and farmed for pigeon meat. Young unfledged pigeons are called squabs.

Pigging

Pigging is the cleaning of pipes or ducts in processing equipment, including that in food factories, by forcing a tightly fitting, flexible object, such as a brush,
blade or swab (pig), through the pipeline in order to scrape or push out the residual contents.

Pigments **Colour** that a substance exhibits, due to the presence of pigments.

Pigments _Compounds, usually fine, solid particles, that give colour or other properties to a tissue, object or substance. For example, chlorophylls impart a green colour to _lettuces_ and _peas, carotenes_ are responsible for the orange colour of _carrots, lycopene_ gives the red colour to _tomatoes, anthocyanins_ contribute the purple colour of _grapes_ and _blueberries_, and _oxymyoglobin_ gives the red colour to _meat_. Pigments are sensitive to chemical and physical effects during food processing, and to chemical change during ripening. Pigments may also be added intentionally to foods in the form of food colorants._

Pigs _Specific types of swine_. Domesticated omnivorous ungulates, which are related to the wild boar (_Sus scrofa_) with some crossing with the Chinese type (_Sus indicus_). Pigs are kept for _bacon, ham_ and _pork_ production. Commercial farming systems commonly produce four classes of pigs, namely: _pork_ (also known as _porkers_) usually slaughtered at about 19 weeks of age; _bacon_ (also known as _baconers_) usually slaughtered at about 24 weeks of age; _cutters_ usually slaughtered at about 23 weeks of age; and _heavy hogs_ usually slaughtered at about 27-28 weeks of age. Pig performance and carcass confirmation are optimized by selective breeding and feeding, especially in _bacon_ pigs.

Pike Any of several _freshwater fish_ species in the genus _Esox_; distributed across Europe and North America. Valued as a food fish in some regions, where it is utilized fresh or frozen. Also known as _pickerel_ in North America.

Pilchards Any of a number of small _herring_-like _marine fish_ species in the family Clupeidae; worldwide distribution. Many species are also referred to as _sardine_; the term _pilchards_ generally refers to larger individuals within the species. Commercially important species include _Sardina pilchardus_ (European pilchard), _Sardinops caerulea_ (Californian pilchard) and _S. melanosticta_ (Japanese pilchard). Marketed fresh, smoked, salted and dried; particularly popular as a canned product in various _sauces_ or _oils_.

Pili Thin hair-like structures on the surface of many _bacteria_. Composed of oligomeric _pilins_. Long _pili_ play a role in bacterial conjugation and _gene transfer_. Short _pili_ are involved in _adherence_ and are also known as _fimbriae_. Can be important _virulence factors_ in _pathogens_.

**Pilins** Fibrous _microbial proteins_ which make up the structures of _bacterial pili_ and _fimbriae_.

Pimaricin Alternative term for the fungicide _nata- mycin_.

Pimento Alternative term for _allspice_.

Pimento peppers _Large red peppers_ (_Capsicum annuum_). Flesh is more aromatic and sweeter than that of _bell peppers_. Available fresh, canned and bottled. Used as a stuffing for green _olives_. Dried fruits are used as a source of _paprika_. Also known as _pimento peppers_.

Pimiento peppers Alternative spelling for _pimento peppers_.

Pineapple juices _Fruit juices_ extracted from _pineapples_ (_Ananas comosus_).

Pineapple nectars _Fruit juice beverages_ made by addition of water and/or _sugar_, and optionally other ingredients, to _pineapple juices_.

Pineapples _Fruits_ produced by _Ananas comosus_. Good source of _potassium_ and _fibre_, and contain moderate amounts of _sugars_ and _vitamin C_. Consumed fresh, dried or canned, and used to make _pineapple juices_ and _jams_. Pineapple juices can be further processed into _vinegar_ or _spirits_. Fruits and stems of the plant contain _bromelains, proteinases_ used for the _tenderization of meat_ and for chill proofing _beer_ to prevent _haze_.

Pine needles Needles produced by plants of the genus _Pinus_, extracts of which have health promoting properties including _antioxidative activity_ and _antimicrobial activity_. May be used to make beverages, including _teas_, which are rich in _vitamin A_ and _vitamin C_.

Pinenes _Terpenoids_ and _flavour compounds_ with a _camphor-like aroma_ frequently present in _essential oils_. Used for manufacture of synthetic pine oil.

Pine nuts _Nuts_ produced by _Pinus_ spp. Found on the woody scales of female pine cones. Removal is labour-intensive, making the nuts expensive. Eaten raw or roasted, or used in savoury and sweet dishes.

Pink salmon Smallest of the _Pacific salmon_ species (_Oncorhynchus gorbuscha_); found in rivers and coastal waters along western and eastern Pacific coasts. Mostly sold canned but also utilized fresh, smoked and frozen; _roes_ are used as _caviar substitutes_, especially in Japan.

Pinto beans _Type of common beans_ (_Phaseolus vulgaris_).

**Pinus** _Genus of plants_ of the family _Pinaceae_, commonly known as _pines_. The inner bark (cambium) can be eaten or ground into powder and used as _thickeners_ for _soups_. _Pine needles_ are steeped to make
Piperine Organic nitrogen compound derived from piperine by heating. Present in pepper in small amounts.

Piperine One of the alkaloids and flavour compounds isolated from black pepper, this one primarily responsible for pungency. Used in flavourings for products such as brandy, as well as in insecticides. This compound improves the absorption of nutrients (e.g. vitamin B6, β-carotene and selenium) from foods and aids thermogenesis.

Piperonyl butoxide Chemical substance used primarily as a synergist for enhancing the toxicity of pyrethroid insecticides through inhibition of cytochrome P450 detoxification enzymes. Also used as a food additive in Japan (as a preservative for cereals and legumes). Classified by WHO as unlikely to present acute hazard in normal use.

Pipes Tubes of various diameters through which substances, including gases and liquids, can flow. Usually made of metal or plastic. Used to convey ingredients and products during processing of foods.

Pips Alternative term for small seeds, usually applied to those within fruits.

Pirimicarb Selective systemic carbamate insecticide. Used to control aphids and other insects in a wide range of plants, including cereals, fruits and vegetables. Classified by WHO as moderately hazardous (WHO II).

Pirimiphos-methyl Broad-spectrum organophosphorus insecticide and acaricide used to control a wide range of insects and mites in fruits, vegetables, cereals and sugar cane. Also used for pest control in stored grain and in animal houses. Classified by WHO as slightly hazardous (WHO III).

Piscicides Chemical substances used for control of undesirable fish species, normally non-indigenous species that have been introduced to lakes or river systems. Rarely used in practice, mainly due to their tendency to harm many other organisms in addition to target species. Examples include antimycin and rotenone.

Piscicolins Plasmid encoded nonantibiotic bacteriocins synthesized by Carnobacterium piscicola. Small hydrophobic peptides that are moderately heat stable. Activity is not affected by exposure to pH values in the range 2 to 8. The antibacterial spectrum of the bacteriocins produced by C. piscicola includes various genera of lactic acid bacteria and generally also includes Listeria monocytogenes. Gram-negative bacteria are not inhibited.

Pisco South American spirit made by distilling Muscat grape wines.

Pistachio nuts Nuts produced by Pistacia vera. Shells split as the nut matures, making the kernels easy to remove. Kernels are green and have a unique flavour that makes them a popular constituent for a range of sweet and savoury dishes. Also eaten raw or roasted and salted in their shells. Rich in calcium, phosphorus, iron, thiamin and vitamin A.

Pita bread Round or oval, flat bread originating from the Middle East. Made from yeasts-leavened dough, which expands when baked to form a pocket which can be opened and filled to form a sandwich. Alternative spelling for pitta bread.

Pitayos Pink to red or yellow-orange fruits produced by several species of cacti, including Hylocereus spp. and Stenocereus spp. The white or red juicy flesh is full of tiny seeds. Eaten out of hand, and used in preserves, sorbets and beverages. Also called pitayas, pitahayas and dragon fruits.

Pito Traditional African alcoholic beverages made by fermentation of mashes based on cereals.

Pitta bread Alternative spelling for pita bread.

Pizza dough Yeasts-leavened dough used to make the base for pizzas.

Pizza fillings Foods used to top pizzas. Include tomatoes, mozzarella cheese, salami and sea foods.

Pizzas Baked tarts of Italian origin composed of a flat base of yeast dough topped with seasoned tomato sauces, cheese (usually mozzarella cheese) and other foods such as salami, olives, vegetables and sea foods. Traditionally baked rapidly in wood burning ovens and served hot.

PKU Abbreviation for phenylketonuria.

Plaice Generally refers to the marine flatfish species (Pleuronectes platessa; European plaice), found in the northeast Atlantic, where it is a highly valued food fish. Other plaice species include P. quadrituberculatus (Alaska plaice) and Hippoglossoides platessoides (American plaice). Marketed live (on ice), fresh (gutted or fillets), frozen or smoked.

Plankton General name given to animal (zooplankton) or plant (phytoplankton) organisms which float more or less passively in large bodies of freshwater and in oceans. The majority of planktonic organisms are microscopic. Forms the primary food base for larger aquatic organisms.
Plantains Fruits resembling bananas produced by *Musa paradisiaca*. Larger, firmer and starchier than bananas and usually eaten cooked (e.g. fried, baked or boiled). When green, the cooked fruit tastes like potatoes, but as it ripens, it becomes sweeter, black skinned fruits being used for dessert recipes. Very ripe fruits may also be consumed raw. Rich in vitamin A.

Plantaricins The wide range of bacteriocins synthesized by *Lactobacillus plantarum*. Includes plantaricin A, which is bactericidal towards some lactic acid bacteria, but is not active against other Gram positive bacteria or Gram negative bacteria, and plantaricin B, which has a narrow inhibitory spectrum against only a few strains of lactic acid bacteria. Many others exist, such as plantaricins C, S, T, W, C19, SA6, LP84, KW30, BN, NC8, 423 and 149.

Plant density The density at which plants are cultivated. The spacing between crops during cultivation can affect factors such as growth and development, plant biomass, yield, shading, abundance of pests and microclimate.

Plant diseases Adverse effects in plants caused by infection with bacteria, viruses or fungi, or by infestation with pests. Can affect the growth and survival of the whole plant and quality of the fruits and other edible parts it produces.

Plant disorders Adverse effects in plants caused by abiotic factors, such as environmental, nutritional and physiological conditions. As with plant diseases, the plant and quality of its product can be affected.

Plant extracts Products obtained from plants by extraction. Appropriate solvents are employed to recover active ingredients from the plant tissue. Certain extracts provide a source of phytochemicals for use in nutraceuticals and functional foods.

Plant foods Foods derived from plant sources.

Plant growth regulators Chemicals that affect growth of plants. Include endogenous compounds, i.e. phytohormones, and exogenously applied chemicals, such as herbicides and antipsprouting agents.

Planting Placing of plants in the ground so that they can take root and grow. Date and density of planting can affect growth of the plants and the yield and quality of produce.

Plant proteins Proteins sourced from plant material as opposed to animal products. Include vegetable proteins and cereal proteins. Preferred by some consumers due to health benefits. Quality of plant proteins, especially with respect to amino acids composition, varies according to source, but many plant breeding programmes have aimed to improve protein quality of individual crops. Legumes, particularly soybeans, are especially rich in protein.


Plasma Liquid component of blood in which blood cells (e.g. leukocytes and erythrocytes) are suspended. Comprises approximately 90% water and 10% other substances, mainly proteins. Further constituents include salts, lipids and glucose. Straw yellow in colour.

Plasmids Autonomously replicating, extrachromosomal, covalently closed, circular molecules of DNA found in bacteria, fungi, algae and plants. In bacteria, they often carry genes conferring antibiotic resistance. Usually non-essential for cell survival under non-selective conditions and may integrate into the host genome. Used widely as expression and cloning vectors.

Plasmin EC 3.4.21.7. One of the serine endopeptidases that cleaves preferentially after Lys and Arg residues. Derived from plasminogen by the proteolytic action of plasminogen activators, it is responsible for digestion of fibrin in blood clots. It is also the predominant native proteinase in milk where it hydrolyses casein, with both desirable and undesirable effects on product quality. Important in ripening of cheese and can be used to alter the functional properties of milk proteins.

Plasminogen The inactive precursor of plasmin.

Plasminogen activators EC 3.4.21.68 (t-plasminogen activators) and EC 3.4.21.73 (u-plasminogen activators). The latter are also known as urokinas. Serine proteinases that differ in structure but which both cleave Arg-Val bonds in plasminogen to form plasmin. Their presence in milk can have significant effects on product quality. Have been associated with invasion of cells by certain pathogens.

Plasteins Proteins produced by action of proteinases on protein hydrolysates (peptides). Plastein reactions, i.e. transpeptidation and condensation reactions, have been used to improve nutritional quality, sensory properties and/or functional properties of proteins, such as fish proteins, soy proteins and whey proteins.

Plasticity Extent to which a substance can be deformed as a result of application of a stress. When stress is applied in excess of a certain value (yield point), deformation is permanent. Below a certain stress, the elastic limit, most substances will recover.
**Plasticizers**  Substances that are capable of imparting flexibility to non-plastic materials or improving the flexibility of ceramic mixtures. Added during the manufacturing process to decrease brittleness and to promote plasticity. Applications within the food industry include the production of food packaging films from plastics such as polyvinyl chloride.

**Plastics**  Synthetic materials made by polymerization, polycondensation, polyaddition or other similar processes from molecules with a lower molecular weight, or by chemical alteration of natural macromolecules. Can be formed into different shapes while soft, generally when heated, and then set into a slightly elastic or rigid form. Synthetic organic polymers which are used as the basis of plastics are referred to as resins. Early plastics were used to make imitations of other materials, but they are now appreciated widely for their own range of useful thermal, electrical, optical and mechanical properties. Major applications of plastics include their use in containers, packaging materials, construction materials, consumer items, adhesives, pipes, textiles and electronic components. Types of plastics used commonly for packaging of foods include polyethylene, polyvinyl chloride and nylon.

**Plastics bags**  Bags made from plastics. Used widely as containers for particulate and solid foods.

**Plastics bottles**  Bottles made from plastics. Used widely as containers for liquid foods and beverages.

**Plastics films**  Packaging films, such as cellulose films and polyethylene films, made from plastics. Used to wrap or to make containers for foods.

**Plate counts**  Estimations of the numbers of microorganisms in a sample, by means of culturing a solution of the sample on agar plates and counting the number of microbial colonies that grow.

**Platelets**  Fragments of cells found in the blood of vertebrates that are involved in the formation of blood clots. A higher than normal platelet count is associated with increased risk of cardiovascular diseases while a low count can lead to extensive bleeding.

**Plesiomonas**  Genus of facultatively anaerobic, rod-shaped **Gram negative bacteria** of the family **Enterobacteriaceae**. Occur in surface waters, soil, fish, shellfish, aquatic animals and mammals. **Plesiomonas shigelloides** is responsible for **gastroenteritis** in humans due to consumption of contaminated food (e.g. fish and shellfish) or water.

**Pleurotus**  Genus of basidiomycetous **edible fungi** of the family Pleotaceae, that grows on logs in shelf-like layers. Includes the commercially important oyster mushrooms (*Pleurotus ostreatus*). Has a delicate flavour and texture. Cap colour varies with age. Can be eaten raw or cooked.

**Plumcots**  Fruits that are a hybrid cross between plums and apricots, with the combined flavour of each fruit.

**Plum juices**  Fruit juices extracted from plums (*Prunus domestica*).

**Plums**  Stone fruits produced by plants of the genus *Prunus*. Vary widely in flesh and skin colour and flavour, according to variety. Contain about 10% sugar and are rich in potassium. Available fresh or canned; dried fruits are known as prunes. Eaten out of hand and used in desserts, jams and jellies. Also used to make liqueurs and spirits, such as slivovitz.

**Plutonium**  One of the radioelements, chemical symbol Pu. Isotopes with atomic masses of 228-247 have been identified. Can occur as a low-level contaminant in foods and drinking water.

**Pneumatic conveyors**  Conveyors containing or operated by air or gas under pressure.

**Poffertjes**  Small pancakes originating from Holland. Usually served hot with icing sugar and butter.

**Pogonias**  Genus of marine fish containing several species of **croakers** (drum). The most commercially important species is *Pogonias cromis* (black drum); distributed along the Atlantic seaboard of North and South America. Marketed fresh and frozen.

**Poi**  Dish made by fermentation of cooked taro that has been pounded to a paste.

**Polar compounds**  Compounds that are ionic or are made up of molecules with a large permanent dipole moment. Commonly used as indicators of oil quality. During repeated heating of frying oils in the presence of oxygen, water and foods, triglycerides are broken down into polar compounds such as free fatty acids, monoglycerides, diglycerides, glycerol and polymers. Such decomposition products have a negative effect on the flavour and nutritional quality of the fried foods. To avoid deterioration in food quality and possible health effects for consumers, there are regulations in force in some countries specifying limits for total polar compound levels in frying oils. Once these values have been reached, the oils are prohibited for use in food processing. Polar compound profiles can also be used in detection of adulteration of oils such as virgin olive oils with less expensive types.

**Polarimetry**  Technique in which the identity and quantity of a substance are determined from its effect on the direction of vibration of polarized light.
Polarization  Restriction of the waves of electromagnetic radiation, including light, to one plane or one direction. This property is not directly perceived by the eye but can be detected, in the case of light, by its behaviour after it has interacted with polarizers. Measurement of the degree of polarization of electromagnetic radiation coming from an object reveals valuable information not only about that object but also about any material lying between the object and observer.

Polarography  Electrochemical technique in which current flowing through an electrolysis cell is measured as a function of the potential of the working electrode.

Pole beans  Type of common beans (Phaseolus vulgaris).

Polenta  Thick porridge of Italian origin made with ground corn or sometimes barley which is boiled in water or stock. Eaten hot with cheese, gravy, butter or oils, or tomato-based sauces. Alternatively, may be cooled, cut into shapes, and baked or fried.

Policosanols  Very long chain aliphatic alcohols derived mainly from sugar cane. Used as ingredients of nutraceutical foods and food supplements to reduce plasma cholesterol levels.

Polioymelitis  Infectious disease of the central nervous system which may result in muscle paralysis. Caused by a picornavirus, which is excreted in the faeces of an infected person; the disease is most common where sanitation is poor.

Polioviruses  Single stranded RNA viruses of the genus Enterovirus within the family Picornaviridae responsible for poliomyelitis in humans. Transmission may be through the faecal-oral route via contaminated food or water.

Polishing  Process in which a surface is made shiny and smooth by rubbing against abrasive materials such as metal, rock or wood. With reference to rice, polishing is the final stage in milling, in which hulled and pearled rice is spun in cones that are lined with leather or sheepskin. The fully processed form is called polished rice.

Pollack  Marine fish species (Pollachius pollachius) from the cod family (Gadidae); distributed across the northeast Atlantic. Flesh is dry with a delicate, somewhat sweet flavour. Marketed fresh (whole, gutted or fillets) or salted.

Pollen  Granules produced in the anthers of seed forming plants that contain the male gametes.

Pollination  Transfer of pollen from the anther to the stigma of a flower, constituting the first step in the production of fruits or seeds.

Pollock  Alternative term for coalfish, or saithe.

Polonium  Radioactive element, chemical symbol Po. Isotopes of Po have relative atomic mass numbers of between 188 and 220. $^{209}$Po is the most stable isotope.

Polyacetylenes  These hydrocarbons (e.g. falcarnol) are bioactive compounds found in various plant foods, including carrots, celery and ginseng. Demonstrate antimicrobial activity, neurotoxicity, anti-inflammatory activity and anticarcinogenicity.

Polyacrylamide gel electrophoresis  Electrophoresis technique in which polyacrylamide gel is used as the diffusion medium. Commonly abbreviated to PAGE.

Polyamides  Synthetic polymers, including nylon, in which the structural units are linked by amide or thioamide groupings. Used as components of casings and packaging materials for foods.

Polyamines  Compounds that contain two or more amine groups. Examples include putrescine, spermidine and spermine.

Polybrominated biphenyls  Organic halogen compounds which are known toxins and suspected carcinogens.

Polybrominated diphenyl ethers  Organobromine compounds used as flame retardants in a variety of commercial products. Persistent and ubiquitous in the environment. There are public health concerns regarding potential adverse effects of polybrominated diphenyl ethers found as contaminants in fish.

Polybrominated diphenyl ethers  Toxic chlorinated hydrocarbons once widely used in industry, e.g. as pesticide extenders and plasticizers. Proven toxicity to humans and animals includes adverse clinical effects on the gastrointestinal tract and eyes. May also act as carcinogens. Environmental contamination with these compounds and their high stability can allow them to enter the food chain, affecting predominantly animal foods. Preparations include Arochlor, Clophen, Fenclor, Kanechlor, Phenoclor, Pyralene and Santotherm. Commonly abbreviated to PCB.

Polybrominated dibenzodioxins  Toxic environmental contaminants produced by municipal waste incinerators and chemical, paper and metallurgical industries. Exposure to these toxic organochlorine compounds can occur via the diet, particularly from consumption of animal foods, due to their accumulation in fats.

Polybrominated dibenzofurans  Potential toxic contaminants of foods, particularly animal foods.
Polychlorinated dibenzo-p-dioxins

where they accumulate in fats. These organochlorine compounds are produced as a result of incineration of municipal waste and as wastes from various industrial processes.

Polyethylene bags Bags made from polyethylene which are used for packaging or storage of foods.

Polyethylene glycol Synthetic polymer which exists as a liquid or waxy solid, depending on its degree of polymerization, and thus molecular weight. Soluble in water. Applications within the food industry include emulsifiers, thickeners, stabilizers, antifoaming agents, lubricants for food processing equipment, solvents, plasticizers for edible films and coatings, enzyme immobilization and modification of proteins.

Polyethylene naphthalate Polyester polymer with characteristics making it suitable for food packaging applications. Compared with polyethylene terephthalate (PET) it has improved oxygen barrier properties, chemical and heat resistance, and stiffness, but is more expensive. Its physical and mechanical properties make it suitable for manufacturing refillable containers and use in hot fill applications. Polyethylene naphthalate is sometimes blended with PET to make plastics containers for foods and beverages, e.g. bottles for beer.

Polyethylene terephthalate Synthetic resin produced from ethylene glycol and terephthalic acid. Used in production of polyester fibres, plastics bottles for beverages, and food trays for use in conventional and microwave ovens. Commonly abbreviated to PET.

Polygalacturonases EC 3.2.1.15. Glycosidases which hydrolyse 1,4-α-D-galactosiduronic linkages in pectate and other galacturonans. Involved in the ripening of fruits, and are used in the processing of fruits and vegetables, and production of wines, specifically for improving cloud stability in citrus juices, mash treatment, clarification of fruit juices, and maceration and pulping of plant tissues. Potentially useful for production of oligogalacturonides that can be used as functional food components. These pectic enzymes are also known as pectinases and pectin depolymerases.

Poly(y-glutamic acid) High molecular weight polymers composed of glutamic acid residues. Produced as bacterial fermentation products, mainly by Bacillus spp. Exhibit biodegradability and so are useful alternatives to conventional plastics and flocculants used in bioremediation. Also used as food...
thickeners, cryoprotectants and debittering agents, and to promote the absorption of minerals (e.g. calcium).

Polyglycerol fatty acid esters  Fatty acid esters widely used as non-ionic emulsifiers in foods (e.g. bakery products, dairy products) and beverages). Can also be used as thickeners, stabilizers and inhibitors of fat crystallization. May be hydrophilic or lipophilic. Also known as glycerin fatty acid esters.

Polyglycerol polycrinooleate  Highly viscous, strongly lipophilic liquid comprising polyglycerol fatty acid esters derived from castor oils. Insoluble in water or ethanol, but soluble in fats and oils. Used in the chocolate industry as a viscosity reducing agent and as a partial substitute for cocoa butter in reduced fat products. Also used in emulsifiers for foods such as salad dressings and spreads. Commonly abbreviated to PGPR.

Polyhydroxyalkanoates  Salts or esters of poly(hydroxyalkanoic) acids.

Poly(hydroxyalkanoic) acids Organic compounds formed by polymerization of hydroxyalkanoic acids, e.g. hydroxybutyric acid and hydroxyvaleric acid. Used in biodegradable packaging materials. May be formed as fermentation products by bacteria grown on food processing wastes such as whey.

Polyketides  Precursors in the mycotoxins biosynthesis pathway in fungi.

Polylysine  Homopolymer of L-lysine. These peptides are used as natural food preservatives with antimicrobial activity against a wide range of microorganisms, including Escherichia coli and Salmonella Typhimurium. Used in foods (e.g. surimi) and in antimicrobial packaging materials. Also claimed to reduce risk of obesity.

Poly(β-d-mannuronate) lyases  EC 4.2.2.3. Lyases which catalyse the eliminative cleavage of polysaccharides containing β-d-mannuronate residues to give oligosaccharides with 4-deoxy-a-L-erythro-hex-4-enopyranuronosyl groups at their ends. Since these enzymes degrade alginates, they are also known as alginate lyases.

Polymerase chain reaction  Technique usually abbreviated to PCR.

Polymerization  Chemical combination of simple molecules (monomers) to form long chain molecules (polymers) of repeating units. In addition polymerization, the monomers simply add together and no other compound is formed. In condensation polymerization, water, alcohol, or some other small molecule is formed in the reaction.

Polymers  Long chain molecules of repeating units formed by the chemical combination of monomers in a process called polymerization. Natural organic polymers include proteins, DNA and latexes, such as rubber. Diamond, graphite and quartz are examples of inorganic natural polymers. Synthetic polymers include inorganic compounds, such as glass and concrete, but the great majority are plastics. Polymers are formed from monomers under the influence of heat, pressure or the action of a catalyst.

Polymorphism  Difference in specific DNA sequences among individuals. Useful for genetic linkage studies.

Polymyxins  Group of five antibiotics (designated alphabetically A-E) that show specialized activity against Gram negative bacteria. Polymyxins B and E are the only examples used in animal husbandry. They are mainly applied orally to treat infections caused by Escherichia coli and Salmonella, or topically to treat Pseudomonas aeruginosa. Can inactivate endotoxins during the early stages of coliform mastitis in cattle.

Polynuclear aromatic hydrocarbons  Hydrocarbons comprising two or more ring structures, at least one of which is an aromatic (benzene) ring. Lipophilic pollutants and potential carcinogens. Examples that have been found in foods include benzo[a]pyrene and phenanthrene; foods affected include cheese, cooked meat and shellfish. Commonly abbreviated to PAH and also called polycyclic aromatic hydrocarbons.

Polyolefins  Polymers, including polyethylene and propylene made from olefin monomers. Used as components of plastics films for packaging of foods.

Polyols  Products formed by hydrogenation (reduction) of the free aldehyde or ketone groups of reducing sugars to produce an alcohol group. Examples include sorbitol, mannitol and maltitol, produced by hydrogenation of glucose, mannose and maltose, respectively. Also known as sugar alcohols.

Polypeptides  Unbranched chains of 10 to approximately 100 amino acid residues linked via peptide bonds. In contrast to proteins, polypeptides have no secondary or tertiary structure.

Polyphenol oxidases  Alternative term for catechol oxidases.
antinutritional factors, due mainly to the effects of tannins, which reduce protein digestibility.

**Polysaccharides** Carbohydrates that are composed of at least 10 monosaccharide residues linked via glycosidic bonds. Starch, celluloses, pectins and carrageenans are all polysaccharides. Polysaccharides have multiple applications in the food industry as thickeners, bulking agents, anticaking agents, gelling agents, and substrates for microbial fermentations and manufacture of sweeteners.

**Polysorbate 60** Additive produced by reaction of ethylene oxide with partial stearic acid esters of sorbitol. Has an average of 20 oxyethylene groups per molecule. Used predominantly as emulsifiers, e.g. in cakes, coffee whiteners, imitation cream and frozen desserts, but also as foaming agents and dough conditioners. Also called polyoxyethylene (20) sorbitan monostearate.

**Polystyrene** Synthetic resin made by polymerizing styrene. Produced in two forms, i.e. a hard form and a lightweight foam form called expanded polystyrene. There is concern about health hazards associated with migration of styrene monomers, dimers and trimers from packaging materials into some types of foods.

**Polytetrafluoroethylene** Tough synthetic resin which is used to coat non-stick cooking utensils. Commonly abbreviated to PTFE.

**Polythene** Alternative term for polyethylene.

**Polyunsaturated fats** Fats and oils that contain at least two carbon-carbon double and/or triple bonds due to the presence of unsaturated fatty acids. Have lower melting points than saturated fats, and are therefore more likely to be oils at room temperature. Considered more beneficial than saturated fats with respect to their influence on risk of developing cardiovascular diseases.

**Polymers** Synthetic polymers produced by condensation of two or more phosphoric acid molecules. Sodium and potassium salts of tripolyphosphates are permitted food additives and uses include as emulsifiers and texturizers.

**Polypropylene** Synthetic resin prepared by polymerization of propylene. Used for food packaging in a variety of forms including plastics films, foamed resins, sheets and labels. Useful for the construction of containers, including some microwaveable containers. Polypropylene membranes also find use in some enzyme immobilization applications.

**Polysaccharides** Carbohydrates that are composed of at least 10 monosaccharide residues linked via glycosidic bonds. Starch, celluloses, pectins and carrageenans are all polysaccharides. Polysaccharides have multiple applications in the food industry as thickeners, bulking agents, anticaking agents, gelling agents, and substrates for microbial fermentations and manufacture of sweeteners.

**Polyethylene** Synthetic resin which is a polymer of ethylene oxide. Used as a component of chewing gums. Also used in high-gloss coatings for foods. Hydrolysis of polyvinyl acetate generates polyvinyl alcohol.

**Polyvinyl alcohol** Synthetic resin produced by polymerization of vinyl acetate and hydrolysis of the resultant polymer (polyvinyl acetate). Exhibits biodegradability and is suitable for use in food packaging materials. Also used for the immobilization of enzymes. Commonly abbreviated to PVA.

**Polyvinyl chloride** Tough, chemically resistant, synthetic resin, which is a polymer of vinyl chloride. Low cost material that is moisture-proof but has some oxygen permeability. Used in a variety of packaging applications including plastics films for wrapping foods (e.g. meat), beverage bottles and containers for take away foods. Other uses include the production of drinking straws and plastics utensils. Commonly abbreviated to PVC.

**Polyvinylidene chloride** Transparent, moisture-proof, thermoplastic polymer also known as Saran. Used in food packaging, often as a component of multi-layer packaging materials or for coating films made from other plastics to improve their barrier properties and prolong the shelf life of the...
foods they are used to package. Commonly abbreviated to PVDC.

**Polyvinylpyrrolidinone** Alternative term for polyvinylpyrrolidone.

**Polyvinylpyrrolidone** Polymer of N-vinyl pyrrolidone used in its cross-linked form (polyvinylpolypyrrolidone; PVPP) to control haze or colloidal stability in beer by removing polyphenols. Similarly used in clarification of wines. Also known as povidone.

**Pomaces** Wastes or by-products from manufacture of fruit juices. Solid residue remaining after pressing of fruits to extract juices or musts.

**Pombe** Type of sorghum beer made in East Africa.

**Pome fruits** Fruits produced by pomegranates (Punica granatum). The pulp is scooped out and eaten fresh. Pomegranate juice is used in wines and cocktails and is the main ingredient of grenadine syrup.

**Pomegranates** Fruits produced by Punica granatum. The orange to red skin is leathery and encloses a pinkish pulp that contains numerous edible seeds. The pulp is scooped out and eaten fresh. Pomegranate juice is used in wines and cocktails and is the main ingredient of grenadine syrup.

**Pomelos** The largest of the citrus fruits, produced by Citrus maxima or C. grandis. Ancestors of the modern grapefruit. Closely resemble the grapefruit in appearance, but the flesh is sweeter and less acidic, lacking the bitterness of a grapefruit. Rich in vitamin C and potassium. Eaten fresh or used to make jams, jellies and marmalades. Also known as shaddocks, Chinese grapefruit and pummelos.

**Pomfret** Any of a number of marine fish species within the family Bramidae; worldwide distribution. Species valued as food fish include Brama brama (pomfret; black sea bream), B. japonica (Pacific pomfret), Taractichys longipinnis (bigscale pomfret; long-finned bream) and Paratromateus niger (black pomfret). Flesh tends to be tender with a rich, sweet flavour. Marketed fresh, frozen and canned; also salted in India.

**Pommes frites** French term for potatoes that have been cut into thick or thin strips, soaked in cold water, dried and deep fried in oil. Also called chips (UK), fries or French-fried potatoes or French fries.

**Ponceau** Group of synthetic, mostly red, azo dyes, some members of which have uses as food colorants. Ponceau 4R or Cochineal Red A, which is used in foods such as sea food dressings, sweets, salami and cake mixes, has been linked with hyperactivity in children and intolerance reactions in people with allergies to salicylates. It may also exacerbate the symptoms of asthma and exhibits carcinogenicity in animals. It is banned in Norway and the USA.

**Ponkans** Type of mandarins (Citrus reticulata).

**Pont-l’Eveque cheese** French soft cheese made from cow milk. The edible brown rind is slightly mouldy and ridged as the cheese is cured on straw mats. The interior is soft and yellow. Flavour is savoury and piquant.

**Poori** Puffed, deep fried, unleavened Indian bread made from wheat flour. Eaten warm. Plain poori is eaten as an accompaniment to curries; can also be flavoured to make a sweet or savoury product.

**Popcorn** Variety of corn with hard kernels that expand on exposure to heat or microwaves to form large, fluffy white masses. Also refers to the edible mass formed by this process, which is eaten as a snack food, often flavoured with salt or a sweet substance such as toffee.

**Popping** Process in which cereals and grains are expanded by heating until the outer skin of the kernels burst with a sudden sharp, explosive sound. Used particularly in the manufacture of popcorn.

**Poppy seeds** Small, kidney shaped, grey-blue seeds produced by Papaver somniferum. Have a mild, nutty flavour and aroma and are used as toppings and ingredients for bread and other bakery products.

**Porcine** Affecting, resembling or relating to swine.

**Porcine somatotropin** Growth hormone produced by swine in the anterior lobe of the pituitary gland, which stimulates growth and influences the metabolism of proteins, carbohydrates and lipids. Has been used in agriculture to improve growth performance and carcass characteristics of swine.

**Poria cocos** Species of edible fungi of the family Coriolaceae. Used as medicinal products in Asia and thought to have lipaemic activity and antitumour activity. Common names include hoelen and fu ling.

**Porins** Transmembrane proteins present in outer membranes of Gram negative bacteria. Porin trimers form channels in the membrane through which transport of small molecules, e.g. monosaccharides can occur.

**Pork** Meat from swine, especially when the meat is uncured. Depending on the size of the animal and the part of the swine carcasses from which the meat is cut, colour of pork varies from pale pink to pinky-red.
Raw boar meat and sow meat tend to be a stronger red colour than pork from young swine. On cooking, pork becomes paler and may become almost white in colour. Pork is characterized by clearly noticeable deposits of subcutaneous fats, which are white in colour and medium-firm in texture. Pork is a particularly rich dietary source of thiamin, containing up to 10 times as much as beef. In some religions, pork is considered as unclean and consumption is forbidden; conversely, in certain parts of the world, notably in China and the Pacific, and in other Asian cultures, pork is highly regarded. Pork quality is affected by halothane sensitivity and Rendement Napole genes in swine. Quality is often categorized as being: pale, soft and exudative (PSE defect); reddish-pink, soft and exudative (RSE defect); red, firm and non-exudative (RFN; normal); or dark, firm and dry (DFD defect).

**Pork bellies** Cuts of swine carcasses used in preparation of various foods such as commercial pork, bacon, bacon bits and specialities including smoked and salted products. Also an important commodity in the futures market.

**Pork chops** Thick slices of pork, usually including an eye of meat, a rib and a layer of subcutaneous fat.

**Pork mince** Meat mince prepared from pork. Also known as ground pork or minced pork.

**Pork patties** Meat patties prepared from comminuted pork. May be seasoned with a variety of ingredients but commonly contain herbs, salt and pepper.

**Pork products** Products manufactured from pork, e.g. charcuterie products and pork patties.

**Pork sausages** Sausages prepared from pork. Properties of pork make it highly suitable for the preparation of sausages. The majority of sausages include some pork, but pork sausages include a high proportion of pork (lean meat, skin and offal) and pork fat trimmings. Although they may include other types of meat, the proportions of these are lower than the proportion of pork.

**Porosity** The amount of void space in a material, expressed as a proportion of its total volume. Materials that contain many pores exhibit increased permeability.

**Porphyra** Genus of red seaweeds found on rocky shorelines around the world. Some species are utilized as foods, including *Porphyra tenera* and *P. yezoensis*. Various names are given to seaweed products formed from members of this genus, including laver (England), nori (Japan, North America), kim (Korea) and karengo (New Zealand). Cultured on a large scale in some parts of Asia.

**Porphyridium** Genus of red microalgae of the family Porphyridiaceae. Species include *Porphyridium cruentum* and *P. purpureum*. Source of a range of compounds, including polysaccharides, the long chain polyunsaturated fatty acids docosahexaenoic acid and eicosapentaenoic acid, and the pigment phycoerythrin, which is used in natural colorants.

**Porphyrins** Derivatives of porphin (a cyclic tetrapyrole) in which the pyrrole β-carbon atoms are variously substituted. Can readily chelate various minerals, the metalloporphyrins being components of several important biological pigments, e.g. chlorophylls, cytochromes and haem.

**Porpoises** Marine mammals from the family Phocidae; worldwide distribution. Not commercially exploited on a large scale. However, some species are utilized as a source of meat and oils.

**Porridge** Breakfast foods originating from Scotland made by boiling oatmeal or other oat products in water or milk. May be flavoured with ingredients such as sugar or salt. Usually eaten hot.

**Porridges** Soft, easily digestible breakfast foods made by boiling cereals, pseudocereals or legumes in water, milk or a water-milk mixture until thick. Usually eaten hot and may be flavoured with a variety of ingredients, e.g. salt or sugar, either during or after preparation.

**Port** Sweet fortified wines produced from specific local grape cultivars in a delimited area of the upper Douro valley in Portugal. Types include: vintage port; ruby port; and tawny port. Most port is red, but white port is also available.

**Portioning** During food processing, this is the division of foods into food portions of a particular size for further processing, packaging or distribution.

**Portion packs** Packs which each provide an amount of food suitable for one person.

**Port Salut cheese** French semi-soft cheese made from cow milk. Originally made by Trappist monks. Rind is smooth and yellow; interior has an elastic texture. Slightly aromatic flavour but no pronounced aroma. Also known as Saint-Paulin cheese.

**Possums** Tree-dwelling Australian marsupial animals; there are many species, particularly in the family Petauridae. Recently, interest has increased in farming possums for the production of possum meat, particularly in New Zealand. Possum carcasses (brush-tail possums, *Trichosurus vulpecula*; 1-5 years old) are characterized by a high content of lean meat and a low content of fat. Cooked brush-tail possum meat has acceptable tenderness, a high content of protein, a low...
Potato crisps

**Potato crisps** are thin slices of potatoes that are fried until crisp. They can be used as an ingredient in many types of processed foods or as a snack. When made from potatoes, they are often referred to as potato chips.

Potato flakes

**Potato flakes** are made by drying thin slices of potatoes. They can be used in doughs or to make instant mashed potatoes by reconstituting with water or milk.

Potato granules

**Potato granules** are fine powders (instant foods) which are mixed with boiling water to yield foods similar in texture and flavour to mashed potatoes. Often called instant mashed potatoes, they are produced by peeling, cooking and drying potatoes, which are then reduced to granules of 1 or a few cells each. Chemical additives may be used to prolong their shelf life and prevent lumping.

Potato meal

**Potato meal** is flour prepared from potatoes. It can be used as an ingredient in many types of processed foods.

Potato peel

**Potato peel** refers to the outer skin of potatoes, including the flesh. It can be fried or roasted, as in baked potatoes, boiled potatoes and potato wedges. Consumption of the peel along with the flesh is often recommended as it is rich in vitamins, minerals and fibre.

Potato products

**Potato products** is a generic term for foods which have been formulated using potatoes or their components (e.g. potato starch) as the main ingredient.

Potato puree

**Potato puree** is made by mashing cooked potatoes to a smooth, thick consistency by forcing through sieves or blending in food processors. It may be combined with other ingredients and served as a side dish or used to thicken soups and sauces.

Potato salads

**Potato salads** are salads prepared from boiled or roasted potatoes, cut into chunks. They can be coated with various dressings, often a mayonnaise-type dressing. Usually served cold, but can be eaten hot.

Potato starch

**Potato starch** refers to starch isolated from potato tubers.

Potentiotetry

**Potentiotetry** is a technique in which detection is achieved by measuring the change in electric potential between two electrodes placed in the sample solution. One electrode (the indicator electrode) responds to analyte concentration, while the other (the reference electrode) remains at a fixed potential.

Pouches

**Pouches** are small, sealed flexible bags which can be used as containers for foods. Commonly made from plastics or foils, they are used to store frozen foods or dried foods.

Pouchong tea

**Pouchong tea** is a lightly fermented tea, intermediate between green tea and oolong tea.

Poultry

**Poultry** is the collective term for any domestic or farmed birds including chickens, chukars, ducks, emus, geese, guinea fowl, ostriches, quails, rheas, turkeys and waterfowl. They are reared primarily for poultry meat production and production of eggs.
Poultry breast A part of poultry carcasses which consists of the breast muscle (meat), skin, ribs, sternum and pectoral girdle. It is usually removed from the carcass by cutting through the ribs, near to their attachment to the backbone. Some poultry breast meat is deboned before retail. The breast muscle of larger species of poultry may be processed by deboning and slicing or rolling before retail. Poultry breast meat is lighter in colour than meat from the legs and thighs.

Poultry meat Meat from poultry. Most of the fat in poultry products is associated with the skin and can be removed. Skinless poultry meat has low intramuscular fat and saturated fat contents making it a healthy dietary alternative to red meat. Meat from younger birds tends to be more tender than that from older birds. Developments in poultry husbandry (e.g. intensive production systems), advances in feeds and selective breeding have led to large-scale, rapid production at low prices. Consequently, poultry meat has become an increasingly important part of diets in many countries.

Poultry products Generic term for foods which have been formulated using meat from domestic fowl (e.g. chickens, turkeys, ducks and geese) as the main ingredient.

Poultry sausages Sausages made from poultry meat. They are often prepared from mechanically recovered poultry meat, poultry meat trimmings or poultry thigh meat. Other ingredients may include poultry skin and the less preferred components of poultry offal, such as gizzards and hearts. Poultry fat, pork fat or beef fat may also be included. They may be smoked or unsmoked. They include chicken sausages and turkey frankfurters.

Poultry science Division of animal science dealing with the production, management and distribution of poultry, including those intended for food use or for production of eggs to be used in or as foods.

Poverty The state of being poor.

Powders Dried foods in the form of fine particles. Food powders include products, which can be reconstituted (e.g. with milk or water) to form liquid foods, and powdered ingredients such as baking powders and spices.

Pozol Corn dough traditionally produced in Mexico and Guatemala by steeping corn in lime followed by cooking and fermentation. The fermented dough is often suspended in water and consumed as a refreshing beverage.

Pralines Cooked mixtures of crushed nuts and partly caramelized sugar, often used as a centre for chocolates. May be ground to a paste for use in pastry or candy fillings.

Prato cheese Brazilian semi-hard cheese similar to Gouda cheese.

Prawn crackers Fried sea food products made from minced prawns or shrimps mixed with flour (usually tapioca flour) and seasonings. Often consumed as snack foods or a meal accompaniment.

Prawns General name for many species of marine and freshwater crustacea within the suborder Dendrobranchiata. Often confused with shrimps, prawns may be distinguished by their branched gill structure and abdominal plates that overlap in sequence from front to back. They also have longer legs and a smaller set of first pincers than second, whereas in shrimps the reverse is true. Despite these differences, the term prawns is often applied, on the basis of size only, to larger species within the families Pandalidae, Penaeidae and Palaemonidae. Many species have commercial importance as foods, including Palaemon serratus (common prawns), Marsupenaeus japonicus (kuruma prawns) and Fenneropenaeus indicus (Indian prawns). Marketed fresh, frozen, canned and as pastes.

Prebiotic foods Foods containing nondigestible ingredients with potentially beneficial health effects for the host based on selective stimulation of the growth and/or activity of one or a limited number of bacterial species already resident in the colon (e.g. probiotic bacteria). Examples of prebiotic components include inulin and nondigestible fructooligosaccharides. Food sources include bananas, onions, tomatoes, legumes and Jerusalem artichokes.

Prebiotics Nondigestible carbohydrates which provide health benefits by stimulating growth of selected bacteria (e.g. lactic acid bacteria and bifidobacteria) in the colon. Common prebiotics in foods include oligosaccharides and inulin.

Precipitation Process of forcing a substance in solid form from solution. Achieved through a variety of means, including addition of an agent to the solution and centrifugation.

Predictive microbiology Determination of the influence of various chemical, physical and biological factors on microbial growth and survival, typically by means of challenge trials or mathematical models.

Predictive modelling Use of simplified and generalized representations (models) of phenomena to forecast the influence of certain factors on events.

Prepared dishes Types of convenience foods similar to prepared meals.

Prepared foods Alternative term for processed foods.

Prepared meals Convenience foods eaten at mealtimes and/or designed to be one of the main meals of the day. Similar to prepared dishes.
Preservation  Process of maintaining a food in its original or existing state by treatment that will prevent its spoilage or deterioration. Preservation is achieved by a range of treatments, including refrigeration, freezing, canning, brining, smoking, freeze drying, drying and pickling.

Preservatives  Additives that increase the shelf life of foods and beverages. Shelf life is determined by rates of growth of spoilage microorganisms and chemical degradation, usually oxidation, of food components. Preservatives are chemicals that inhibit one or both of these processes. Examples include organic acids (e.g. lactic acid, propionic acid, formic acid), benzoic acid derivatives (sodium benzoate, hydroxybenzoic acid esters), sulfur dioxide, nitrites and antioxidants.

Preserves  Term applied to preserved foods, usually referring to preserved fruits. Fruit preserves are made by cooking fruits with sugar and sometimes also pectins. Differ from fruit jams in that preserves generally contain larger chunks of fruit, while jams are similar to thick fruit purées. Preserves are used in a similar manner to jams. Other types of preserves include vegetable preserves and fish preserves.

Preserving  Alternative term for preservation.

Presses  Devices used for applying pressure in order to flatten or shape an item, or to extract natural fluids, e.g. fruit juices from fruits or oils from oilseeds or nuts. For oil extraction, screw presses are commonly used in preference to hydraulic presses because they provide a continuous process, have greater capacity, require less labour and generally remove more oil.

Pressing  Process whereby pressure is applied to an item with presses in order to flatten or shape it, or to extract natural fluids. Used to produce fruit juices from fruits, and vegetable oils from oilseeds and nuts.

Pressure  The force per unit area applied to a surface. Pressure is usually measured in pascals (Pa), which are defined as 1 Newton per square metre; it can also be measured in millimetres of mercury (mmHg) or millibars. High pressures may be applied in food manufacturing (high pressure processing) for preservation purposes and in certain analytical techniques to enhance method performance.

Pressure shift freezing  A freezing technique that results in frozen foods with improved texture. Foods are subjected to pressure, which reduces the freezing point of water. They can then be cooled to a sub-zero temperature without the water within them freezing. Upon release of the pressure, rapid freezing occurs, resulting in the formation of small, uniform ice crystals throughout the food and reduced structural damage due to crystal growth.

Pretzels  Small, brittle biscuits made from a stiff dough typically formed into loose knots which are boiled briefly, glazed with eggs and baked. Often topped with salt crystals.

Pricing  Determination of the amount of money expected or required in payment for something.

Prickly pears  Spiny fruits produced by several varieties of cacti, especially Opuntia ficus-indica. The soft flesh is similar in texture to that of watermelons. Usually eaten fresh, but also used as an ingredient for desserts and beverages. Also known as cactus pears, Indian figs and barberry figs.

Principal component analysis  Statistical technique by which variables in a data matrix are transformed to make them independent of one another. Covariance values are plotted on axes in multidimensional space. The first principal component, describing the majority of the spread of data, corresponds to the first axis in multidimensional space. Higher order axes show less variation, as the data are less correlated.

Printers  Equipment, such as computer peripherals, which are used for printing text or graphics, e.g. on labels for foods. Print quality and printing speed vary greatly between printers. The major types include line printers, matrix printers, letter quality printers and laser printers.

Printing  Process of generating printed material, such as labels for foods, including text and graphics.

Prion diseases  Degenerative, fatal brain diseases which are believed to be transmitted by prions. Prion diseases are characterized by very long incubation periods. They include bovine spongiform encephalopathy (BSE) in cattle, Creutzfeldt-Jakob disease (CJD) and kuru in man, and scrapie in sheep. They may also be known as transmissible spongiform encephalopathies.

Prion proteins  Alternative term for prions.

Prions  Submicroscopic particulate proteins, which are believed to be the infective agent of prion diseases such as bovine spongiform encephalopathy, Creutzfeldt-Jakob disease and scrapie. They resist inactivation by procedures that modify nucleic acids. Conversion of soluble prion proteins (PrP) into insoluble, pathogenic, proteinase-resistant isoforms is one of the crucial events in the development of prion diseases. However, to date, the mechanism by which this conversion gives rise to pathogenic events remains unclear. Also known as prion proteins.

Pristane  Member of the branched chain hydrocarbons produced by certain zooplankton.
Private labels  Products manufactured by one company, but labelled as a store brand.

Proanthocyanidins  Condensed tannins found in many foods and beverages, such as green tea and red wines, where they contribute to flavour, e.g. astringency and bitterness. Possess antioxidative activity and antibacterial activity. Can form complexes with proteins in beer, which may lead to formation of non-biological haze. Also thought to scavenge free radicals. Proanthocyanidins isolated from cranberries have been found to inhibit the adherence of Escherichia coli to model epithelial surfaces.

Probiotic bacteria  Bacteria which benefit health by promoting a balanced gastrointestinal microflora (e.g. Bifidobacterium and Lactobacillus spp.). Used in the preparation of microbial cultures for use in foods and animal feeds.

Probiotic foods  Novel foods containing viable probiotic microorganisms (particularly lactic acid bacteria, but also some bifidobacteria and yeasts) that have beneficial effects on the health of the host by improving the microbiological balance of the intestine. Examples include bifidus milk, acidophilus milk and Yakult.

Probiotic microorganisms  Microorganisms which benefit health by promoting a balanced gastrointestinal microflora. Used in the preparation of microbial cultures for use in foods and animal feeds.

Prokaryotes  Alternative spelling of prokaryotes.

Process control  Use of computerized systems for automatic control of continuous industrial processes.

Processed cheese  Product made from one or more hard or semi-hard cheese by milling and heating with water, emulsifying agents such as phosphates or citrates, and other ingredients including milk or whey powder, butter, cream, seasonings and flavourings. The mixture is pasteurised at a high temperature to extend shelf life of the product. The heating used during processing stops any further cheese ripening or flavour development. Soft versions containing 50% water are used as processed cheese spreads.

Processed foods  Foods which have been subjected to some degree of processing in order to bring about a desired modification, e.g. enhanced shelf life, physicochemical properties, sensory properties or nutritional quality. Examples include chilled foods, frozen foods, canned foods, ready meals, preserves and dietetic foods. Also known as prepared foods.

Processing  Treatment of a raw material, such as a food, usually by applying a series of actions or steps, to produce a specific end product.

Processing equipment  Machinery used in the processing of foods.

Processing lines  Sequences of processing equipment units that are integrated in order to manufacture a complete product.

Process water  Water that is used in the manufacture of foods for processes such as cooling and cleaning. Spent process water may be re-used to minimize waste water production, but must first be treated so that it is at least of drinking quality.

Procyandins  Polyphenols found in foods such as cocoa, chocolate, green tea and red wines, which are thought to exhibit cardioprotective effects due to their ability to scavenge free radicals, inhibit oxidation of lipids and suppress the activation of platelets.

Procymidone  Systemic fungicide which inhibits synthesis of triglycerides by fungi. Used to control a range of fungal pathogens on crops. Classified by WHO as unlikely to present acute hazard in normal use.

Production  The action or process of producing or being produced, or the bulk of a commodity produced in a given country or area.

Product liability  A producer's legal responsibility for goods, or the liability of manufacturers and traders for damage or injury caused to purchasers or bystanders by their products.

Product recalls  Requests made by food companies that batches of foods should be returned to the manufacturer, usually in response to health hazards or food safety issues.

Product technology  Processing procedures employed during the manufacture of foods.

Profilins  Small, actin-binding proteins found in all eukaryotes. Some are highly cross-reactive allergens responsible for allergies to pollen and fruits. Present in a range of plant foods, including celery, peppers, melons and corn.

Profitability  The monetary difference between the cost of producing and marketing goods or services and the price subsequently received for those goods or services. Profit is an essential competitive feature of buying and selling in the economic system.

Profiteroles  Small, cream puffs made from baked choux pastry shells, which are filled with whipped cream and topped with chocolate sauces.

Progesterone  One of the steroid hormones produced mainly by the corpus luteum which prepares the uterus to receive the fertilized egg and maintains the...
uterus during pregnancy. Used in cattle breeding to suspend the oestrous cycle and allow the mating of the whole herd to be synchronized. Potentially useful as a marker of mastitis in cattle.

**Progoitrin Glucosinolates** found in *Brassica* vegetables that may contribute to their flavour and bitterness.

**Prokaryotes** Typically, unicellular microorganisms within the superkingdoms (domains) bacteria and archaea. Characterized by a lack of a defined nucleus, and the possession of a single circular DNA molecule and a very small range of organelles. Alternative spelling is procaryotes.

**Prolactin** Proteinaceous hormones secreted by the anterior lobe of the pituitary gland which stimulate secretion of milk in mammals and assist in maintaining the corpus luteum. Also thought to be involved in development of the immune system in neonates.

**Prolamins** Seed globulins that are insoluble in water and soluble in water-ethanol mixtures. Rich in proline and glutamic acid but contain small amounts of lysine, arginine and tryptophan, resulting in their being of poor nutritional value.

**Proline** Non-essential amino acid whose structure differs from those of other amino acids in that its side chain is bonded to the N of the amino group as well as the C, making the amino group a secondary amine. Has a strong influence on the secondary structure of proteins and is found more abundantly in collagen than in other proteins.

**Prometryn** Selective triazine herbicide which controls annual grasses and broad-leaved weeds in a variety of crops including cotton and celery. Classified by WHO as unlikely to present acute hazard in normal use.

**Promoters** Nucleotide sequences located upstream from transcription start sites that are recognized and bound by DNA-directed RNA polymerases and other regulatory proteins during the initiation of transcription.

**Pronase** A commercial preparation of proteinases from *Streptomyces griseus* containing at least 4 enzymes, including trypsin and a neutral metalloproteinase. Used for production of protein hydrolysates, and improving the sensory properties of dry fermented sausages and the functional properties of insoluble gluten.

**Proofers** Equipment assisting in the proofing (or proving) of dough, in which airflow, ambient conditions (e.g. air temperature and relative humidity) and handling can all be controlled.

**Proofing** Stage of barmaking in which dough is fermented under controlled conditions. During proofing (or proving), starch is converted by enzymes into sugars that are used as growth substrates by the yeasts employed. The breakdown products are carbon dioxide and alcohol. As carbon dioxide is produced, it is retained in the tiny cells formed in the protein matrix during mixing, causing them to grow and the dough to expand. Other products of yeast activity, mainly acids, are also formed during proofing; they contribute significantly to flavour development. Dough expands by a factor of three or four during proofing, and it is important that the skin remains flexible so that it does not tear as it expands. Yeast is at its most active at 35-40°C, so to minimize proofing time, heat transfer to the dough is necessary, to raise its temperature by 10-15°C.

**Prooxidative activity** Ability of a substance to promote oxidation. Some substances can act as prooxidants or antioxidants, depending on the conditions, including some minerals, vitamins and carotenoids.

**Propanal** Aldehyde that exists as a colourless liquid. Can be reduced to propanol and oxidized to propionic acid. Also known as propionaldehyde.

**Propane** Gaseous hydrocarbon of the paraffin series obtained from petroleum. Useful in the food industry for extraction of lipophilic compounds and proteins.

**1,2-Propanediol** Aliphatic alcohol used primarily in emulsifiers. Other uses in foods include in anticaking agents, antioxidants, flavourings and humectants. Used in freezing media and solvents for food processing. Synonym for propylene glycol.

**Propanil** Common name for 3',4'-dichloropropianilide, a selective contact herbicide with short duration of activity used to control broad-leaved and grass weeds, particularly among rice. Classified by WHO as slightly hazardous (WHO III). Also known as DCPA.

**Propanol** Alcohol containing three carbon atoms which is also known as propyl alcohol. Used for extraction of glutenin subunits from wheat and phospholipids from fish oils.

**Propanone** Colourless, flammable, volatile ketone used as a solvent and as a raw material for making plastics. Produced commercially by fermentation of corn or molasses, or by controlled oxidation of hydrocarbons. Also known as acetone.

**Propazine** Selective systemic triazine herbicide used for pre-emergence control of grasses and broad-leaved weeds around carrots, parsley and sorghum (most other vegetables and cereals are sensitive). Classified by WHO as unlikely to present acute hazard in normal use.
Propionic acid bacteria  Bacteria, usually of the family 
Propionibacteriaceae. Occur in soil, milk and dairy products, and the gastrointestinal tracts of herbivores. Certain species (e.g. Propionibacterium shermanii) are used to promote flavour development and eye formation during the ripening of some types of hard cheese. Other species may cause food spoilage.

Propionic acid  Colourless liquid carboxylic acid. Propionic acid and its derivatives, such as calcium propionate, are used as preservatives in foods and beverages, where they act as fungicides. Can be produced by fermentation of bacteria such as Propionibacterium spp., Clostridium propionicum and Megasphaera elsdenii.

Propionic acid bacteria  Bacteria, usually of the genus Propionibacterium, which produce propionic acid as a main end product in the propionic fermentation of glucose or lactic acid.

Propionic fermentation  Process by which certain bacteria (such as Propionibacterium spp., Clostridium propionicum and Megasphaera elsdenii) fermentation substrates such as glucose and/or lactic acid to produce propionic acid.

Propionicins  Bacteriocins synthesized by Propionibacterium spp. Propionicin PLG-1, produced by P. thoenii P127, has a bactericidal mode of action. It is heat labile, and effective against a wide range of Gram positive bacteria and Gram negative bacteria, as well as against some yeasts and fungi. Different aggregative forms exist: one of 10,000 Da and the other of >150,000 Da.

Propolis  Resinous product collected by bees from plant exudates for use in the construction of hives. Has wide applications in medicine, cosmetics and foods, e.g. in food supplements. Also reported to have antibiotic or antifungal properties. Other hive products include honeys, beeswax and royal jelly.

Propoxur  Non-systemic N-methylcarbamate insecticide used for control of insect pests in food storage areas. Also used for control of sucking and chewing insects in a range of crops. Residues tend to be relatively persistent. Classified by WHO as moderately hazardous (WHO II).

Propyl alcohol  Synonym for propanol. Alcohol containing three carbon atoms. Used for extraction of glutenin subunits from wheat and phospholipids from fish oils.

Propylamine  Amine containing three carbons atoms.

Propylene  Colourless, gaseous hydrocarbon with a garlic odour. Also known as propene. Active ethylene analogue, which can be used to promote the ripening of fruits.

Propylene glycol  Aliphatic alcohol used primarily in emulsifiers. Other uses in foods include as antickaking agents, antioxidants, flavourings and humectants. In food processing, propylene glycol is used in freezing media and solvents. Synonym for 1,2-propanediol.

Propylene oxide  Oxide of propylene that can be used for fumigation. Also used as an intermediate in the synthesis of propylene glycol, glycerol and propanolamines, and as a solvent for cellulose acetate, cellulose nitrates and natural resins.

Propyl gallate  Esters of propanol and gallic acid (3,4,5-trihydroxybenzoic acid) with antioxidative activity. Soluble in fats and thus used as antioxidants for fats, including margarines and edible oils, and meat products. Propyl gallate exhibits synergistic antioxidative activity with BHT and BHA.

Propylparaben  One of the parabens, also called 4-hydroxybenzoic acid propyl ester. Several of the paraben esters are used as preservatives for foods, beverages, pharmaceuticals and cosmetics. In 2004, propylparaben was excluded from the list of permitted food additives in the EU, due to concerns over possible oestrogenic activity.
Prosopis africana

Prostaglandins

Prostaglandin-endoperoxide synthases

Prostate cancer

Proso millet Millet belonging to the species Panicum miliaceum, which is grown as a cereal food in Asia and Eastern Europe.

Prosopis africana seeds Seeds of a wild tropical plant that grows in Nigeria. Fermented to produce condiments (kpaye, okipye or okpehe) that may be used in soups, or boiled and made into daddawa cake, used to add flavour in cooking. A potential source of vegetable oils.


Prostaglandins Group of compounds formed from unsaturated fatty acids with 20 carbon atoms, predominantly arachidonic acid. Prostaglandins contain a five membered ring and are mediators of a wide range of physiological processes.

Prostate cancer A form of cancer in men involving the uncontrolled growth of abnormal cells in the prostate gland. A healthy diet that includes plenty of fruits and vegetables may offer protection against this malignancy.

Prostokvasha Low fat fermented milk product, popular in Russia, fermented with lactic acid bacteria.

Protamine Antimicrobial peptide with high arginine content, usually found in association with DNA of spermatozoan nuclei of fish (including salmon, carp and herring). Particularly active against Gram positive bacteria. Used in food preservatives for inhibition of microbial growth, and also shows emulsifying capacity. Also known as salmine.

Proteases Alternative term for proteinases.

Proteasomes Alternative term for proteinases.

Proteinases Enzymes that hydrolyse proteins by cleavage of peptide bonds. Endoproteases cleave within protein molecules, while exoproteases attack the ends of protein chains removing amino acids one at a time. They are classified as serine proteinases, thiol proteinases, metalloproteinases or acid proteinases. Some proteinases exhibit a high degree of specificity with respect to the peptide bonds they cleave (e.g. trypsin), while others are much less specific (e.g. papain). These enzymes are used in all areas of food production, including the meat, brewing, cheesemaking and breadmaking industries. Also known by many other names, including proteases, proteasomes and proteolytic enzymes.

Proteinases inhibitors Substances that have the ability to inhibit the proteolytic activity of certain enzymes. Such inhibitors are found throughout the plant kingdom, particularly among legumes. Trypsin inhibitors are found in soybeans, lima beans and mung beans. Chymotrypsin inhibitors are found in cereals and potatoes. Proteinase inhibitors are destroyed by heat.

Proteinates Products typically obtained by precipitation of proteins from the source material at the isoelectric points, followed by a neutralization step (e.g. to form sodium or calcium proteinates). Some of the most widely used proteinates include caseinates, total milk proteinates and soy proteinates, which have applications as functional ingredients in meat products, dairy products and imitation foods. Mineral proteinates are also used in animal and human nutrition as a readily absorbed form of mineral complex.

Protein concentrates Products prepared by extracting proteins from animal and plant materials such as vegetables, fish or whey. Protein content varies among preparations. Used to provide protein fortification and enhance functional properties in a wide range of foods. Some of the most commonly used concentrates in the food industry are fish protein concentrates, soy protein concentrates and whey protein concentrates.

Protein efficiency ratios Biological method (commonly abbreviated to PER) for evaluating protein quality in terms of weight gain per amount of protein consumed by a growing animal. PER is used widely in comparing the nutritional values of proteins in individual foods. It assumes that all protein is used for growth and no allowance is made for maintenance.

Protein engineering Use of genetic techniques to modify and enhance the properties of proteins.

Protein-glutamine γ-glutamyltransferases EC 2.3.2.13. Catalyse the formation of amide bonds between side chain glutamine and side chain lysine residues in proteins with the elimination of ammonia. Used for cross-linking proteins, thus modifying their functional properties (e.g. milk proteins in production of yoghurt, cereal proteins in production of bakery products and fish proteins in production of surimi gels). Also used for covalently incorpo-
Protein hydrolysates

Protein hydrolysates Proteins that have been subjected to hydrolysis by treatment with enzymes, acids or alkalies, so that the protein molecule is broken down into peptides and free amino acids. Easily digestible and used to reduce antigenicity of foods. Applications include as ingredients of medical foods, infant formulas and hypoallergenic foods.

Protein isolates Products prepared by extracting and purifying proteins from animal and plant materials. Have similar properties to protein concentrates, but typically contain about 90% protein. Examples include soy protein isolates and whey protein isolates.

Proteins Nitrogenous organic compounds consisting of linked amino acids that are distributed widely in plants and animals. The sequence of amino acids in proteins is determined by the base sequence of their encoding genes. They serve many roles, such as enzymes, structural elements and hormones, and are essential nutrients.

Protein values Relative nutritional values of proteins based on amino acids composition, digestibility and availability of the digested products. Also the relative biological value defined in various terms, including the ability of a test protein, fed at various levels of intake, to support nitrogen balance, relative to a standard protein.

Proteobacteria Diverse phylum of Gram negative bacteria containing several genera of foodborne pathogens, including Escherichia, Salmonella, Vibrio and Helicobacter.

Proteoglycans High molecular weight complexes of proteins and polysaccharides that are major constituents of structural tissues such as bones, cartilage and muscles, and are also found on the surface of cells. Glucosaminoglycans, the polysaccharides in proteoglycans, are polymers of acidic disaccharides containing derivatives of glucosamine or galactosamine.

Proteolipids Complexes of proteins and lipids abundant in brains but also found in a wide variety of tissues in animals and plants. In contrast to lipoproteins, they are insoluble in water. The proteins in proteolipids have high contents of hydrophobic amino acids, while the lipids consist of a mixture of phosphoglycerides, cerebrosides and sulfatides. In contrast, lipoproteins consist of phospholipids, cholesterol and triglycerides.

Proteolysis Hydrolysis of proteins to smaller peptide fractions and their constituent amino acids, catalysed by alkalies, acids or enzymes (proteases).

Proteolytic enzymes Alternative term for proteases.

Proteomics Branch of science involved with the study of proteins produced by an organism during its lifetime (the proteome). Analogous to genomics as the study of genomes. Various analytical techniques are employed for investigation of the protein content of cells, tissues or organisms. Effects of development, mutations, diseases, environment, etc. on protein composition, structure, expression and activity may be studied using a proteomics approach.

Proteose peptones Small peptides in milk derived from the breakdown of casein by proteinases.

Proteus Genus of Gram negative, facultatively aerobic, rod-shaped bacteria of the family Enterobacteriaceae. Occur in soil, water, dairy products, raw shellfish, fresh vegetables and the gastrointestinal tracts of humans and animals. Some species (e.g. Proteus vulgaris and P. intermedium) may cause spoilage of foods (e.g. eggs, cottage cheese, meat and shellfish).

Protocatechuic acid Phenolic compound found in many foods and beverages which exhibits antioxidative activity and is able to scavenge free radicals.

Proton magnetic resonance Spectroscopy technique also known as ¹H-NMR (nuclear magnetic resonance) in which analysis is based on chemical shifts between non-equivalent protons in the molecule under investigation.

Proton resonance Phenomenon used in nuclear magnetic resonance and proton magnetic resonance in which protons in a static magnetic field absorb energy from an alternating magnetic field at characteristic frequencies.

Protoplast fusion Fusion of protoplasts from different strains, species or genera to form hybrid protoplasts, and ultimately hybrid cells. Protoplasts are mixed together, transferred to appropriate media for cell wall regeneration and the resulting cells are screened for the presence of genetic markers from both parents.

Protoplasts Bacterial and plant cells that lack cell walls. Cell walls can be removed enzymically or by growth in the presence of antibiotics that block synthesis of cell wall peptidoglycans. Protoplasts can continue to metabolize and can revert to normal cells under appropriate conditions, although they cannot divide. Protoplasts are prepared more easily from Gram
positive bacteria than from Gram negative bacteria.

Protozoa Former taxonomic group which included unicellular eukaryotes such as amoebae, flagellates and ciliates. These microorganisms are found in soil and freshwater, brackish and marine habitats. Some, such as Cryptosporidium and Giardia spp., are pathogens in humans and animals. Transmission is typically via water, raw meat and faecally-contaminated vegetables, salads and fruits.

Providencia Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae. Occur in soil, dairy products, raw shellfish, fresh vegetables, and the gastrointestinal tract of humans and animals. Providencia alcalifaciens is associated with diarrhoeal illness in humans due to consumption of contaminated foods.

Provitamin A Vitamin precursor for vitamin A. Some carotenoids, such as α- and β-carotene and β-cryptoxanthin, have provitamin A characteristics. Provitamins are chemically related to preformed vitamins, but have no vitamin activity unless converted to the biologically active form.

Provolone cheese Italian semi-hard all-purpose cheese made from cow milk. The rind is yellow and shiny, thin and hard. It may also be waxed. The interior is cream-white or slightly straw coloured with a compact texture. Marketed in various types that have been aged for periods of 2-3 months to 2 years, and differ in flavour and aroma.

Prunasin Cyanogenic glycoside found in a range of plant materials including almond roots and leaves, vetch seeds (used as lower priced substitutes for lentils), Japanese apricot seeds, plum seeds, juice and peel of passion fruits, and black cherry seeds. Also isolated from fresh tea leaves, where it is a precursor for the flavour compound benzaldehyde. Present in many immature fruits, but converted to amygdalin during maturation.

Prune juices Fruit juices prepared by water extraction of the soluble solids from prunes (Prunus domestica). A good source of dietary antioxidant compounds, vitamin A, potassium, magnesium, fibre and iron. The high fibre content provides a digestive function as a natural laxative.

Prunes Dried plums. Specific varieties, mainly of European plums, are suitable for production of prunes. Plums are dried on the tree where the climate is warm enough, or alternatively dried by artificial means.

Pruning Cutting branches or roots of trees and bushes, usually to a specified length or position. Can have beneficial effects on plant growth as well as on yield and quality of fruits produced.

PSE defect Abbreviation for the pale soft exudative defect of meat, especially pork.

Pseudoalteromonas Genus of Gram negative bacteria of the family Pseudoalteromonadaceae which are found in marine environments. The type species is Pseudoalteromonas haloplanktis, and the genus includes species which are psychrophiles and/or halophiles. Biotechnological potential for production of various enzymes, including cold-adapted variants, particularly hydrolases and poly(β-D-mannuronate) lyases. May be associated with spoilage of shellfish.

Pseudocereals Plant species that do not belong to the grass family, but produce seeds or fruits that are used in the same way as grain from cereals to make flour and bakery products. Include buckwheat, quinoa and amaranth grain.

Pseudomonadaceae Family of aerobic, curved or straight, rod-shaped Gram negative bacteria of the order Pseudomonadales. Occur in fresh water, salt water and soil. Includes many plant pathogens and a few animal pathogens. Some members synthesize products of biotechnological interest. Includes the genera Cellvibrio, Azotobacter and Pseudomonas.

Pseudomonas Genus of aerobic, curved or straight rod-shaped Gram negative bacteria of the family Pseudomonadaceae. Occur in soil, water, salads and meat. Some species (e.g. Pseudomonas fluorescens and P. fragi) may cause spoilage of meat, dairy products, eggs and fish. Certain species, e.g. P. cepacia, have been reclassified under the new genus Burkholderia.

Pseudoterranova Genus of parasitic nematodes of the family Anisakidae. Larvae have been implicated in anisakiasis, an infection caused by consumption of contaminated raw or undercooked sea foods.

Psicose Sugar with the systematic name D-ribo-2-hexulose of interest for potential use in sweeteners or bulking agents.

Psicodes Insects of the order Psocoptera, which are small, soft-bodied and sometimes winged. Some species, e.g. those of the genus Liposcelis, are pests infesting grain stores in hot, humid areas, with consequent adverse effects on grain quality and value. Also infest raw and processed foods in food manufacturing or retail premises as well as in the home. A wide range of commodities is prone to infestation, but the insects have a preference for microorganisms. These can become entangled in their bodies, and thus, the insects provide a means of disseminating spoilage-causing organisms. Also known as booklice.

Psoralens Toxic secondary metabolites found in many fruits and vegetables. They are potent photo-
sensitizers that can form photoadducts with nucleic acids if irradiated with UV light.

**Psychrotrophs** Genus of aerobic, mainly psychrotrophic Gram negative bacteria of the family Moraxellaceae. Some species, such as *Psychrobacter immobilis*, can cause spoilage of animal foods, including meat and fish products.

**Psychrophiles** Organisms, especially microorganisms, that grow best at relatively low temperatures. Their optimum growth temperature is generally accepted as being below 15°C.

**Psychrotrophs** Organisms, especially microorganisms, that can grow at relatively low temperatures, but grow optimally within the temperature range of 15 to 20°C.

**Psyllium** Small, dark red/brown seeds from plants belonging principally to the species *Plantago psyllium*, *P. ovata* or *P. afra*, producing a mucilaginous mass which is often added to foods as a source of soluble fibre.

**Psyllium gums** Gums extracted from seeds of psyllium (selected *Plantago* spp.). Used primarily as stabilizers for ice cream and sherbet.

**Ptarmigans** Game birds belonging to the genus *Lagopus* of the Tetraonidae (grouse) family, which are hunted for their meat.

**PTFE** Commonly used abbreviation for polytetrafluoroethylene.

**Puberty** The stage of physical development during which the reproductive organs become functional and secondary sexual characteristics begin to develop. These changes typically occur earlier in girls than in boys.

**Public health** Systems and procedures designed to protect and improve the health of a population and to prevent the spread of diseases. Includes concepts such as sanitation, disease control, public health education and access to health treatment.

**Pubs** Informal name for public houses, also known as inns. Establishments, found chiefly in the UK, consisting of at least one public room and licensed for the sale and consumption of alcoholic beverages. Most pubs now sell meals, often in a separate restaurant area.

**Pudding mixes** Dried instant foods consisting of a mixture of pregelatinized starch and other ingredients used to prepare puddings, typically by adding milk.

**Puddings** Sweetened, usually cooked, desserts made from various ingredients, e.g. flour, fruit, milk and eggs. Include milk puddings and steamed sponges. The term may also refer to savoury dishes topped with or surrounded by suet crust or pastry, such as steak and kidney puddings, or to savoury products in a sausage shape enclosed in casings, e.g. black puddings or white puddings.

**Puerarin** One of the isoflavones found in the legume *kudzu*, also known as *Pueraria lobata*. A glycoside of daidzein that acts as a phytoestrogen. Claimed to improve memory and cognitive performance, reduce osteoporosis risk and improve glucose tolerance.

**Pu-erh tea** Type of China tea which has undergone a microbial fermentation process during manufacture.

**PUFA** Abbreviation for polyunsaturated fatty acids.

**Puff balls** Common name for edible fungi of the genus *Lycoperdon*.

**Puffed rice** Rice grains that are heated under pressure which is then rapidly released, causing the superheated steam in the grain to expand and explode the rice grain. Used in a range of food applications, including snack foods, breakfast cereals and confectionery.

**Pufferfish** Any of a number of small, predominately marine fish in the family Tetraodontidae; widespread in the Indo-Pacific region. Some species are highly esteemed food fish, particularly in Japan. Many species contain potent neurotoxins, implicated in severe and often fatal food poisoning incidents. Commercially important species include *Takifugu porphyreus* (purple puffer) and *T. vermicularis* (nashi-fugu). Normally marketed fresh and prepared for consumption by specialist chefs able to remove toxic components.

**Puffing** Method for expanding foods, particularly cereal grains. Grain is subjected to high pressure and/or temperature, before being ejected into a normal atmospheric pressure, causing the samples to expand sharply. Used mainly in the manufacture of breakfast cereals such as puffed rice and puffed wheat, and for making snack foods and puffed rice cakes.

**Puff pastry** Light flaky pastry formed by alternating layers of fat and dough so that, upon baking, steam collects between dough layers, causing them to expand and form cavities between the thin pastry layers.

**Pullet eggs** Eggs produced by pullets (young chickens usually less than one year old).

**Pullulan** Extracellular, water-soluble, linear D-glucan produced by *Aureobasidium pullulans*, consisting
Pullulanases predominantly of maltotriose units linked by (1,6)-α-glucosidic bonds. Useful as a starch replacer in dietetic foods and as a component of edible films.

Pullulanases EC 3.2.1.41. Glycosidases which hydrolyse (1,6)-α-β-glucosidic linkages in pullulan, amylopectins and glycogen, and in α- and β-limit dextrins of amylopectins and glycogen. Also known as debranching enzymes, α-dextrin endo-1,6-α-glucosidases and amylopectin 6-glucanohydrolases, and, erroneously, as limit dextrinases. Applications include the production of resistant starch or other modified starches, often by debranching treatments, and use in the saccharification of starch to yield starch syrups.

Pulp Pulpboard Type of paperboard in which all plies are usually made from wood pulp, although the centre may sometimes be filled with waste paper.

Pulping Crushing of foods, e.g. fruits and vegetables, into soft, smooth and moist masses (pulps).

Pulps Preparations of a soft, moist consistency, typically obtained by mashing foods, particularly fruits or vegetables. Used in the manufacture of a wide range of foods and beverages, including fruit juices, yoghurt and pie fillings. Also refers to the solid residue remaining after extraction of juices from fruits and vegetables.

Pulque Mexican alcoholic beverages prepared by fermentation of sap of the agave plant.

Pulsed electric fields Used in food processing and preservation. A high intensity electric field is delivered as a series of pulses of direct current to the food for a very short period of time while the food is held between two electrodes. This process results in formation of pores in, and breakdown of, cell membranes. Applications include inactivation of microorganisms and increased yield of fruit juices during extraction. The risk of dielectric breakdown of foods limits this type of processing primarily to liquid foods, because uniformity of the applied electrical field would be distorted by air bubbles or suspended solids that usually exist in solid foods.

Pulsed field gel electrophoresis Gel electrophoresis technique in which DNA fragments are separated by subjecting the gel to an electric current alternately from two angles at timed intervals. Commonly abbreviated to PFGE.

Pulses Edible seeds of leguminous plants, including various beans, peas and lentils. Mature seeds are dry and can be stored. Also refers to the plants producing these seeds.

Pulverization Reduction into fine particles (powders or dust), usually by crushing, pounding or grinding.

Pummeleos Alternative term for pomelos or shad-docks, the largest of the citrus fruits, produced by Citrus maxima or C. grandis and ancestors of the modern grapefruit. Closely resemble the grapefruit in appearance, but the flesh is sweeter and less acidic, lacking the bitterness of a grapefruit. Rich in vitamin C and potassium. Eaten fresh or used to make jams, jellies and marmalades.

Pumpernickel Dark brown, dense bread made with coarsely ground whole rye flour and sourdough, originating from Germany.

Pumpkins Fruits produced by plants of the genus Cucurbita, especially C. pepo and C. maxima. Contain approximately 90% water, moderate amounts of vitamin C, and small amounts of carotenes, starch, sugars, proteins, fats and the vitamin B group. Used in jams and pies and as vegetables. Leaves and flowers of the plants can also be eaten. Pumpkin seeds are eaten or processed into pumpkin seed oils.

Pumpkin seed oils Oils rich in unsaturated fatty acids. Frequently used as salad oils; also used as an ingredient of cider vinegar.

Pumpkin seeds Oilseeds produced by pumpkins, Cucurbita pepo, which, when roasted and salted, may be consumed as snack foods. Rich in unsaturated fats, vitamins and minerals.

Pumps Mechanical devices that use suction or pressure to raise or move liquids or compress gases. Often components of larger pieces of equipment.

Pungency Sensory properties relating to the extent to which the aroma or flavour of a product (usually onions, chillies, peppers, ginger and radishes) is acrid or pungent.

Pungent principles Flavour compounds responsible for pungency of foods such as chillies, onions, peppers, ginger and radishes.

Punnets Small lightweight containers or baskets for vegetables or fruits.

Puppy foods Pet foods designed to meet the nutritional needs of puppies. Contain relatively large amounts of proteins and certain minerals and vitamins to promote growth and organ development. Include dried, semi-moist and moist foods with or without mixers. Often contain chicken meat, rice and corn as major ingredients. Also available are premium and organic products.

Purchasing behaviour Consumer activity related to awareness, attitudes, knowledge and selection of foods, as well as willingness to pay. Influenced by consumer-related factors (age, ethnic groups, socioeconomic groups, education, ability to pay), pricing, shopping
environment and marketing. An important aspect of market research.

Purees Smooth, thick preparations made by mashing foods, particularly cooked fruits and vegetables, which have had any coarse fibre removed by sieving or similar means.

Purge loss The loss of liquid from a food such as meat following processing, particularly thawing. Accumulation of liquids in packs during retail display can adversely affect consumer acceptability.

Purification Removal of contaminants or undesirable components from a substance.

Purines Heterocyclic organic bases that pair with pyrimidines in DNA and RNA, and whose derivatives are important in metabolism. They include adenine and guanine, as well as many alkaloids, such as caffeine and theophylline.

Purity Extent to which an item or substance is pure, i.e. free from contaminants and adulterants.

Puroindolines Lipid-binding cereal proteins (purindolone-a and purindolone-b) found in wheat which play a significant role in texture of bread crumb. Genetic variation of puroindoline alleles is associated with kernel hardness in wheat, a property known to affect milling and baking qualities.

Purothionin Disulfide-rich protein of the wheat endosperm which shows antimicrobial activity.

Purslane Common name for plants of the genus Portulaca, especially P. oleracea. Leafy vegetable that is eaten raw in salads or cooked in soups or as greens. Rich source of ω-3 fatty acids, known to be beneficial in coronary heart diseases and some types of cancer. Seeds are ground into a meal that may be used to make bread.

Puto Fermented rice cakes which are consumed as breakfast foods or snack foods in the Philippines.

Putrefaction Typically anaerobic, microbial decomposition or spoilage of substances (especially proteinaceous and fatty products such as meat and fish) with the production of foul-smelling compounds (e.g. ammonia, hydrogen sulfide, cadaverine and putrescine).

Putrescine Foul-smelling biogenic amine formed from the decarboxylation of ornithine, usually during putrefaction.

PVC Abbreviation commonly used for polyvinyl chloride.

PVDC Abbreviation commonly used for polyvinylidene chloride.

Pycnometry Technique for determining the density of a liquid, using a small bottle of accurately measured volume. Density is determined from the ratio between the weights of a given volume of water and the same volume of sample.

Pycnoporus cinnabarinus Species of fungi of the family Polyporaceae. Used for bioremediation of processing wastes such as olive oil mills effluents and sugar cane bagasse, and for the industrial production of enzymes.

Pyanoanthocyanins Derivatives of anthocyanins found mainly in red wines, berries (e.g. strawberries, raspberries) and fruit juices. Pigments with a range of chemical structures. Can be formed in wines during fermentation, by reaction of yeast metabolites with anthocyanins. Include vitisins A and B, which may contribute to the orange/red colour of wines, and portins (vinylproanthocyanins), which are found in port and exhibit a blue colour in solution.

Pyrazines Nitrogen containing, heterocyclic flavour compounds that can be formed during the Maillard reaction. Found in many foods and beverages.

Pyrene Toxic four ringed polycyclic aromatic hydrocarbon that can contaminate foods and beverages.

Pyrethrins Natural insecticidal compounds found in the flower of the pyrethrin daisy, a Chrysanthemum sp. native to Kenya. Used in the manufacture of pyrethroid insecticides.

Pyrethroid insecticides Class of synthetic insecticides based on pyrethrins. Widely used for control of insects on a range of crops. Examples include cypermethrin, deltamethrin, fenvalerate and permethrin.

Pyridine Heterocyclic nitrogenous base that acts as the nucleus of a large number of organic compounds, such as alkaloids. Used as a solvent, and in the manufacture of various drugs and pesticides.

Pyridoxal One of the three forms of vitamin B6, the aldehyde form, the others being pyridoxamine (the amine form) and pyridoxine (the alcohol form). The relative proportion of each of the three forms in foods varies considerably. All are equally biologically active.

Pyridoxamine One of the three forms of vitamin B6, the amine form, the others being pyridoxal (the aldehyde form) and pyridoxine (the alcohol form). The relative proportion of each of the three forms in foods varies considerably. All are equally biologically active.

Pyridoxine One of the three forms of vitamin B6, the alcohol form, the others being pyridoxal (the aldehyde form) and pyridoxamine (the amine form). The relative proportion of each of the three forms in foods varies considerably. All are equally biologically active.

Pyrimethanil One of the anilinopyrimidine fungicides. Also known as Scala. Effective against Botrytis cinerea and Penicillium spp. Used to reduce fungal contamination of fruits (e.g. stone fruits, pome
**Pyrimidines**

fruits, grapes) before harvest and to minimise decay during storage. Can be applied by spraying or dipping. Classified by WHO as unlikely to present acute hazard in normal use.

**Pyrimidines** Heterocyclic organic bases that pair with purines in DNA and RNA, and whose derivatives are important in metabolism. Include cytosine, thymine and uracil.

**Pyrocarboxylic acid diethyl ester** Esters with antimicrobial activity used as preservatives mostly for beverages, including wines, alcohol reduced wines, fruit juices and iced tea. Also known as dimethyl dicarbonate.

**Pyrocarbonic acid** Heterocyclic organic bases that pair with pyrimidines.

**Pyrolysis** Decomposition of chemical substances as a result of high temperatures. Sometimes used in analysis of foods by gas chromatography and mass spectroscopy, and as part of some processing techniques to add flavour or colour to products.

**Pyrones** Heterocyclic flavour compounds found, for example, in roasted malt and chicory. Can also be produced by microbial fermentation. Certain pyrones act as mycotoxins, while others have been found to exhibit antifungal activity.

**Pyrophosphatases** Group of enzymes within the subclass EC 3.6.1 that catalyse the hydrolysis of di-phosphate bonds, mainly those of nucleoside di- and triphosphates, liberating either a mono- or diphosphate.

**Pyrophosphates** Compounds containing two phosphate groups linked together by an ester bond. Involved in many metabolic reactions in prokaryotes and eukaryotes.

**Pyroles** Organic nitrogen compounds that can be formed in foods by the Maillard reaction or by other pathways, and contribute to flavour. Some pyroles exhibit antimicrobial activity. The pyrrole ring structure is also found in many important biological compounds, such as pigments, chlorophylls and haem.

**Pyridine** Alkaloids found in some flowering plants. Can be consumed directly as natural food components (e.g. in honeys and herb tea) or indirectly via consumption of cereal products contaminated with weeds that produce these toxins. Can also occur in eggs, milk and offal, after animals have eaten contaminated grain. Cause hepatotoxicity in animals and humans. Can be fatal.

**Pyruvaldehyde** Organic compound often used as a reagent in organic syntheses and in flavourings. Can be formed by the Maillard reaction and has been shown to exhibit antibacterial activity. Also known as methylglyoxal.

**Pyruvic acid** EC 4.1.1.1. Enzymes which catalyse the decarboxylation of α-keto acids to aldehydes and carbon dioxide. Decarboxylate pyruvic acid to acetaldehyde prior to metabolism via the tricarboxylic acid cycle (aerobically) or to ethanol (anaerobically). Thought to contribute to the formation of important flavour compounds such as acyloins and isoamyl alcohol produced by yeasts in alcoholic beverages and also important during postharvest storage of fruits. Also known as α-carboxylases, pyruvic decarboxylases and α-ketoacid carboxylases.

**Pyruvic acid** Intermediate in a wide range of aerobic and anaerobic metabolic pathways. Produced as the end product of glycolysis and is at the starting point of the Krebs cycle.
QTL  Abbreviation for *quantitative trait loci*.

**Quail eggs**  Eggs produced by *quails*. Considered as a delicacy. Consist of approximately 13% protein and 11% lipids, and have a mean weight of 11 g. **Egg shells**  may be a variety of colours, but are often light brown with dark speckles.

**Quail meat**  Meat from *quails*, commonly from farmed bobwhite quails (*Colinus virginianus*) or Japanese quails (*Coturnix coturnix*). Farmed quail meat tends to be white in colour, delicately flavoured and very tender. In comparison, wild quail meat can be very richly flavoured, but it can also be tough; consequently, it benefits from application of marinades or slow pot-roasting, which soften the meat.

**Quails**  Several species of migratory, short-tailed birds belonging to the Phasianidae family, which are hunted for *quail meat* or farmed for production of quail meat and *quail eggs*.

**Quality assurance**  Planned and systematic actions necessary to provide adequate confidence that goods or services will satisfy given requirements. For the food industry, this is a customer-focused management system, whose aim is to guarantee food safety and consistent product quality by application of production, processing and handling standards. Proactive food safety programmes, in particular those based on **Hazard Analysis Critical Control Point** (HACCP) principles, are the foundation of many food quality assurance systems.

**Quality control**  A system of maintaining standards in manufactured products by testing a sample against the specification.

**Quantitative descriptive analysis**  Comprehensive system used in *sensory analysis* that covers sample collection, assessor screening, vocabulary development, testing and data analysis. Quantitative descriptive analysis (commonly abbreviated to QDA) uses small numbers of highly trained assessors. Once the training sessions have established satisfactory panel performance, and removal of ambiguities and misunderstandings, the test samples can be evaluated. This is carried out in replicated sessions using experimental designs that minimize biases. Three major steps are required: development of standardized vocabulary; quantification of selected sensory characteristics; and analysis of results by parametric statistics.

**Quantitative trait loci**  Location of genes that affect traits which can be measured on a quantitative (linear) scale. These traits are usually affected by more than one gene and also by the environment. Examples of quantitative traits are body wt. and plant height. Abbreviated to QTL.

**Quarg**  German *soft cheese* made from *cow milk*. Can be made from whole, skim or semi-skimmed milk or *buttermilk*. **Skim milk powders** are sometimes added, giving a gritty **texture**. Ripens within a few days. The moist, white product has a light taste and is usually sold in pots. Also known as quark.

**Quartoiro cheese**  Italian *soft cheese* similar to *Taleggio cheese*. Also made widely in Argentina where it is known as Cuartirolo Argentino cheese.

**Quassin**  Triterpenoid produced in the bark of the plant *Quassia amara*. Used as a bittering agent in foods and beverages.

**Quaternary ammonium compounds**  Cationic surfactant ammonia salts in which the nitrogen atom is bonded to four organic groups. Used as **antiseptics**, **disinfectants** or **preservatives** due to their **antimicrobial activity**. Commonly used for disinfection of equipment in **dairies** and **breweries**.

**Quercetin**  Flavonol aglycone distributed widely in plants and found in many foods and beverages. Exhibits a range of biological activities including **antioxidative activity**. Forms the **glycosides** quercitrin and rutin with **rhamnose** and rutinose, respectively.

**Quercitrin**  Flavonol glycoside formed from quercetin and rhamnose. Distributed widely in plants and found in many foods and beverages. Exhibits a range of biological activities including **antioxidative activity**.

**Queso Blanco cheese**  Mexican *soft cheese* made from *cow milk*. Traditionally produced from **skim milk** or **whey** coagulated with **lemon juices**. Flavour is milky and fresh. Has an elastic **texture** which holds its shape when heated, making it ideal for preparation of dishes such as stuffed chicken breasts, stuffed peppers, enchiladas and burritos.
**Quinoas flour**  Food produced by milling seeds of quinoa, a pseudocereal. Can be used in wheat-based and gluten-free baking.

**Quinolones**  Group of synthetic antibiotics used to combat a wide range of diseases in animals and farmed fish. Commonly used examples include oxolinic acid and nalidixic acid, which show activity against Gram negative bacteria only. Second generation quinolones (containing a fluorine or piperazino moiety) show broader antibacterial activity; examples include ciprofloxacins and sarafloxicin.

**Quinones**  Aromatic dioxo compounds that are usually coloured and are constituents of many natural pigments; intermediate products of enzymic browning. Their derivatives include the K vitamins. They function in aerobic and anaerobic electron transport chains, in photosynthesis, and as carriers of reducing equivalents between dehydrogenases and terminal enzyme complexes.

**Quintozone**  Soil applied fungicide that controls a wide range of soil borne plant diseases. Classified by WHO as unlikely to present acute hazard in normal use. Also known as pentachloronitrobenzene.

**Quito orange**  Alternative term for naranjilla.

**Quorn**  Trade name for textured mycoprotein obtained from the filamentous fungus Fusarium graminearum A3/5. Commonly used as meat substitutes, e.g. in sausages and ready meals, or sold as unflavoured chunks or mince for use in home cooked dishes. Originally conceived as a protein-rich food, now usually promoted as a healthy food that is high in fibre and low in calories and saturated fats.

**Quorum sensing**  Mechanism through which communication occurs among bacteria and some social insects. In bacteria, this involves the accumulation and detection of signalling molecules (autoinducers) secreted by other bacteria. Usually communication is between bacteria of the same species; however, recognition of signals produced by other species has been shown. Used by a bacterium to monitor the number of bacteria within an environment and co-ordinate a response to an environment. Important for successful virulence of some pathogens or formation of biofilms.
Rabadi  Traditional fermented food of India, prepared by fermentation of a mixture of flour, made usually from pearl millet, and buttermilk. Cereal flour may be partially substituted by that prepared from soybeans or other vegetables.

Rabbitfish  Marine fish species (Chimaera monstrosa) found in the northeast Atlantic. Of little commercial value, but livers are sometimes utilized as a source of oils.

Rabbit meat  Meat from wild or farmed rabbits. Rabbit carcasses have a high meat to bone ratio; a high proportion of the carcass is edible meat. Meat from young rabbits tends to be more tender and succulent than meat from older rabbits. Rabbits are sold whole or jointed into back legs, forelegs, saddle and fillets. The highest quality meat is found in the rabbit thigh. Farmed rabbit carcasses tend to be larger than those of wild rabbits. Farmed rabbit meat tends to be whiter in colour, is covered by a thin layer of fat and is generally more tender, more delicately flavoured and juicier than wild rabbit meat. Wild rabbit meat is very lean and, consequently, can be tough and dry when cooked.

Rabbits  Burrowing, plant-eating mammals belonging to the Leporidae family, that are farmed and hunted for rabbit meat and fur production.

Rabri  Concentrated and sweetened buffalo milk product with a flaky/layered texture. Popular in India. Traditionally, milk standardized to 6% fat is heated at approximately 90°C with repeated removal of clotted cream (malai), sugar is added to the concentrated milk and finally the clotted cream is added back to the concentrated sweetened milk. In a commercial method, shredded chhana or paneer is used in place of clotted cream. Rabri has a relatively short shelf life.

Racemases  Includes members of subclass EC 5.1. These isomerases catalyse the racemization of a centre of chirality and are subdivided according to their substrates; amino acids (EC 5.1.1), hydroxy acids (EC 5.1.2), carbohydrates (EC 5.1.3) and other compounds (EC 5.1.99).

Racking  Process of drawing off wines or beer from the sediment in the barrel.

Raclette cheese  Semi-firm, salted cheese, with a pale yellow colour and a light brown rind, made from cow milk. Originates from the Swiss canton of Valais but is also made in the French regions of Savoie, Franche-Comte and Bretagne. Cheese flavour is intensified, and its elasticity improved, by heating, usually in front of a fire or under a hot grill. The melted cheese is scraped off onto various dishes such as boiled potatoes, cold meat and gherkins. Can also be used in fondues.

Ractopamine  β-Adrenergic agonist which increases nitrogen retention and protein synthesis, enhances lipolysis, suppresses lipogenesis and increases rate of weight gain and feed conversion efficiency in farm animals. Rapidly absorbed and eliminated from animal tissues; residues rarely persist in any organs beyond 10 days.

Radiation  Energy emitted in the form of electromagnetic waves or subatomic particles.

Radicals  Highly reactive molecular species which possess an unpaired electron. Often formed by the splitting of a covalent bond. May react with macromolecules (especially DNA and proteins), causing them damage.

Radical scavenging activity  Ability to trap organic free radicals formed by the splitting of molecular bonds. This protects cellular membranes from oxidative destruction and ultimately prevents DNA damage caused by the action of the radicals which can lead to carcinogenesis. Substances with high radical scavenging activity include antioxidant vitamins, such as α-tocopherol.

Radioactive contamination  Contamination that is caused by the presence of radioactive materials, such as radioelements.

Radioactivity  Emission of ionizing radiation or particles caused by the spontaneous disintegration of atomic nuclei.

Radioelements  Elements that undergo spontaneous disintegration of their nuclei with the emission of subatomic particles (α-particles and β-particles) or electromagnetic rays (X-rays and gamma rays).

Radiofrequency  Electromagnetic wave frequency between audio and infrared. Radiofrequency technol-
ogy is used in a number of food processing applications, including heating, drying, tempering, defrosting and pasteurization.

Radioimmunoassay Immunological technique in which a substance is measured by its ability to compete with a radioactively labelled form for binding to specific antibodies. Concentration of the substance is determined by comparing inhibition of binding with that caused by a series of standards.

Radioisotopes Isotopic forms of elements that are radioactive and undergo radioactive decay, properties that make them useful in various analytical techniques and for studying metabolic pathways.

Radiometry Technique for measurement of incident radiation using radiometers that can be tuned to specific frequencies.

Radionuclides Radioactive species of atoms that decay into products that themselves decay, the sequence of which constitutes a radioactive series.

Radishes Common name for *Raphanus sativus*, the fleshy roots of which are consumed. Roots vary in colour, size and shape. Western or small radishes, which contain moderate amounts of vitamin C, are generally used raw to add colour, crispness and pungency to salads and sandwiches. Oriental radishes, such as Japanese radishes, produce very large roots which are sold in the UK as mouli or rедь. Other types of radish include rat-tailed radishes, which produce edible pods, and leaf radishes, which are grown for fodder.


Radium Radioactive element with the chemical symbol Ra.

Radon Radioactive element with the chemical symbol Rn.

Radurization Low-level ionizing radiation treatment designed to enhance the shelf life of food by reducing the level of spoilage microorganisms present.

Raffinose Oligosaccharide composed of 3 sugar residues, i.e. fructose, glucose and galactose. Considered one of the antinutritional factors in legumes due to its tendency to cause flatulence.

Raftline Obsolete trade name for oligofructose food ingredients produced by partial enzymic hydrolysis of chicory inulin. Now marketed by the Orafti Group under the trade name Beneo™ oligofructose. The products consist of oligofructose, glucose, fructose and sucrose in varying combinations. Used as sugar substitutes in a wide range of food applications, and can be blended successfully with artificial sweeteners.

Rafilose Obsolete trade name for oligofructose food ingredients produced by partial enzymic hydrolysis of chicory inulin. Now marketed by the Orafti Group under the trade name Beneo™ oligofructose. The products consist of oligofructose, glucose, fructose and sucrose in varying combinations. Used as sugar substitutes in a wide range of food applications, and can be blended successfully with artificial sweeteners.

Ragi Cereal plant, *Eleusine coracana*, that is an important food grain in India and Africa. Used in porridges and gruel, and to make beer. Alternative term for finger millet. Also the Indonesian name for fermented and dried balls of roasted rice flour (other flours may be used as a substitute, e.g. cassava or millet) that contain a mixture of microorganisms and are used as starters for fermented foods such as tape.

Ragout Richly seasoned dishes made by stewing meat and/or vegetables. Preparation usually involves slow cooking over a low heat. Also refers to sauces for pasta, noodles or other starchy foods.

Ragusano cheese Italian hard cheese made from raw cow milk. Curd is heated and stretched until it becomes rubbery before being pressed and left to dry. During ripening the cheese is rubbed with oil and vinegar giving a strong savoury flavour to the mature product.

Rahat Alternative term for Turkish delight.

*Rahnella aquatilis* Species of bacteria of the family Enterobacteriaceae which can cause spoilage of vegetables, fish and dairy products. Also used in biotechnology for the production of lactan gums.

Rainbow trout Salmonid fish species (*Oncorhynchus mykiss*) predominately found in freshwater; indigenous to geographical areas linked to the East Pacific Ocean, but introduced worldwide. An important food fish with high commercial value; cultured in large numbers around the world. Marketed and consumed in a variety of forms, including fresh, frozen, smoked and canned.

Raising agents Bakery additives that are used for chemical leavening of cakes. Raising agents, such as baking powders (mixtures of tartaric acid and sodium bicarbonate), produce CO₂ on addition of liquid, such as water or milk. On baking, the gas bubbles expand but are trapped by the protein and starch of the flour, and become set as the liquid in the cake mix evaporates.

Raisins Dried grapes, usually made from Thompson seedless grapes. Prepared by sun or mechanical drying. Rich in iron with a high sugar content and a range of vitamins and minerals. Eaten out of hand or used in bakery products and various dishes.
Golden raisins are amber in colour due to treatment with sulfur dioxide, and are dried with artificial heat, giving a plumper and moister product that is preferred to common raisins for cooking. Muscat raisins are dark and sweet and used in fruit cakes.

Raki

Rakkyo

Rakia

Rambutan Fruits produced by Nephelium lapaceum. Rich in vitamin C. The outer skin is covered with red or yellow spines and encloses the edible white to pink flesh, in the centre of which is a seed. Flavour varies from sweet to acid according to cultivar; the former are eaten fresh and the latter cooked. Fruits are also available canned.

Ram meat

Ram muscles

Ramp

Rams

Raman spectroscopy

Rams

Raspberry juices

Rancidity Sensory properties relating to the extent to which the flavour of a product containing fats or oils is perceived to be rancid (sour or stale). Caused by oxidation of unsaturated fatty acids in fats and oils, resulting in the characteristic disagreeable flavour and aroma. Occurs slowly and spontaneously, and is accelerated by light, heat and certain minerals. Rancidity in foods may be prevented by proper storage, and/or the addition of antioxidants. Peroxide values are used as a measure of rancidity of oils and fats.

Randomly amplified polymorphic DNA Amplification of randomly selected genomic sequences by PCR under low stringency conditions using arbitrary primers. Can be used to determine taxonomic identity, study genetic diversity, generate probes and analyse mixed genome samples. Usually abbreviated to RAPD.

RAPD Abbreviation for randomly amplified polymorphic DNA.

Rapeseed meal

Rapeseeds Seeds produced by Brassica napus and used as a source of rapeseed oils. Also known as canola seeds.

Raphia Genus of palms. Stems of some species are used in the production of palm wines.

Ras cheese Egyptian hard cheese made from cow milk, buffalo milk or a mixture of both, raw or pasteurized.

Rasogolla Sweetened dairy product prepared from chhana. Chhana is mixed with flour and other constituents, divided into balls and cooked in sugar syrups.

Raspberries Berries produced by some species of the genus Rubus. R. idaeus produces red berries, although it has some less common yellow-fruited cultivars. R. occidentalis produces black fruit, while purple berries are produced by hybrids. Rich in vitamin A and vitamin C. Eaten out of hand and used in making desserts, jams, jellies and beverages.

Raspberry juices Fruit juices extracted from raspberries (Rubus spp.). Good sources of ellagic acid (one of the anticarcinogens), quercetin and anthocyanins (powerful antioxidant compounds).
Ravioli  Small square parcels of pasta which are usually stuffed with meat mince or cheese and served in tomato-based sauces.

Raw milk  Milk that has not been heat treated to destroy disease or spoilage causing microorganisms. Used to make some products, especially cheese, but not usually drunk. Sale of raw milk for drinking is prohibited in many countries. Also called unpasteurized milk.

Ray  General name used for a number of flattened marine fish species in the order Rajiformes; worldwide distribution. Generally used synonymously with skate. Many species are utilized as food fish, including Raja clavata (thornback ray), R. asterias (starry ray) and Leucoraja fullonica (shagreen ray). Flesh tends to be firm and white with a sweet flavour; fins may also be consumed. Marketed fresh, frozen, smoked and salted.

Raya seeds  Seeds extracted from Brassica juncea or B. carinata. Potential use as oilseeds.

Razor shells  Any of a number of marine bivalve molluscs with elongated shells. Found in sediments on Atlantic and Pacific shores. Some species are consumed, including Siliqua patula (razor clam) and Ensis ensis (pod razor).

RDA  Abbreviation for recommended dietary allowance.

RDI  Abbreviation for recommended daily intake.

Reactive nitrogen species  Potent oxidants formed from nitric oxide. Cause inflammation and have been linked to ageing, cancer and other conditions. May be formed by reaction of nitrates (e.g. in leafy vegetables) or nitrites (e.g. in cured meat) with other dietary components or gastric acid. Also generated as part of an innate host defence mechanism against microbial infection. May be inhibited by dietary antioxidants, such as quercetin and isoflavones.

Reactive oxygen species  Small, highly reactive moieties causing harmful effects in humans, such as DNA damage and cell damage, leading to oxidative stress and increased risk of cardiovascular diseases and cancer. Formed as by-products of O₂ metabolism and include oxygen ions, free radicals, peroxides and superoxides. Various dietary components (e.g. polyphenols) react with the above, neutralizing their effects and potentially providing health benefits.

Ready meals  Convenience foods prepared industrially to a set meals recipe usually by cook freeze or cook chill processing, and requiring no further preparation by the consumer other than reheating.

Ready to eat foods  Convenience foods that require no further preparation by the consumer, such as fast foods, food bars, ready to eat meals and ready to eat cereals. Similar to ready to serve foods.

Ready to eat meals  Convenience foods in the form of meals that require no further preparation by the consumer. Similar to ready meals.

Ready to serve foods  Convenience foods requiring no further preparation by the consumer, other than reheating where appropriate. Examples include ready to serve dairy desserts, gravy, salads, soups and beverages. Similar to ready to eat foods.

Rearing  Agricultural term relating to breeding and raising of animals as sources of foods.

Rebaudiosides  Sweet glycosides of the diterpene derivative steviol, which are 400 times sweeter than sugar. Found in leaves of Stevia rebaudiana, along with stevioside. Can be used as natural, non-nutritive, heat-stable sweeteners in foods and beverages. Less bitter than stevioside. Their use in foods is permitted in some countries, but not in others.

Recipes  A set of instructions that provide details on how to prepare culinary dishes and certain beverages. Information may include: ingredients required and their quantities, a step-by-step list of directions, preparation time, cooking instructions and number of servings provided. Some recipes may also give nutritional information, usually per portion, such as the contents of fats, carbohydrates, proteins, salt and calories.

Recombinant enzymes  Enzymes produced by recombinant DNA techniques. DNA encoding the enzyme of interest is manipulated in vitro and transformed into an appropriate cell type where it is expressed.

Recombinant microorganisms  Genetically modified microorganisms that contain DNA or genes from different sources. Produced using genetic engineering techniques.

Recombinant proteins  Proteins produced by recombinant DNA techniques. DNA encoding the protein of interest is manipulated in vitro and transformed into an appropriate cell type where it is expressed.

Recombination  Process similar to reconstitution, but involving addition of substances other than water which have been removed from the product. Examples include addition of butterfat as well as water to dried skim milk to make recombined milk of the desired fat content.

Recombined foods  Products made in a similar way to reconstituted foods, but with the addition of
Recombined milk

Dairy product made by reconstituting dried milk with water and other components such as a fat source (e.g. butter) to give a composition similar to that of milk.

Recommended daily intake

Amounts of nutrients greater than the requirements of almost all members of the population, determined on the basis of the average requirement plus twice the standard deviation, to allow for individual variation in nutrient requirements and thus cover the theoretical needs of 97.5% of the population. Commonly abbreviated to RDI.

Recommended dietary allowance

The average daily dietary intake level of individual nutrients that is sufficient to meet the nutrient requirements of most healthy individuals in a particular gender and age group. Comprises a component of the dietary reference intakes (DRI), and commonly abbreviated to RDA.

Reconstituted foods

Foods that have undergone reconstitution before consumption, often by addition of a liquid. Examples include soups and bakery products made from mixes, and fruit juices made from concentrates.

Reconstituted meat products

Alternative term for restructured meat products.

Rectification

One of two general methods, the other being simple distillation, used to separate a substance or a mixture of substances from a solution through vaporization. Distillation usually involves boiling a liquid and condensing the vapour that forms in a still. In simple distillation, all the distillate is removed from the still after collection. In rectification, part of the distillate flows back into the still. This portion comes into contact with the vapour being condensed and enriches it. Rectification can also be undertaken using large towers (fractionating columns). As the mixture to be separated is heated, its vapours rise through these columns. Substances that boil at the lowest temperatures form the first fractions. Their vapours rise highest and are carried off by pipes near the tops of the fractionating columns. Separate pipes carry off different fractions at various levels. Reflux (return) of some distillate to the columns produces the most efficient conditions for this method of distillation. Rectification can be carried out with a continuous feed of liquid. During manufacture of vodka, by-products of distillation, such as methanol, are removed from the distillate by rectification using a continuous still.

Recycling

Reuse of renewable resources in an effort to maximize their value, reduce waste, and reduce environmental disturbance. Food packaging wastes such as paper, glass and plastics are often recycled.

Red beans

Dark red beans used in making chilli con carne and refried beans. Also used in red beans and rice, a dish that is popular in the southern states of the USA.

Red beets

Roots of some varieties of Beta vulgaris. Eaten cooked as a vegetable and in salads. Also available canned. Leaves are sometimes consumed as a pot herb.

Red cabbages

Cabbages containing anthocyanins as pigments, giving them a red colour. Rich source of vitamin C. Flavour is generally milder and sweeter than that of other types of cabbage. Eaten as a cooked vegetable or raw in salads and coleslaw. Also popular for pickling.

Red chillies

General term for chillies which are red in colour. Immature chillies are green in colour and, depending on the variety, may change in colour during ripening to red, orange, yellow or brown. Thus, all red chillies are mature fruits. Most common type used for preparation of chilli powder. In general for chillies there is no correlation between pungency and colour.

Red clover

Common name for Trifolium pratense. A rich source of isoflavones. The young leaves and flowers of these plants can be used in salads and soups, the seeds can be sprouted and used in salads, and a sweet herb tea can be made from the fresh or dried flowers. Employed as a herbal remedy for various ailments, such as respiratory problems and skin conditions, and may be used to relieve symptoms of premenstrual syndrome and menopause due to its high content of phytoestrogens. Also used for grazing cattle and other animals.

Red crabs

Common name used for several species of marine crabs occurring along Pacific coasts, principally Pleuroncodes planipes and Chaceon quinquepens. Marketed in a variety of forms, including fresh cooked whole crab, cooked leg meat, canned meat and pastes.

Redcurrant juices

Fruit juices extracted from redcurrants (Ribes rubrum).

Redcurrants

Red berries produced by Ribes rubrum. Rich in vitamin C. Eaten out of hand or used as components of preserves, jellies and sauces, especially Cumberland sauce.
Reddish pink soft exudative defect

Commonly abbreviated to RSE defect, a condition which affects pork. RSE describes one of the four quality conditions into which most pork can be categorized. Colour of RSE meat tends to be normal. However, the meat has a poor water holding capacity, and drip loss is far greater than in normal red, firm, non-exudative (RFN) pork. Mishandling of swine pre-slaughter increases the incidence of the RSE defect, but the defect is not associated with any particular halothane genotype.

Redfish

Name given to several different marine fish species, but most commonly refers to Sebastes spp. Used as a synonym for rockfish. In Australia, the name refers to Centroberyx affinis. Marketed fresh and frozen.

Red ginseng

Form of ginseng prepared by sun drying or steaming, which changes the colour of the root from nearly white to red. Contains bioactive ginsenosides, and is used as a traditional medicine in Asia and as an ingredient of functional foods and functional beverages, including ginseng beverages.

Red gram

Alternative term for pigeon peas.

Red hake

Marine fish species (Urophycis chuss) belonging to the family Phycidae. Found in the western North Atlantic Ocean. Marketed fresh, frozen and dried/salted and cooked in various ways, including steaming and baking. Small fish are also used in fish meal production.

Red meat

Meat (e.g. beef, venison, rabbit meat, lamb and mutton) that is dark red in colour before cooking. Generally a good source of iron and proteins.

Red onions

Varieties of onions having inedible peel that is red to purple in colour and edible flesh flecked with red to purple pigmentation caused by the presence of anthocyanins. Many are less pungent than their yellow/brown or white counterparts and can be eaten raw. Used as an ingredient of various meals including salads.

Redox potential

Scale of values, measured as electric potential in volts, indicating the ability of a substance or solution to cause reduction or oxidation reactions under non-standard conditions.

Red peppers

Term applied to any of several types of red coloured hot peppers, such as chillies. Also may refer to red bell peppers, a milder variety of Capsicum.

Red rice

Alternative term for angkkak.

Red salmon

Alternative term for sockeye salmon.

Red sea bream

Marine fish species (Pagrus major) distributed around the northwest Pacific. Popular food fish which fetches high prices in Japan; cultured in some coastal regions. Marketed live, fresh, frozen and as a spice-cured product.

Redspot emperor

Marine fish species (Lethrinus lentjan) of the family Lethrinidae which is of high commercial importance. Widely distributed in the Pacific Ocean. Also known as pink ear emperor.

Reducing agents

Chemicals capable of the reduction of other chemicals, i.e. they donate electrons or hydrogen. During this process, the reducing agents themselves undergo oxidation. Also known as reducing substances.

Reducing substances

Alternative term for reducing agents.

Reducing sugars

Sugars with free aldehyde or ketone groups available for oxidation to form carboxylic acid groups. Reducing sugars are substrates for Maillard reaction with amino acids. Examples include glucose, maltose, lactose and mannose.

Reduction

Loss of oxygen from a compound, e.g. removal by reducing agents. Also includes reactions in which atoms in the reacting materials gain electrons. Reductions always occur simultaneously with oxidation reactions; if one reactant is oxidized, another must be reduced.

Reductones

Chemicals that contain an enediol group, e.g. ascorbic acid. Intermediates of the Maillard reaction which possess antioxidative activity.

Red wines

Wines which are red in colour, due to the presence of anthocyanins extracted from the skins of red winemaking grapes. Thought to have beneficial effects on health due to the anthocyanins and polyphenols such as resveratrol.

Reference materials

Materials of certified composition that are used as standards in analytical procedures.

Refining

Removal of impurities or unwanted elements from a substance. Often used to describe the processing of sugar and oils.

Reflectance

Optical properties relating to the measure of the proportion of light or other radiation falling on a surface which is then reflected or scattered.

Reflectivity

Optical properties relating to the amount of light or other radiation that can be reflected by an item. Rough surfaces reflect in a multitude of directions, and such reflection is said to be diffuse. Smooth, brightly polished or glossy surfaces reflect clearly and sharply at the same angle to the surface as the angle at which the light or heat contacted the surface. Reflectometers are instruments used for measuring the luster or sharpness of reflection of a finished surface.

Reflectometers

Instruments used to measure the colour or gloss of foods based on their reflectance of light.
Refractive index  Measure of the bending or refraction of a beam of light on entering a denser medium (the ratio between the sine of the angle of incidence of the ray of light and the sine of the angle of refraction). Constant for pure substances under standard conditions. Used analytically, for example, as a measure of sugar or total solids in solutions, and in determining the purity of oils.

Refractometry  Measurement of refractive index using one of the several types of refractometer.

Refrigerants  Substances with low vaporization temperatures used to promote the refrigeration conditions necessary for chilling foods and beverages. Ideal refrigerants have good thermodynamic properties, and are noncorrosive and safe. Examples include ammonia, ice and solid carbon dioxide (dry ice).

Refrigerated foods  Chilled foods requiring refrigeration prior to consumption.

Refrigerated storage  Process of keeping objects, usually foods, at a temperature that is significantly lower than that of the surrounding environment in order to extend their shelf life by a few days. Refrigeration or cold storage of foods is a gentle method of preservation, having minimal adverse effects upon flavour, texture and nutritional values. Refrigeration keeps spoilage reactions (microbial or enzymic) to a minimum, but does not kill microorganisms or inactivate enzymes; instead it slows down their deteriorative effects. Household refrigerators are usually run at a temperature of 4-7°C. Commercial refrigerators are operated at a slightly lower temperature.

Refrigerated transport  Specially designed transport vehicles, such as lorries, rail cars, aeroplanes or cargo ships, with refrigeration systems on board which are designed to protect frozen and perishable foods from high ambient temperatures. The refrigeration systems also cool the hot air mass in the cargo container, and remove the stored heat from the structure of the cargo body. Product integrity is maintained through avoidance of temperature fluctuation.

Refrigeration  Process by which heat is removed from an enclosed space or from a substance for the purpose of lowering the temperature. Refrigeration is chiefly used to store foods and beverages at low temperatures, thus inhibiting the destructive action of microorganisms. Cooling caused by the rapid expansion of gases (refrigerants) is the primary means of refrigeration.

Refrigerators  Appliances or compartments kept artificially cool by the use of refrigerants, and used to store foods and beverages. Mechanical refrigerators have four basic elements: an evaporator; a compressor; a condenser; and a refrigerant flow control (expansion valve). A refrigerant circulates among the four elements, changing from liquid to gas and back to liquid. In the evaporator, liquid refrigerant evaporates under reduced pressure, so absorbing latent heat of vaporization and cooling the surroundings. The evaporator is at the lowest temperature in the system and heat flows to it. This heat is used to vaporize the refrigerant. The refrigerant vapour is sucked into a compressor, a pump that increases the pressure and then exhausts it at a higher pressure to the condenser. To complete the cycle, the refrigerant must be condensed back to liquid, and, in doing this, it gives up its latent heat of vaporization to a cooling medium such as water or air.

Regenerated cellulose  Alternative term for cellophane.

Reggianito cheese  Argentinean hard cheese made from cow milk. Similar to Parmigiano Reggiano cheese. Used mostly for grating, in cooking or in toppings on pasta dishes.

Regional foods  Foods produced in, and often traditionally associated with, a particular geographical region. Examples include Cornish pasties and Roquefort cheese. Similar to ethnic foods which are foods associated with a particular nation rather than a particular region.

Reheating  Application of heat to a food that has already been thermally processed but then cooled. Cook chill foods and ready meals often need reheating before consumption.

Rehydrated foods  Products made by reconstitution of dried foods, e.g. dried vegetables, with water.

Rehydration  Process by which the water or moisture removed in making dried foods is replaced, so restoring it to near its original quality.

Reindeer  Large migratory ruminant animals (Rangifer tarandus) belonging to the Cervidae family. Wild reindeer are hunted and domesticated reindeer are farmed as a source of reindeer meat. In some countries, e.g. Sweden, careful management of wild reindeer herds produces a regular crop of animals that can be culled for meat production. Reindeer meat is sometimes referred to as venison.

Reindeer meat  Meat from reindeer. It has a low content of fat. In farmed or harvested reindeer, stress during gathering, herding, selection, feeding, road transport and lairage may result in glycogen depletion and hence deterioration of meat quality.

Relative density  Ratio of the density of a substance to the density of a reference material. For liquids or solids, relative density is the ratio of the density (usu-
Rennetability. The ease with which milk is coagulated using rennets.

Rennets Enzymes used to cause coagulation of milk during cheesemaking. Traditionally extracted from the abomasum of young ruminants, mainly calves (animal rennets, calf rennets), but other forms (e.g. microbial rennets, vegetable rennets, GM rennets) are now used as alternatives to this type of preparation. The active enzyme is chymosin, but pepsin is also present.

Rennet substitutes Enzymes used as alternatives to animal rennets for coagulation of milk during cheesemaking. Developed due to shortages of the animal products and in cases where a vegetarian cheese is desired. Substitutes include microbial rennets, vegetable rennets and GM rennets.

Rennin Alternative term for chymosin.

Reporter genes Genes encoding easily assayed products under the control of regulatory elements from other genes. Regulation and localization of gene expression of the gene of interest can then be studied following transformation into appropriate cells. Examples include the genes encoding luciferases, β-galactosidases, chloramphenical acetytransferases and green fluorescent protein.

Resazurin A member of the quinone-imine group of dyes that is blue when fully oxidized but is reduced irreversibly to the pink-coloured resorufin when the redox potential is lowered sufficiently. On further reduction, the colourless hydroresorufin is formed. Measurement of resazurin reduction time can be used to determine the microbiological quality of raw milk.

Reservoir water Water stored in reservoirs. Commonly intended for purification to drinking water quality and distribution via the water supply system.

Residence time distribution Distribution of times spent by the various components of a substance, e.g. a food product, through a process vessel. Residence time distribution (RTD) is a critical factor affecting the sizing of holding tubes for aseptic processing of particular foods. Also, in design of continuous sterilization equipment for liquid food processing, knowledge of flow characteristics, especially residence time distribution, is of prime importance.

Residues The remainder or surplus after a separation procedure or other process. In a food context, usually refers to chemical contaminants of foods which can be derived from a variety of sources. Include agricultural chemicals (e.g. pesticides, fertilizers and veterinary drugs) and their degradation products or metabolites, and also chemicals resulting from environmental pollution (e.g. radioelements) and manufacturing processes.

Resins Group of organic chemicals, usually polymers, which are solid or semi-solid and have high electrical resistance. Used as chromatography support materials and for manufacture of plastics, including those used as food packaging materials, e.g. epoxy resins used for coating of food containers.
Restrictive enzymes may be conferred by: protection by a physical barrier, such as plant cell walls, e.g. starch in seeds and legumes; the highly crystalline nature of some starch granules, such as those in bananas; retrogradation of starch in cooked foods; and during production of modified starches. Regarded as a source of dietary fibre.

Restriction modification systems

Enzymes are widely used as tools in genetic engineering, in identifying gene polymorphism and in genotyping studies. Also known as restriction enzymes.

Restriction fragment length polymorphism

Commonly abbreviated to RFLP. Variation in the length of DNA fragments produced by the action of restriction endonucleases. A result of changes in the DNA code at the site of action of the enzymes, such as by mutation, insertion or deletion. Employed widely in genetic techniques for differentiating between organisms.

Restriction modification systems

Enzyme systems in bacteria which afford protection against bacteriophages. Comprise restriction endonucleases and DNA methyltransferases. The cell's own DNA is modified by the transferase, the resulting methylation providing protection from degradation by the restriction enzyme. Foreign DNA is not recognized and not methylated and is therefore susceptible to cleavage. Such systems are of potential interest as defence mechanisms against bacteriophages in dairy starters, and have also been studied in pathogens including Helicobacter spp.

Restructured fish products

Reformed products containing small pieces of minced, flaked or diced fish flesh as the main ingredient.

Restructured meat products

Small pieces of meat reformed into steaks, chops and roast-like meat products. They may be difficult to distinguish visually from the real product. Minced, flaked, diced or mechanically recovered meat may be used. Often, massaging and tumbling are used to extract salt-soluble contractile proteins from the meat pieces. The pieces become coated with these proteins, which subsequently act as an adhesive when the pieces are thermally processed and compressed. Cohesion of the meat
pieces also involves gelation of connective tissue proteins. Also known as reconstituted meat products.

**Resveratrol** Polyphenol found in grapes and wines that exhibits antioxidative activity and is thought to protect against cardiovascular diseases.

**Retail display Storage** approaches used for the display or marketing of foods to consumers in a retail environment. Appropriate strategies can be employed to improve the quality and shelf life of foods, and influence the purchasing behaviour of consumers.

**Retinal** Aldehyde derivative of vitamin A, originally isolated from animal retinas. Formed in the body by cleavage of β-carotene in the intestines. Necessary for night vision. Also known as vitamin A aldehyde, retinene or retinaldehyde, the last form being the preferred alternative if the name is liable to be confused with the adjective meaning pertaining to the retina.

**Retinoic acid** Biologically active acid form of retinols; can partially replace retinols in the rat diet. Promotes growth of bone and soft tissue production. However, has no activity in the visual process or the reproductive system and cannot be stored in the body. Retinoic acid is converted by the rat to an unidentified form that is several times as active as the parent compound in conventional vitamin A nutritional assays.

**Retinoids** Compounds consisting of four isoprenoid units joined in a head-to-tail manner. Vitamin A is a generic descriptor for retinoids exhibiting qualitatively the biological activity of retinol. While preformed vitamin A occurs only in foods of animal origin, retinoids such as β-carotene are found in both animal foods and plant foods. Retinoids have many activities in the body, including control of cell proliferation, cell differentiation and embryonic development.

**Retinols** The alcohol form of vitamin A. Vitamin A exists in two forms: retinols, which predominate in mammals and marine fish; and dehydroretinols, which predominate in freshwater fish. Retinols can be reversibly oxidized. Retinols circulate in the blood as a complex with retinol binding protein and transthyretin.

**Retinyl palmitate** Natural antioxidant which occurs in plant materials such as vegetable oils, celery seeds, aniseed and allspice, as well as in animal fats. Used in fortification of foods with vitamin A. Also known as vitamin A acetate.

**Retorting** Thermal process that is part of the food canning process. Batch retorts, of a still or agitating type, and designed to operate with saturated steam or hot water, are used. By processing under pressure, it is possible to use temperatures of approximately 121°C (250°F), which greatly speeds up the destruction of microorganisms and spores.

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**Reverse micelles** Aggregates of small molecules such as surfactants which assemble in non-aqueous solutions at levels above the critical micellar concentration. In contrast to normal micelles, hydrophilic components associate in the interior of the aggregates. Widely used to manipulate localized solvent polarity, for example in enzyme catalysis, to provide a hydrophilic environment for the enzymes used in an otherwise non-aqueous solvent. Also used for selective extraction from mixed solvent systems.

**Reverse osmosis** Membrane process, driven by a pressure gradient, in which a membrane separates the solvent (generally water) from other components of a solution. With reverse osmosis, the membrane pore size is very small (0.0001-0.001 μm) allowing only small amounts of very low molecular weight solutes to pass through. Even small dissolved molecules, such as salts, are retained by the membrane. At this molecular level, high pressures are required of the order of 10-50 bar because osmotic forces come into play. The largest commercial food applications of reverse osmosis are concentration of whey produced as a by-product of cheese manufacture and clarification of wines and beer. Reverse osmosis systems are additionally used in water processing, e.g. for desalination of sea water. Also known as hyperfiltration.

**RFLP** Abbreviation for restriction fragment length polymorphism.

**RH** Abbreviation for relative humidity.

**Rhamnogalacturonans** A group of closely-related pectic substances found particularly in apples, but also in other fruits, vegetables, wines and fruit...

Rheology Study of the relation between forces exerted on a material and the ensuing deformation as a function of time. In the food industry, rheology provides a scientific basis for subjective measurements such as mouthfeel, spreadability and pourability.

Rheometers Devices used for measurement of viscosity.


Rheococcus Genus of obligately aerobic, coccoid Gram positive bacteria of the family Nocardiaceae. Occur in soil and aquatic habitats. Species may be used in the synthesis of carotenoids or enzymes. Rhodococcus erythropolis is used in the production of lactone hydrolases for the biotransformation (debittering) of terpenes in citrus juices.

Rhodobacter Genus of rod-shaped Gram negative bacteria with vesicular-type photosynthetic membranes. Member of the Rhodobacteraceae family. Occur in freshwater, marine and hypersaline habitats. Some species, especially Rhodobacter sphaeroides, produce polyhydroxyalkanoates from food processing effluents.

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Rhubarb Common name for Rheum raphonticum or R. rhaponticum. The part of the plant that is eaten is the leaf stalk. Although not botanically a fruit, rhubarb is eaten like a fruit with added sugar in fruit pies, crumbles, tarts and preserves. It is also used in fruit wines. The leaf blade contains high levels of oxalic acid, which can cause poisoning if this part of the plant is consumed.
Riboflavin  Synonym for vitamin B₂ and vitamin G. A water soluble vitamin which occurs mainly in yeasts, livers, milk, eggs, cheese and pulses; milk and dairy products are probably the most important source in the average diet. Occurs in bound form in plant and animal tissues and is not available unless liberated by cooking. Resistant to heat, but readily destroyed in the presence of light and alkali. Involved in a wide range of oxidation reactions, of fats, carbohydrates and amino acids. A constituent of the coenzymes flavine adenine dinucleotide (FAD) and flavine mononucleotide (FMN). Deficiency impairs cell oxidation and results clinically in a set of symptoms known as riboflavinosis.

Ribonucleases  Nucleases which hydrolyse ester bonds within RNA, acting as either endonucleases or exonucleases. Includes members of EC 3.1.13-3.1.16 and EC 3.1.26-3.1.31. Can be used for production of 5'- and 3'-ribonucleotides, which are useful as seasonings. Also known as RNases.

Ribonucleic acids  Full form of the abbreviation RNA.

Ribonucleosides  Compounds that consist of purines and pyrimidines linked to ribose. Ribonucleosides containing the bases adenine, guanine, cytosine, uracil, thymine and hypoxanthine are called, respectively, adenosine, guanosine, cytidine, uridine, thymidine and inosine.

Ribonucleotide  Nucleosides in which the ribose sugar contains one or more phosphates.

Ribose  Pentose sugar that forms, with phosphate, the backbone for ribonucleic acids.

Ribotype  A DNA fingerprint based on genes coding for ribosomal RNA (rRNA). Polymorphism in rRNA genes provides a sensitive method for distinguishing between strains of bacteria, including food pathogens. Ribotypes are often determined in epidemiological studies when characterizing isolates.

Ribotyping  DNA fingerprinting method used to identify polymorphism in the genes encoding ribosomal RNA (rRNA). Utilizes a variety of genetic techniques, including PCR and restriction fragment length polymorphism, and can be automated. Widely used when studying the epidemiology of food poisoning outbreaks.

Rice  Starchy grain produced mainly by Oryza sativa that forms a staple food, especially in Asia. Brown rice, produced by removal of the hulls, is regarded as a healthier food than white rice, as vitamin B and fibre contents are reduced by removal of the bran and germ. However, parboiling of rice before milling increases the nutritional quality of white rice. Rice is eaten in many forms, as an accompaniment, or as a component of dishes such as paella or risotto. It is also used to make breakfast cereals and infant foods, and as the starting material in manufacture of sake.

Rice bran  Outer layers of rice seeds. Used as a source of rice bran oils and protein concentrates and as a fibre ingredient in bakery products.

Rice bran oils  Oils with high oxidative stability which are derived from the outer layers of the rice grain removed during manufacture of white rice. Used widely in Japanese cooking as salad oils and frying oils. Reported to lower serum cholesterol levels due to high contents of oryzanols.

Rice bread  Bread in which rice flour is used as a complete or partial substitute for wheat flour.

Rice cakes  Cakes made with glutinous rice that have a soft texture. Also known as areare.

Rice crackers  Crackers made with non-glutinous rice that have a hard, rough texture.

Rice flour  Flour produced by milling rice grains. Used to provide texture in various foods including frying batters, breakfast cereals and bakery products. Also used in thickeners for products such as sauces.

Rice germ oils  Oils extracted from rice germ, a by-product of rice milling. Rich in vitamin E. Major fatty acids are linoleic acid and oleic acid. Benefits for human health include protection against cardiovascular diseases, lowering of high cholesterol levels and management of menopausal problems.

Rice koji  Product prepared by fermenting steamed rice with the fungus Aspergillus oryzae, which converts the rice starch into fermentable sugars. Used in manufacture of sake.

Rice milk  Types of grain milk used as milk substitutes. Processed from rice (mainly brown rice) and usually sweetened with cane sugar syrups. Contains more carbohydrates than cow milk but does not contain significant amounts of fats, Ca or proteins, and contains no cholesterol or lactose. Commercial brands are often fortified with vitamins and minerals, such as Ca, vitamin B₁₂, vitamin B₃ and Fe, and may contain added thickeners. Rice milk generally has a shelf life of one to two weeks once it has been opened.

Rice noodles  Noodles prepared from rice flour and water, although other ingredients, such as tapioca or corn starch, may be added. Commonly used in the cuisines of east and southeast Asia, and are available fresh, frozen or dried, and in various shapes and thicknesses.
Rice powders  Ingredients derived from roasted rice grains that are ground into a powder. Often used in infant foods.

Rice starch  Starch isolated from rice. Comprises small granules and has a soft gel structure, which imparts a creamy mouthfeel. Used in various foods including salad dressings, infant foods and dairy desserts. Also used to produce maltodextrins.

Rice vinegar  Vinegar made from fermented rice. Milder and with a gentler flavour than other vinegars made from fruits and wines. Chinese rice vinegars are available in white, red and black varieties, while Japanese rice vinegars tend to be almost colourless. Used in salad dressings, a variety of dishes, including sushi rice and sweet and sour meals, and in pickles.

Rice weevils  Common name for Sitophilus oryzae, serious pests of stored grain and other seeds. Develop inside whole grain kernels with no external evidence of their presence. May be transported into the domestic environment in infested whole grains or seeds, e.g. popcorn or beans.

Rice wines  Oriental alcoholic beverages made from rice based mashes. Saccharification is by enzymes of starters containing fungi, rather than by malt enzymes, as in Western alcoholic beverages based on cereals.

Ricin  Highly toxic lectins extracted from the seeds of castor beans (Ricinus communis). Ricin consists of a toxic A subunit that inactivates ribosomes, and a B subunit that binds to carbohydrates and is specific for galactosyl residues. Poisonous if inhaled, injected or ingested (8 beans are considered toxic for an adult), and acts by inhibiting protein synthesis. Has been used in bioterrorism; however, ricin is not as powerful as some other agents (e.g. botulotoxins and anthrax spores) as it is less toxic and is inactivated more readily.

Ricinoleic acid  Fatty acid found in castor oils and other vegetable oils. Useful as a precursor for microbial production of flavour compounds.

Ricotta cheese  Italian soft cheese made from cow or ewe milk whey. Citric acid is used to facilitate separation of proteins from the whey during heating. Whey proteins rise and coagulate, after which they are skimmed off and drained for 2 days when the ‘cheese’ is ready for market. Varieties of Ricotta include Ricotta Salata Moliterna (made from ewe milk whey), Ricotta Piemontese (made from cow milk whey + 10% milk) and Ricotta Romana (a by-product of Pecorino Romano cheese production).

Rifamycins  Antibiotics belonging to the group of naphthalene-ringed ansamycins. Natural forms are active against Gram positive bacteria only, but derivatives are also effective against some Gram negative bacteria. Useful for the treatment of infections caused by Mycobacterium spp., e.g. tuberculosis. Examples include rifaxim, rifapentine, rifampicin and rifabutin.

Rigidity  Rheological properties relating to the extent to which products (such as food gels, plant cells and meat fibres) are rigid, i.e. solid, firm and inflexible.

Rigor  Relates to rigidity or stiffness of muscles, as occurs in rigor mortis.

Rigor mortis  Stiffening of muscles, which accompanies the post mortem loss of ATP and glycogen in muscle fibres; it develops gradually after slaughter of animals. The physical changes in muscles accompanying development of rigor mortis include a loss of extensibility and elasticity, shortening, and an increase in tension and firmness. Stiffening results from the formation of permanent crossbridges between actins and myosin filaments in the muscles. Rigor mortis does not last indefinitely, as after a period of ageing or conditioning, the muscles gradually lose their stiffness; resolution of rigor mortis results from physical degradation of the muscle structure. In many species, onset and resolution of rigor mortis occur more rapidly following electrical stimulation of carcasses.

Rigorometers  Instruments used to measure rigor mortis development in meat and fish on the basis of muscle tension and length.

Rind  A tough outer layer particularly used in the context of fruits and vegetables (when it is also known as peel), cheese (cheese rind) and bacon (incorporating the skin and subcutaneous fats).

Rinsing  Washing an item with clean water to remove impurities.

Ripened cream  Cream that has been ripened naturally or by fermentation with starters. Used in making butter. Also called sour cream.

Ripeness  Extent to which crops, such as fruits or vegetables, or cheese are ripe (fully developed and mature), and ready for eating.

Ripening  Term used in relation to the maturation of fruits, vegetables or cheese. As ripening proceeds, sensory quality of foods improves. Ripening of fruits and vegetables can involve changes in colour and texture. Flavour development is an important stage during the ripening of cheese.

Risk communication  The exchange of information about health, environmental or food safety risks, so as to arrive at well-informed risks management decisions. In risk communication the 4 elements to con-
Risk factors Characteristics associated with the increased likelihood of an event occurring. Used particularly in the context of variables linked with the development of diseases (e.g. blood pressure, body wt. and lifestyle characteristics such as diet and physical activity) and food contamination (e.g. inadequate hygiene, processing, handling and storage).

Risks assessment Estimation of the probability of adverse effects occurring due to exposure to specified health hazards or the absence of preventive or beneficial measures.

Risks management Process of minimizing the probability of adverse effects occurring by developing systems to identify, analyse and prevent hazards.

Rissoles Meat products often prepared from cooked lamb or beef. The meat is minced before mixing with the other ingredients, which may include onions, breadcrumbs, garlic, eggs, herbs and seasonings. The mixture is then divided and shaped into round cake shapes; these are coated in flour before cooking, commonly by frying.

River fish Any freshwater fish which exist in riverine environments.

RNA Nucleic acids consisting of linked ribonucleotides, each of which contains the sugar ribose, a phosphate group and one of the bases adenine, guanine, cytosine or uracil. Usually single-stranded but can form duplexes with complementary RNA or DNA strands. Constitute the genomes of many viruses. The major RNA species (mRNA, rRNA and tRNA) are involved in all stages of the synthesis of proteins in eukaryotic and prokaryotic cells. Abbreviation for ribonucleic acids.

RNA interference Cellular mechanism which results in gene silencing due to targeted degradation of mRNA, thereby decreasing levels of expression of the corresponding genes. During RNA interference (RNAi), double-stranded RNA (dsRNA), supplied exogenously or originating from infection by a virus, is processed to form small interfering RNA (siRNA). These siRNA bind to sense strands of mRNA to form dsRNA which is itself degraded. Thought to have evolved to protect cells from dsRNA viruses, this process is now exploited to control gene expression. Applications include use for increasing levels of carotenoids in potatoes or for producing foods with reduced levels of allergens.

RNA polymerases Alternative term for DNA-directed RNA polymerases.

RNases Alternative name/abbreviation for ribonucleases.

Roach Freshwater fish species (Rutilus rutilus) distributed in lakes and rivers across Europe. Not a popular food fish, but occasionally sold fresh (whole gutted) or as a dried/salted product.

Roasted coffee Coffee beans which have been roasted to develop characteristic flavour and aroma. The degree of roasting required is dependent on the intended style of coffee beverages to be prepared.

Roasted foods Foods cooked by dry heating, usually with added fats, in ovens. Maillard reaction products contribute to the characteristic roasted flavour.

Roasted peanuts Peanuts that have been roasted by conventional oven cooking in-shell or shelled, or by microwave or oil cooking out of their shells. Usually seasoned with salt or a variety of other flavourings, including garlic, paprika or chilli.

Roasting Cooking of foods, e.g. tender pieces of meat or vegetables, by prolonged exposure to heat in ovens or over a fire. Roasting usually produces foods with a well-browned exterior and, ideally, a moist interior.

Robiola cheese Italian cream cheese made from cow milk, goat milk or a mixture of both. Eaten fresh or aged. During ageing, a pink to brown colour develops, which intensifies as the process proceeds. Flavour is generally tangy. Different varieties of Robiola vary slightly in characteristics due to differences in manufacturing processes. All are typically served as a table cheese, with olive oils, salt, pepper and sometimes a tomato and anchovy based sauce.

Robotics The branch of technology concerned with the design, construction and application of robots used for mechanical operation of procedures.

Rock cod General term used for a variety of marine fish species in the order Perciformes. The majority of species occur in coastal waters in rocky and reef habitats. Some species are utilized as food fish; normally marketed fresh or frozen.

Rocket Common name for Eruca sativa. Generally used in salads, although it can be added to soups and dishes such as sautéed vegetables. Flavour is bitter and peppery. Rich source of iron, vitamin A and vitamin C. Also known by several other names, including arugula, roquette, rugula and rucoila.

Rockfish General term used for a range of marine fish species found in the Atlantic and Pacific Oceans, particularly Sebastes spp. Used as a synonym for redfish. Several species are utilized as food fish; normally marketed fresh or frozen.
Rodenticides Chemical substances used for control of rodents such as mice and rats. Most act as anticoagulants (prevent blood from clotting), causing death from internal bleeding. Some are used for control of rodents in food preparation and storage areas. Examples include bromadiolone, chlorophacinone and cholecalciferol.

Rodents Mammals of the order Rodentia. Occupy a wide range of terrestrial and semiaquatic habitats worldwide. Many species may be pests of stored foods (e.g. rats and mice), while others are used as human food (e.g. agoutis).

Roes Eggs from marine fish or freshwater fish. May also refer to the entire gonads of female fish or to the gonads of male fish (also known as soft roes). Marketed and sold in a variety of forms, including caviar (from sturgeon), caviar substitutes (from a range of fish species), dried/salted and smoked products.

Rohu Freshwater fish species (Labeo rohita) of high commercial value belonging to the carp family (Cyprinidae). Widely distributed throughout Asia. Marketed fresh.

Rohwurst Raw, fermented, dry sausages, conventionally made from frozen raw materials. Rohwurst may be prepared from red meat or poultry meat, and may contain pork fat. They may be produced by rapid, moderate or slow fermentation. Addition of starter cultures/micrococci cultures to the sausage emulsion considerably improves reddening of rohwurst. Modern curing methods use starter cultures and additives, such as glucono-δ-lactone, to accelerate gel formation; however, these methods tend to cause flavour losses in comparison with traditional curing methods. Natural and synthetic flavourings may be used to enhance the spicy characteristics of the sausages.

Rolkpol cheese Typical Polish blue-veined cheese.

Roller drying Type of web drying in which the material to be dried makes a sinusoidal path around rollers while heat is supplied externally by blowing air.

Roller mills Mills that crush or pulverize items by means of rollers that move the material and press it against the sides of a revolving bowl.

Rolling Flattening of an object by passing a roller over it or by passing it between rollers. During baking, a rolling pin is used to flatten dough into a thin, even layer.

Rollmops Fish products consisting of marinated herring fillets wrapped around pickled vegetables or slices of onions and fastened with small sticks or cloves. Packed in brines and vinegar; may also be packed with spices, mayonnaise or other conditioners. Marketed as a semi-preserved product, often with added preservatives.

Rolls Small rounded portions of bread made from yeasts-leavened dough. May have a soft or crisp crust. Also called bread rolls.

Rollmops Alternative spelling for rollmops.

Romano cheese Italian hard cheese made from cow milk, goat milk, ewe milk (Pecorino Romano cheese), or a combination of cow milk with goat or ewe milk. Traditionally from the area around Rome in Italy. Pale yellow in colour and used mostly for grating. Alternatively, this cheese can be spray dried and used as a powder. Flavour varies according to the type of cheese milk used in manufacture, but is usually strong, due to the long ageing period.

Roncal cheese Spanish hard cheese made from raw ewe milk. The surface of the hard rind has a layer of blue grey mould which is sometimes covered in olive oil. The beige interior is firm with small irregular holes and has a sweet herby flavour which becomes increasingly tangy as the cheese ages.

Rooibos tea Type of herb tea from South Africa, produced from leaves of the bush Aspalathus linearis. Has strong antioxidative activity.

Root crops Produce of plants grown for their edible roots.

Rootstocks Part of the stem of a plant into which a bud or scion is inserted for grafting.

Root vegetables Produce of plants with edible roots, e.g. carrots, turnips, salsify and celeriac.

Ropiness Condition responsible for spoilage in products including beer, wines and bread due to the presence of certain bacteria (ropy bacteria) which form polysaccharides and rope-like threads, adversely affecting viscosity and consistency of the product. In yoghurt manufacture, ropy bacteria are sometimes used as yoghurt starters to produce a product with the desired consistency.

Ropy bacteria Bacteria which produce ropiness in foods, due to production of slimy exopolysaccharides. Usually undesirable as they cause food spoilage (e.g. Acetobacter spp. causing ropiness in beer, Bacillus spp. acting on bread, Leuconostoc spp. responsible for spoilage of wines and Alcaligenes viscolactis causing ropiness in milk). However, in some fermented dairy products, ropy lactic acid bacteria, such as certain subspecies of Lactococcus lactis, are used to develop texture. The exopolysaccharides produced increase product viscosity, bind hydration water and interact with other milk constituents to strengthen the rigidity of the casein network.

Roquefort cheese French semi-soft blue cheese made from ewe milk. Traditionally ripened in natural
caves under the French village of Roquefort-sur-Soulzon. Interior is creamy and white with blue to green-grey veins. Cheese has a pungent flavour with a metallic tang. Frequently used in dressings and salads.

**Roquefortine** A family of tremorigenic cyclopeptide mycotoxins produced by various species of *Penicillium* (e.g. *P. roquefortii* and *P. crustosum*). Roquefortine C is neurotoxic and inhibitory to Gram positive bacteria. Although it has been found in blue cheese and blue cheese products, the low levels present, combined with the low toxicity of roquefortine C, make these products safe to eat.

**Rose apples** Fruits produced by some species of the genus *Eugenia*, especially *E. jambos*. Usually red and juicy; used in various products, mainly jellies and sauces. May also be eaten candied.

**Rose Bengal** A xanthene dye and food colorant also known as Food Red No. 105. Commonly incorporated into nutrient media as a stain for detection of growth of yeasts and fungi.

**Rosehips** Fruits of the dog rose (*Rosa canina* or *R. rugosa*). Used to make jellies, preserves, sauces, syrups, fruit tea and other beverages. Rosehip syrups are particularly rich in vitamin C.

**Roselle** Common name for *Hibiscus sabdariffa*, and red colorants extracted from its berries. Roselle is rich in delphinidin-based pigments.

**Rosemary** Common name for *Rosmarinus officinalis*, the leaves of which are used as spices and commonly used as flavourings for meat dishes.

**Rosemary essential oils** Essential oils obtained by steam distillation of the flowering heads of rosemary. Possess strong antioxidative activity and antimicrobial activity, allowing use for extending shelf life of fats and meat.

**Roses** Flowers produced by bushes and shrubs of the genus *Rosa*, the petals of which may be used as the source of pigments or essential oils. Rose oils are used as flavourings in foods. The plants are also the source of rosehips, fruits with a number of uses in the food and beverages industries.

**Rose wines** Wines which are pink in colour, covering a range of shades. The pink colour results from extraction of a small proportion of the anthocyanins from the grape skins during winemaking.

**Rosmarinic acid** Phenolic compound produced as a secondary metabolite in plants. Of interest in food preservation due to its antioxidative activity and antimicrobial activity. Can be produced by plant suspension cultures.

**Rossiiskii cheese** Russian hard cheese.

**Rotaviruses** Viruses of the family Reoviridae. Occur in the faeces of birds and mammals. Responsible for acute gastroenteritis in humans, especially children. Transmitted by the faecal-oral route via foods, such as salads and fruits, or contaminated water.

**Rotenone** Colourless-to-red odourless solid, used as a broad spectrum insecticide and piscicide. Extractable from various tropical plants, such as derris, and has been used in organic agriculture. Classified by WHO as moderately hazardous (WHO II).

**Roti** Flat, unleavened bread prepared with corn flour.

**Rots** Fungal or bacterial infections of plant tissues that cause softening, discoloration and disintegration.

**Rotting** Natural process in which animal or plant tissues decay or decompose due to microbial activity.

**Roughage** Alternative term for dietary fibre, previously widely used.

**Roughness** Physical properties relating to the extent to which the surface of an item feels rough, i.e. not smooth or glossy.

**Roux** A base for thickening of sauces, prepared by heating together flour with fats. Sauces produced from this base by addition of liquid (e.g. milk or stocks) and heating, to thicken the liquid, are known as roux sauces.

**Rovral** Alternative term for the fungicide iprodione.

**Rowanberries** Scarlet berries produced by *Sorbus aucuparia*. Used to make jams and alcoholic beverages.

**Royal jelly** An apicultural product. Secreted from the hypopharyngeal glands located in the heads of young worker bees and used in the colony to feed young larvae. The secretions are thought to possess beneficial health properties, and are thus marketed as health foods.

**rRNA** Abbreviation for ribosomal RNA. The major component of ribosomes, the sites where messenger RNA (mRNA) undergoes translation to proteins. rRNA is transcribed but not translated.

**RSE defect** Abbreviation for reddish pink soft exudative defect.

**Rubber** Elastic, tough polymeric substance made synthetically or produced from the latex of *Hevea brasiliensis*, a tropical plant native to the Amazonian rainforest. Used in making various food contact materials, including sealing rings for bottle closures, teats for infant feeding bottles and rubber nettings used to enclose meat joints.

**Rubber nettings** Nettings made from rubber thread, which are used to enclose joints of meat such as beef and ham to prevent their disintegration during cooking. Health concerns are associated with possible for-
Rubber seeds

Seeds produced by *Hevea brasiliensis*, which are rich in unsaturated fatty acids and show potential as oilseeds.

Rubratoxins

Mycotoxins produced by certain strains of *Penicillium rubrum*. Cause liver damage, brain lesions and gastrointestinal haemorrhages when ingested by animals.

Rue

Common name for *Ruta* spp., the leaves of which are used as spices. Added as natural flavourings to bakery products and dairy products.

Rum

Spirits made by distillation of fermented mashes based on cane sugar juices or molasses. Exist in different grades, such as light (or white), gold (or amber), spiced, dark, overproof and premium. Choice of distillation still affects final rum character. Ageing in barrels and use of caramel colorants determines final colour.

Ruminants

Herbivorous even-toed ungulate mammals belonging to the sub-order Ruminantia. They include cattle, sheep, goats, antelopes and deer. Ruminants regurgitate and re-chew feeds (chew the cud) and have a four-chambered stomach, comprising a rumen, reticulum, omasum and abomasum. Composition of ruminant meat fats and milk fats are greatly affected by microbial activity in the rumen, particularly by the hydrogenation of unsaturated fatty acids into relatively more saturated fatty acids.

Ruminococcus

Genus of anaerobic, coccoid Gram positive bacteria of the family Ruminococcaceae. Occur in the rumen, large intestines and caecum of mammals. *Ruminococcus albus* may be used in the production of glycosidases and other enzymes, while *R. flavefaciens* is used in the production of cellulases.

Runner beans

Beans produced by *Phaseolus cocineus*. Popular as a vegetable particularly in the UK. Young pods are eaten, but when older, seeds are removed from the pods before consumption.

Rye

Edible grain from hardy plants belonging to the species *Secale cereale*, used to make rye bread and rye whisky. Young pods are eaten, but when older, seeds are removed from the pods before consumption. Rye bran Outer layers of the rye grain. Used as a source of fibre; displays cholesterol lowering activity and anticarcinogenicity.

Rye bread

Bread made either entirely from rye flour or with a blend of wheat flour and rye flour. When made entirely from rye flour, it is often dark grey in colour and lacks the elasticity of wheat bread.

Rye flour

Flour produced by milling of rye grains. Available in varying degrees of purity and colour (light, medium or dark).

Rye malt

Fermented mashes made from rye grain, which are used in the manufacture of rye whisky.
**Saccharates** Alternative term for \(\beta\)-fructofuranosidases.

**Saccharides** General term for monosaccharides, disaccharides, oligosaccharides and polysaccharides.

**Saccharification** Process by which oligosaccharides and polysaccharides are degraded to produce smaller sugar units. Involves acid, alkali or enzymic (e.g. cellulases, amylases) hydrolysis of glucosidic bonds. Term is used frequently to describe hydrolysis of wastes, e.g. sugar cane bagasse or other lignocellulosic materials to produce substrates for microbial fermentation.

**Saccharimeters** Devices used for measuring degree of rotation produced during transmission of polarized light through a sugar solution. When a standardized saccharimeter is used, this property is a function of the concentration of a sugar solution. In the sugar industry the rotation value (Pol) is used as a measure of sucrose content due to the low concentrations of other sugars.

**Saccharin** Heterocyclic organic sulfur compounds (o-benzosulfinimide) that are 300-600 times as sweet as sucrose and are used as artificial sweeteners. Available as a free acid and as sodium or calcium salts. Like sugar, saccharin salts are white crystalline solids that are highly soluble in water, but unlike sugar they are non-nutritive and impart a bitter aftertaste. Saccharin is stable when heated and in the presence of acids, and blends well with other sweeteners. It is used in a wide range of low calorie foods and beverages, such as soft drinks, tabletop sweeteners, jams, chewing gums, candy and salad dressings. Approved for use in many countries worldwide.

**Saccharometers** Graduated devices used for determination of the density of sugar solutions, based on the level at which the device floats. Also known as hydrometers.

**Saccharomyces** Genus of yeast fungi of the class Saccharomycetes. Occur in foods and beverages (e.g. fruit juices, fruits and alcoholic beverages), soil and on human skin. Saccharomyces cerevisiae is used in breadmaking (bakers yeasts) and brewing (brewers yeasts). S. cerevisiae is also used in the manufacture of spirits, wines, kefir, cider and pulque.

**Saccharomyces** Genus of yeasts of the family Saccharomycodeaceae. Saccharomyces ludwigii may be responsible for spoilage of grape juices and wines, and may also be used in winemaking.

**Saccharomycopsis** Genus of yeast fungi of the class Saccharomycetes. Occur on fruits, and in soils, foods and the tunnels of wood-boring beetles. Saccharomycopsis fibuligera may be responsible for the spoilage of bread and cereals.

**Saccharose** Alternative term for sucrose.

**Sachalinmint** Perennial herb (Mentha sachalinensis, syn. M. canadensis), the leaves of which are used for flavouring foods.

**Sachets** Small packs or bags made of flexible material, that are used to package small quantities of substances, e.g. single servings of foods. Common applications include liquid foods such as sauces, ketchups and other condiments, and particulate products such as instant soups, dried infant foods and coffee granules.

**Sacks** Large bags usually made of thick paper, plastics or materials such as hessian. Used for carrying or storing goods, e.g. potatoes or grain. Less commonly, refers to dry white wines formerly imported into the UK from Spain and the Canary Islands.

**SADH** Alternative term for the plant growth regulator daminozide.

**Safflower oils** Oils extracted from seeds of Carthamus tinctorius which are rich in linoleic acid. Used as cooking oils, in salad dressings and in the manufacture of margarines.

**Safflowers** Large orange, red or yellow flowers produced by the thistle-like plant, Carthamus tinctorius. Used as a source of food colorants that may be used
Safflower seeds

as a substitute for saffron dye. The plant also has edible leaves and produces seeds from which safflower oils may be extracted.

Safflower seeds Oil-rich seeds produced by Carthamus tinctorius.

Saffron Dried stigmas from flowers of Crocus sativus that are used as yellow colorants and spices. The principal pigments of saffron are the carotenoids crocin and crocetin.

Safranal One of the major aroma compounds found in saffron. This monoterpane aldehyde is believed to be a degradation product of saffron. It can be used as an indicator of saffron quality. Demonstrates antioxidative activity, radical scavenging activity and antitumour activity.

Safrole Organic compound found in various spices and essential oils that has been shown to be carcinogenic in rats. Safrole and its isomer isosafrole are used as flavourings in foods.

Sage Common name for Salvia officinalis, the leaves of which are used as spices. Sage has a warm, camphor-like flavour and aroma, and is often used in flavourings for seasonings, soups and meat dishes.

Sago Starchy substance extracted from the interior of the trunk of sago palms (Metroxylon sagu) and other similar plants such as sugar palms (Arenga pinnata). The wet starch that is washed out from the bark can be eaten cooked, or dried to produce flour. Pearl sago is produced by forcing wet starch through flour. Pearl sago may also be inhibited by addition of anticlouding agents, namely oxystearin, polyglycerol esters and emulsifiers.

Sailfish Any of a number of large, fast-swimming pelagic marine fish from the genus Istiophorus; found in tropical and temperate Pacific waters and the Indian Ocean. Commercially important species include I. albicans (Atlantic sailfish) and I. platypterus (Indo-Pacific sailfish). Marketed fresh, smoked and frozen; also used in preparation of sashimi and sushi.

Saint-Nectaire cheese French semi-soft cheese made from cow milk. Rind is pink with a covering of grey mould; the soft interior is ivory to straw coloured. Saint-Nectaire has a fruity flavour and characteristic grassy aroma due to being cured on a bed of straw for 8 weeks.

Saint-Paulin cheese French semi-soft cheese made from cow milk. Originally made by Trappist monks. Rind is smooth and leathery, and yellow to orange in colour. Also known as Port Salut cheese (licensed name). Saint-Paulin is a mild, creamy dessert or table cheese firm enough for slicing.

Saithe Alternative term for coalfish or pollock.

Sakacins Bacteriocins synthesized by Lactobacillus sakei. Sakacin A, produced by L. sakei LB706, is heat resistant and bactericidal to sensitive strains. Its inhibitory spectrum includes Carnobacterium piscicolae, Enterococcus spp., L. curvatus, other L. sakei strains, Leuconostoc spp. and Listeria monocytogenes. Sakacin A is plasmid encoded.

Saki Rice wines made in Japan by fermentation of rice mashess accharified with koji starters.

Sake yeasts Yeasts (Saccharomyces spp.) used for fermentation of sacharified rice mashess in sake manufacture.

Sakuradai Marine fish species (Odontanthias rhodopeplus) from the sea bass family (Serranidae); occurs in the Indo-West Pacific. Consumed mainly in Japan and Indonesia. Usually marketed fresh.

Salad cream Salad dressings similar to mayonnaise but of a more fluid consistency. Major ingredients include water, vinegar and oils. Egg yolks and mustard provide a characteristic yellow colour.

Salad dressings Condiments that are served with, and complement the flavour of, salads. Examples include mayonnaise, French dressing and salad cream.

Salad oils Refined, bleached and deodorized vegetable oils used in preparation of salad dressings. Oils used in manufacture of commercial salad dressings are also subjected to winterization to prevent clouding upon refrigeration. Clouding is caused by formation of crystals of high melting point triglycerides and may also be inhibited by addition of anticlouding agents, namely oxystearin, polyglycerol esters and some emulsifiers.

Salads Cold dishes consisting of one or more uncooked salad vegetables, such as tomatoes, cucumbers and lettuceess, usually sliced or chopped, and often accompanied by a protein source, such as eggs, fish or meat. Also refers to dishes of vegetables served with dressings, such as potato salads or coleslaw, and to cold dishes of cooked rice or pasta mixed with cooked or raw vegetables or fruits. Fruit salads usually comprise sliced mixed fruits served in fruit juices or sugar syrups.

Salad vegetables Vegetables eaten raw in salads. Include leafy green vegetables, such as lettuceess, chicory and watercress, spring onions and radishes.

Salami Highly seasoned, raw, dried sausages, originally produced in Italy. They are prepared from coarsely comminuted meat. There are two major kinds, namely soft salami, which are semi-dry sausages; and dry salami, which are dried slowly to a hard texture. Most are made from fresh pork and include garlic; however, they may be prepared from beef, turkey meat, veal, or from meat mixtures. The ma-
Salatrim  Acronym for short- and long-chain acyl triglyceride molecules. Fat substitutes produced by interesterification of short chain triacylglycerols, such as triacetin, tripalmitin or tributyrin, or their mixtures, with fully hydrogenated vegetable oils, such as hydrogenated rapeseed, soybean, cottonseed or sunflower oils. Applications include use in confectionery, bakery products and dairy products. Trade name is Benefat™ (Cultor Food Science).

Salbutamol  β-Adrenergic agonist used to enhance growth rates and improve feed efficiency and lean meat content of animals. Normally depletes rapidly from animal tissues following treatment.

Salchichon  Spanish, raw, dry, fermented pork sausages, that are very popular in Spain. They are prepared primarily from lean pork, but also include beef and pork backfat. Varieties include Salchichon de Vich (Vich sausage).

Salers cheese  French hard cheese made from raw cow milk. Traditionally, only milk from cows grazing mountain pastures in the summer can be used. The hard brown rind becomes rough with ageing. The yellow interior has a flowery, grassy aroma and a nutty, savoury flavour.

Sal fats  Vegetable fats rich in stearic acid and oleic acid, derived from the seeds of the sal tree, Shorea robusta. Physical properties and melting behaviour are similar to those of cocoa butter, making them useful as cocoa butter extenders.

Salicylic acid  Aromatic acid with the systematic name 2-hydroxybenzoic acid that is found as the methyl ester in many essential oils. In the food industry, it is used in preservatives. Used in the pharmaceutical industry in antiseptics and aspirin.

Salinity  Measure of the total amount of salt in foods and brines.

Salinomycin  Polyether antibiotic and coccidiostat used for prophylaxis of coccidiosis in chickens; also used as a growth promoter in swine. Residues present in edible tissues are generally barely detectable after 1 day of withdrawal.

Saliva  Fluid secreted by the salivary glands which facilitates mastication. Saliva serves to moisten foods, help create a food bolus and aid swallowing. It also contains enzymes that initiate the digestion of starch (salivary amylase) and lipids (lipase).

Salmon  Any of several medium to large anadromous fish of the family Salmonidae, native to the North Atlantic and North Pacific Oceans and spawning in adjacent streams of Europe, Asia and North America. All are important food fish highly prized for the flavour of their flesh, which in many species is typically redish-orange in colour. Well-known Pacific salmon species include chinook (king) salmon (Oncorhynchus tshawytscha), coho (silver) salmon (O. kisutch) and sockeye (red) salmon (O. nerka). The Atlantic salmon, Salmo salar, is the principal salmon species consumed in Europe. Marketed and consumed in a wide variety of forms.

Salmonella  Genus of facultatively anaerobic, rod-shaped Gram-negative bacteria of the family Enterobacteriaceae. Occur in soil, water, foods (e.g. raw meat, raw sea foods, eggs and dairy products) and the gastrointestinal tract of humans and animals (especially poultry and swine). Salmonella Typhi is the causative agent of typhoid fever, while Salmonella Typhimurium and Salmonella Enteritidis are responsible for gastroenteritis. Transmission is via the faecal-oral route by contaminated foods or water.

Salmonellae  Bacteria of the genus Salmonella.

Salmonellosis  Any infection caused by Salmonella spp. Usually manifests itself as food poisoning with severe diarrhoea, nausea, vomiting, fever, headache and abdominal cramps.

Salmon oils  Fish oils derived from salmon such as Salmo salar. Rich in ω-3 fatty acids, particularly eicosapentaenoic acid.

Salsa  Literally, the Spanish word for sauces. In culinary terms, the term refers to sauces prepared from chopped vegetables, lemon juices or lime juices, and spices. The most common type is tomato-based salsa.

Salt  Mineral with the chemical formula NaCl, obtained by mining or as residues from evaporation of sea water. Several different forms of this mineral are used as condiments; table salt, rock salt and sea salt are all...
Sampling

Collection of samples for analysis. Procedures vary according to type of material and analytical technique to be used.

Salted fish

Fish products preserved or cured with dry salt or in brines, after which they may or may not be dried. In the UK, the term usually refers only to salted white fish species, such as cod, coalfish, haddock and hake.

Saltine crackers

Crackers which are thin and crisp-like and are topped with coarse salt crystals.

Saltiness

Sensory properties relating to the extent to which a product tastes of salt.

Salting

The process of treating foods with dry salt, particularly as a preservation technique. Used in the production of salted fish and cured meat. Contrasts with brining in which salt solutions (brines) are applied.

Salts

Compounds produced from the reaction between acids and bases.

Salt substitutes

Chemicals used to mimic the flavour and/or applications of salt. Concern regarding effects of salt consumption on blood pressure has lead to a search for salt substitutes that do not have hypertensive effects. Potassium, ammonium and calcium salts have been tested as salt substitutes, but these metal ions have been unsuccessful in replacing sodium, underlining the importance of sodium ions in perception of saltiness. Reductions in salt content of processed foods have been possible due to the addition of salt flavour enhancers such as amino acids, yeast extracts, acetic acid and allyl isothiocyanate.

Samna

Egyptian clarified butter.

Samphire

Herbs (Crithmum maritimum) native to Mediterranean and European Atlantic coastlines. Used as condiments and incorporated into pickles and salads. Essential oils extracted from the plant display antimicrobial activity. Also known as crest marine, rock samphire, marine fennel, sea fennel and sampier. Can also refer to marsh samphire, another name given to edible glassworts, such as Salicornia europaea.

Sanitation

Establishment and maintenance of environmental conditions conducive to the preservation of public health.

Sanitizers

Agents used in disinfection or sterilization.

Sans-a-oils

Low quality vegetable oils that are chemically extracted from press residues of olives. May be used as frying oils.

San Simon cheese

Spanish semi-hard cheese made from cow milk. Curd is pressed in pear shaped moulds and smoked to give a woody flavour. Rind is glossy and honey to red-brown in colour. Consistency of the interior is open and supple. Flavour is also buttery with slight acidity.

Sanpontoquin

Alternative term for the antioxidant oxyquin.

Sapodillas

Fruits produced by Manilkara zapota or Achras zapota. Also known as sapota. Brown skinned, with black shiny seeds embedded in the amber to brown pulp. Seeds are removed before consumption of the flesh. Contain moderate amounts of vitamin C and approximately 15% sugars. Mainly eaten out of hand, but also used in fruit salads and ice cream. The plant produces a latex that coagulates into chicle, used in the manufacture of chewing gums.

forms marketed for this purpose. Commercial salt often includes other salts, such as calcium chloride or magnesium chloride, as anticking agents. Salt has multiple uses in the food industry, primarily in flavourings, e.g. salted butter and salted nuts, and in aqueous solutions (brines) as preservatives. Other uses include as dough conditioners and curing agents.

Flavour is mild and nut-like, but a sweet-sour pungency develops with ageing. Used in a wide variety of ways, from cooked dishes to salads and sandwiches. Alternative spelling is samsoe cheese.

Sandesh

Sweetened Indian dairy product made from chhana.

Sand lance

Marine fish species of the genus Ammodytes, some of which are of commercial interest. Similar to sand eels. Widely distributed in the Arctic, Pacific and Atlantic Oceans. Marketed dried, salted or frozen and mainly consumed fried. Also used as a source of fish meal.

Sandwiches

Snack foods comprising 2 or more slices of bread (usually buttered), enclosing sweet or savoury fillings (e.g. meat, fish, cheese, eggs, jams). Variations include open sandwiches and toasted sandwiches. Commercial, pre-packed sandwiches form an important part of the fast foods sector in many countries.

Sangak

Middle Eastern flat bread made from whole wheat sourdough and baked in traditional style ovens.

Sangria

Beverages originating in Spain based on red wines, citrus juices, sugar and water (optionally carbonated water). May be garnished with berries or fruit slices.

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Saponins and Glycosides  
Alternative term for Sapoviruses  
Saponins  
Glycosides found in many plants, consisting of sapogenins and sugars. Thought to have a number of beneficial health effects, such as the ability to lower cholesterol levels.  
Sapot A  
Alternative term for sapodillas.  
Sapoviruses  
Pathogenic enteric viruses of the family Caliciviridae that infect humans and other vertebrates (including swine), and are a causative agent of gastroenteritis. Type species is the Sapporo virus. Comprise a single strand of RNA surrounded by a capsid, but does not possess an outer envelope.  
Saran  
Class of thermoplastic resins that are polymers of vinylidene chloride. Made into transparent films, also called cling films, that are resistant to oils and chemicals and used for wrapping foods. Originally a US trademark. It is also known as saran wrap.  
Sarcina  
Genus of anaerobic, coccoid Gram positive bacteria of the family Clostridiaceae. Occur in soil, air, milk, grain and the gastrointestinal tract of humans and animals. Species may cause spoilage of milk.  
Sarcocystis  
Genus of parasitic protozoans of the family Sarcocystidae. Occur in reptiles, birds and mammals (especially sheep, cattle and swine). Sarcocystis hominis and S. suihominis may cause infection in humans when contaminated meat is consumed.  
Sarcodon aspratus  
Species of edible fungi of the family Thelephoraceae. Extracts thought to possess antiallergic activity, antiallergic activity and anticarcinogenicity. Also known as neungee and koutake.  
Sarcodon imbricatum  
Species of edible fungi.  
Sarcoplastic proteins  
Animal proteins found in fish and meat. Include globulins, myoglobin and various enzymes involved in cell metabolism. Influence meat quality parameters, such as colour, water holding capacity, gelation properties and binding capacity. Precipitation of sarcoplastic proteins contributes to the PSE defect in pork.  
Sarcosine  
Amino acid derivative (N-methylaminoacetic acid) occurring as an intermediate in the metabolism of choline.  
Sarda  
Genus of marine fish containing several medium-sized tuna species; generally known as bonito. Commercially important species include Sarda sarda (Atlantic bonito), S. chilensis (Pacific bonito) and S. orientalis (Oriental bonito). Marketed mainly fresh; also dry-salted, canned and frozen.  
Sardine  
Any of a number of herring-like marine fish species in the family Clupidae; distribution is worldwide. Many species are also referred to as pilchards; the term sardine generally refers to smaller individuals within the species. Commercially important species include Sardina pilchardus (European pilchard), Sardinops sagax (Pacific sardine) and S. melanosticta (Japanese pilchard). Marketed fresh, smoked, salted and dried; particularly popular as a canned product in various sauces or oils.  
Sardinella  
Genus of herring-like marine fish in the family Clupidae; worldwide distribution. Commercially important species include Sardinella aurita (gilt sardine), S. longiceps (oil sardine) and S. anchovia (Spanish sardine). Marketed fresh or canned; sometimes processed in the same way as sardine and pilchards.  
Sardine oils  
Fish oils extracted from the body of Sardina pilchardus. Contain variable amounts of eicosapentaenoic acid and docosahexaenoic acid. May be used in the manufacture of margarines.  
Sargassum  
Genus of brown seaweeds containing a number of free-floating and attached species; distributed across the world. Some species are edible and are consumed directly or used as the basis of food additives. Rich source of certain minerals and functional polysaccharides.  
Sarsaparilla  
Spices prepared from the roots of Smilax spp. Root extracts from this plant are also used as flavourings. Former name for root beer, a beverage containing sarsaparilla extracts.  
Sashimi  
Fish products consisting of thin slices of raw fish flesh. Fish commonly used include tuna, halibut, red snapper, yellowtail and mackerel. Also known as tsukuri.  
Saskatoon fruits  
Dark blue to black berries produced by Amelanchier alnifolia. The mild flavour resembles a combination of those of blueberries and cranberries. Used in pies, preserves and fruit toppings. Also known as juneberries, serviceberries and Saskatoon berries.  
Satiety  
State in which the desire or motivation for something no longer exists because the need has been satisfied. In the food sense, satiety relates to the physiological sensation of fullness after consumption of a meal. Satiety can also be sensory-specific, e.g. texture and flavour specific satiety; this may significantly contribute to overall satiety. Sensory-specific satiety refers to the decrease in the perceived pleasantness of a food after it has been eaten to satiety, and the smaller amount of that food, relative to other foods, that is subsequently eaten.
**Satratoxins**  Trichothecene mycotoxins produced by Stachybotrys atra. Cause mycotoxicosis (stachybotryotoxicosis) in humans, horses, cattle and poultry. Responsible for irritation and ulceration of the mucous membranes of the mouth, throat and nose, widespread haemorrhages, leucopaenia and possible death.

**Satsuma mandarins**  Small citrus fruits of the mandarins (Citrus reticulata) family. Almost seedless with a smooth, thin skin. Used in production of canned mandarin oranges. Also called satsumas.

**Satsumas**  Alternative term for satsuma mandarins.

**Saturated fats**  Fats composed of triglycerides containing saturated fatty acids. Have a relatively high melting point and tend to be solid at room temperature. High intakes are associated with hyperlipaemia and increased risk of cardiovascular diseases. Main sources are from animal foods, including red meat and dairy products (e.g. butter, cream and cheese), although some plant foods such as palm oils, palm kernel oils and coconut oils also contain high levels.

**Saturated fatty acids**  Fatty acids that contain no double bonds. Diets rich in saturated fatty acids are thought to increase the risk of developing coronary heart diseases.

**Sauce mixes**  Powders containing all the ingredients required (e.g. fats, flour, seasonings, stabilizers) to produce sauces upon reconstitution with water. The reconstituted powders are usually thickened by heating to produce sauces of the required consistency.

**Sauces**  Condiments of a pourable or spoonable consistency that are served as an accompaniment to foods in order to enhance the flavour of the food. Sauces may be sweet or savoury, e.g. apple sauces and cheese sauces, respectively, and may be served as a side dish, poured over the food or used during cooking.

**Saucisson**  Raw, dry, fermented sausages. Varieties include French and Spanish saucisson. They are prepared from lean meat, generally pork and beef; other ingredients include pork fat, spices and salt. Lactic starters are often used. The surface of the sausages is often coated with chalk or t alc.

**Sauerkraut**  Dish made by fermenting shredded cabbages, salt and, optionally, spices. Rich in vitamin C and B vitamins. Sold fresh or in jars or cans. Eaten as a side dish, in sandwiches and in casseroles.

**Saury**  Any of a number of marine fish species in the family Scomberesocidae; distributed worldwide. Commercially important species include Scomberesox saurus (Atlantic saury) and Cololabis saira (Pacific saury). Flesh of most species has a highly esteemed flavour. Marketed fresh, frozen or as a dry-salted product.

**Sausage casings**  Natural, cellulose or collagen casings which are filled with sausage emulsions in the preparation of sausages. Particular types of sausages are prepared in particular types of casings. For example, sheep intestines are used as casings for chipolatas and frankfurters, swine intestines are used as casings for fresh frying sausages, and cellulose casings are used in the preparation of skinless sausages.

**Sausage emulsions**  Fillings for sausages prepared from comminuted meat, fats, preservatives, spices, salt and sometimes fillers, such as cereals or dried milk solids. Level of NaCl is controlled in order to improve the binding capacity of sausage emulsions, especially those prepared from non-slaughter-warm meat. Additives are often included to help preserve, thicken or colour sausages. Extent of comminution of the raw meat materials differs widely, so that sausage emulsions may include small pieces, chunks, chips or slices of meat. Curing ingredients may be added during comminution or mixing, either in dry form or as a concentrated solution. Most sausage emulsions are packed into sausage casings to produce sausages.

**Sausagemeat**  Fresh sausages which are sold in bulk without casings. Often mixed with other meats, formed into patties or balls, or used as an ingredient in stuffings.

**Sausages**  Comminuted, seasoned, usually cylindrical, meat products prepared from sausage emulsions stuffed into sausage casings. Commonly, filled sausage casings are twisted at intervals to form links; these vary in shape and size depending on the type of sausages. Sausage production may also involve curing, smoking, fermentation, shaping and/or cooking. Shape or form of particular types of sausages tends to be dictated by tradition. Countries such as France, Italy and Germany have an extensive range of regional speciality sausages. Most sausages are prepared from pork mince or beef mince, but some are prepared from other meats (e.g. chicken mince or donkey mince) or various types of offal (e.g. livers). They often include low value meat, such as mechanically recovered meat or parts of the carcass that are unattractive to the consumer, e.g. the intestines and feet. The six major types of sausages are: fresh (e.g. fresh pork sausages), cooked (e.g. liver sausages); uncooked smoked (e.g. mettwurst); smoked and cooked (e.g. knackwurst); semi-dry (e.g. semi-dry salami); and dry (e.g. rohwurst).
Scalding

Scalding is the process of briefly immersing foods in hot water or oil to remove scales or loosen them for easier removal. It is particularly useful for cleaning fish, as it can loosen the scales without damaging the flesh. The term is also used for a culinary technique that involves frying foods in a small amount of hot fat or oil in a skillet or special saute pan over direct heat.

Savory

Leaves of *Satureja hortensis* (summer savory) or *S. montana* (winter savory) which are used as spices. Essential oils and extracts of savory leaves are also used as natural flavourings.

Scallion

Name applied to various types of green onions and spring onions. Fried dishes, salads, soups and garnishes. Also called Vidalia onions, which do not develop a bulb at the root. The long, straight green leaves and the white part nearer the bottom are both eaten, raw or cooked. Uses include stir-frying and sautéing. They may be used as an ingredient in coleslaw.

Scallop

Common name for marine bivalve molluscs in the family Pectinidae; widely distributed in intertidal zones and deeper waters of the Atlantic and Pacific Oceans. Most species are valued for the flavour and texture of flesh, which has a distinct, sweet odour when fresh and is creamy white or slightly orange in colour; normally, only the large adductor muscle is eaten. Commercially important species include *Pecten maximus* (great scallops), *P. yessoensis* (Japanese scallops) and *Chlamys opercularis* (queen scallops).

Scampi

Italian name for Norway lobsters (*Nephrops norvegicus*) or langoustines; also refers to lobster tail meat, fried after coating in batters or breadcrumbs. In the UK, foods labelled as scampi must be derived from Norway lobsters, but elsewhere other species may be used. In the USA, the term may refer to shrimps and is sometimes used to describe a culinary style rather than an ingredient. Thus, meat subjected to marination and broiling, then served in a sauce of garlic, butter and white wines may also be referred to as scampi (e.g. chicken scampi).

Scanning electron microscopy

Electron microscopy technique, usually abbreviated to SEM, in which a focused beam of electrons is used to scan the surfaces of suitably prepared samples. Secondary electrons emitted from the samples are detected and used to create detailed images of the structure of the samples. Advantages over light microscopy include greater magnification (up to 100,000×) and much greater depth of field.

Scenedesmus

Genus of green algae of the family Scenedesmaceae. Occur in a wide range of freshwater habitats. Some species (e.g. *Scenedesmus quadricauda*) may be used in production of single cell proteins.

Schizochytrium

Genus of microorganisms of the family Thraustochytriidae in the stramenopile taxonomic group. Fermentation products obtained from this organism include lipids enriched with docosahexaenoic acid. Substrates used in these fermentations include glycerol and food industry wastes. Cofermentation of *Schizochytrium* spp. with other stramenopiles of the genus *Thraustochytrium* is also used for production of docosahexaenoic acid and other polyunsaturated fatty acids.

Schizophyllum

Basidiomycetes that grow on decayed wood. Some species, mainly *Schizophyllum commune*, are consumed as food, in soups or raw. Can cause the disease basidioneuromycosis in humans. Also used as a source of enzymes and polysaccharides.

Schizosaccharomyces

Genus of fungi of the class Schizosaccharomycetes. Occur in fermented beverages, fruit juices, dried fruits, molasses and cereals. *Schizosaccharomyces pombe* is used in the manufacture of sorghum beer.
Schmalzfleisch  Comminuted meat products, produced from pork and pork fat, seasoned with salt and spices; they have a very high content of fat.

Schnapps  Strong, dry spirits, consumed mainly in Germany, the Netherlands and Scandinavia.

School meals  Meals, particularly lunches, but sometimes also breakfasts and evening meals, provided for school pupils, usually by a food service. Emphasis is placed on planning healthy menus that appeal to children and adolescents and which provide suitable nutrients for these age groups.

Schwanniomyces  Obsolete name for a genus of yeasts whose species have been reclassified into other genera, including Debaryomyces.

Sclerotinia  Genus of fungi of the class Leotiomycetes. Some species (e.g. Sclerotinia fructigena and S. trifoliorum) are responsible for several plant diseases. S. sclerotiorum and S. fructigena cause spoilage of vegetables (e.g. carrots, celery, cucumbers and artichokes) and fruits (e.g. apples, pears and peaches) during storage.

Sclerotium  Genus of fungi that includes some important plant pathogens that cause rotting. Sclerotium rolfsii produces several glycosidases as well as the exopolysaccharide scleroglucan, with many potential applications in the food industry, e.g. in thickeners.

Scombroid poisoning  Poisoning linked to consumption of fish containing high levels of histamine, which is produced soon after death in fish having naturally high levels of free histidine, particularly scombroid or scombroid-like marine fish such as mackerel and tuna. Formation of histamine in fish depends on the temperature at which the fish is kept from time of capture until it is consumed; to minimize risks it is important to refrigerate fish after capture.

Scones  Quick breads traditionally prepared with leavened barley flour or oat flour, milk or buttermilk, baking powders, sugar, salt and sometimes cream and eggs, which are then cut into various shapes and baked on a griddle or in ovens. Often made with additional ingredients, such as dried fruits, cherries, nuts, dates and cheese.

Scoops  Utensils used to collect, transfer and dispense substances such as foods. Can also refer to containers for dispensing fast foods, particularly French fries.

Scopoletin  6-Methoxy-7-hydroxycoumarin. Found in a number of higher plants, often as scopolin (scopoletin 7-glucoside). Accumulates in the tissues of certain microbially infected plants and is thought to exhibit antifungal activity. Scopolin may contribute to the bitterness of citrus fruits.

Scopulariopsis  Genus of fungi of the class Hyphomycetes. Occur in decaying plant material and foods. Scopulariopsis brevicaulis causes spoilage of cereals, meat, salami, cheese and eggs.

Scrambled egg  Eggs which have been beaten, usually with milk, seasonings and butter, and cooked with stirring to give a lumpy texture.

Scrapie  One of a group of prion diseases, this one affecting sheep. Scrapie is characterized by progressive and fatal degeneration of the central nervous system. Deaths occur a few weeks or months after the initial symptoms appear. Mode of transmission of scrapie is not fully understood, but evidence suggests that scrapie has been present in sheep in many parts of Europe for more than 250 years. Experimentally, scrapie has been transmitted to mice, rats, hamsters and goats; however, there is currently no evidence for transmission of scrapie from sheep to man. Scrapie is not currently believed to have a role in the origins of bovine spongiform encephalopathy (BSE). Slaughter programmes for scrapie have failed as a means for control, but it may be possible to breed for scrapie resistance.

Screw caps  Closures for sealing containers such as bottles or jars. These caps screw onto threads on the neck of the container.

Sculpin  Any of a number of marine fish or freshwater fish species in the family Cottidae; most species occur off the Atlantic and Pacific coasts of the USA. Few species have significant commercial importance as food fish.

SDS  Abbreviation for sodium dodecyl sulfate.

SDS-PAGE  Abbreviation for sodium dodecyl sulfate polyacrylamide gel electrophoresis. A process for separation of a mixture of proteins according to their size and charge. SDS, a detergent, is used to denature the proteins to the same linear shape and to apply a negative charge to them prior to separation. A polyacrylamide gel is used for the separation, as it allows differently sized proteins to move at different rates through it. Electricity is used to pull the denatured proteins through the gel for a set amount of time after they have been applied to one end of the gel. Smaller proteins move faster through the gel than larger proteins, and the proteins of different sizes appear as distinct bands in the gel upon staining.

Sea bass  Any of a number of marine fish in the family Serranidae, many of which are valued food fish; distributed worldwide. Commercially important species include Dicentrarchus labrax (European bass), Centropristis striata (black sea bass), Morone saxatilis (striped bass) and M. chrysops (white bass). Marketed fresh, frozen and smoked.
Sea bream

Any of a number of marine fish in the family Sparidae, many of which are valued food fish; distributed in the Atlantic and Mediterranean. Some species are cultured in sea cages. Commercially important species include Pagrus major (red sea bream), Sparus aurata (gilthead sea bream) and Pagellus centrodontus (sea bream). Flesh tends to be lean, with a coarse-grained texture. Marketed fresh, frozen, salted, dried and as semi-preserved or canned products.

Sea buckthorn

Common name for Hippophae rhamnoides and the round yellow-orange berries it produces. Fruits are rich in vitamin C, vitamin E, carotenoids and flavonoids. Used in sauces and jellies, and to make liqueurs and fruit juices. Also the source of oils with reported health properties.

Sea buckthorn juices

Fruit juices prepared from sea buckthorn (Hippophae rhamnoides) berries. When prepared by pressing, the juice may be turbid due to its high content of insoluble solids and oil droplets, which can be removed by centrifugation. Contains high levels of vitamin C and carotenoids. May provide health benefits due to its antioxidative activity, anti-inflammatory activity and anticarcinogenicity. Astringent, so usually mixed with sweeter ingredients (e.g. grape juices or apple juices) to improve its palatability. Used in drinks for troops working in cold conditions, due to its relatively low freezing point (-22°C).

Sea buckthorn oils

Oils extracted from the pulp or seeds of berries produced by sea buckthorn. Oils vary in composition according to source (pulp or seed), but are consistently rich in tocopherols. May be used in foods. Health benefits include potential for protection against cardiovascular diseases.

Sea cucumbers

Any of the 1100 species of marine invertebrates from class Holothuroidea of the phylum Echinodermata; all have soft cylindrical bodies and are mainly found in shallow tropical waters. Many species are edible, particularly those from the genus Stichopus and Cucumaria. A popular delicacy in some Asian countries, where they are normally gutted, boiled and dried prior to consumption. Also known as beche de mer and sea slugs.

Sea fennel

Common name for Crithmum maritimum, a herb which grows wild along coastlines, particularly in the Mediterranean and European Atlantic areas. Rich in vitamin C. Sensory properties are similar to those of parsley. Used in condiments and in pickles and salads. Essential oils extracted from the plant display antimicrobial activity. Also known by a variety of names, including samphire, rock samphire, crest marine, sampier and marine fennel.

Sea food products

Generic term for products which contain fish, shellfish, aquatic foods or algae as the main ingredient.

Sea foods

All edible marine and freshwater aquatic organisms; includes fish (finfish), shellfish, aquatic mammals, plants and algae. Generally regarded as a healthy component of the human diet. Many sea foods are good sources of high quality proteins, unsaturated fatty acids, vitamins and minerals, and are low in fats and calories.

Sea kale

Common name for Crambe maritima, these plants are found on shingle and sandy shores, mainly of the Baltic Sea and Atlantic Ocean. Leaf stalks are blanched by covering when the plants are young, or by a covering of shingle in the wild. Stalks are boiled like asparagus and served with mild white sauces or butter.

Seal blubber

Thick, subdermal lipid layer found in seals; marine mammals belonging to the family Phocidae. Often forms up to 25% of the animal’s total weight and acts as an insulator. May often become contaminated by organochlorine compounds such as polychlorinated biphenyls (PCB). Frequently consumed by Arctic inhabitants.

Seal blubber oils

Oils derived from the subdermal lipid layer (blubber) of seals; marine mammals of the family Phocidae. Rich source of ω-3 fatty acids.

Sea lettuces

Any of several green seaweeds of the genus Ulva; distributed on rocky shores worldwide. Consumed raw, cooked, dried, in soups or as a deep fried product.

Sealing

Process of closing openings in containers in such a way as to prevent leakage of the contents or entry of undesirable elements.

Seal meat

Meat from seals. The prime cuts of seal carcasses are the flank, flipper and rump sections. Seal meat is dark red in colour and has a characteristic aroma. Composition of meat is altered when seals are in moultng condition; at this time they shed their hair, reduce feeding substantially and hence lose up to 20% of their blubber. Age of seal and type of carcass cut significantly affect sensory quality of the meat.

Seal oils

General term for oils derived from seals, marine mammals belonging to the family Phocidae.

Seals

Fish-eating marine mammals belonging to the Phocidae family (eared or true seals) or Otariidae family (the earless or hair seals); there are many species. They are hunted for seal blubber and seal meat.

Seaming

Process of joining together the edges of food cans to form a seal.

Sea mustard

Common name for Undaria pinnatifida, a member of the brown (Phaeophyta) group of seaweeds. Rich source of dietary fibre. Extracts pos-
Sea perch

Selenium salts

Sea trout

Sess antitumour activity and antimitagenicity. Used in production of soups, edible starch gels (mook or muk) and jams, and as an ingredient of foods including cakes and kimchies.

Sea perch General name given to a number of marine fish within the family Serranidae (including grouper and sea bass); particularly refers to Epinephelus species.

Sea slugs Any of the 1100 species of marine invertebrates from class Holothuroidea of the phylum Echinodermata; all have soft cylindrical bodies and are found mainly in shallow tropical waters. Many species are edible, particularly those of the genera Stichopus and Cucumaria. A popular delicacy in some Asian countries, where they are normally gutted, boiled and dried prior to consumption. Also known as sea cucumbers.

Seasonings Blends of spices, flavourings and other additives, such as colorants and sweeteners, that are used to enhance flavour, aroma and/or overall appearance of foods. Commercial seasonings may also contain anticaking agents. Seasonings are often created for use with particular types of food, e.g. barbecue seasonings or chicken seasonings.

Sea squirts Primitive marine chordates of the class Ascidiaeae, which are found attached to natural and man-made structures in sea water and distributed worldwide. Some species are consumed as a delicacy; particularly popular in France (often eaten raw with lemon juices) and in Japan. Also known as ascidians.

Sea trout Marine form of the brown trout (Salmo trutta) found in northern Atlantic waters; migrates back into freshwater to spawn. Highly valued as a sport fish and for the flavour and texture of its flesh. Cultured in some areas of northwest Europe. Marketed fresh, frozen and as a smoked product.

Sea urchin gonads Ovaries and roes of sea urchins (echinoids); the only part of sea urchins which are consumed. A highly esteemed and valuable delicacy, particularly in Japan (known as unij). Marketed principally as a salted product; also sold fresh and frozen. Used to make shiokara.

Sea urchins Any of around 700 species of marine invertebrates in the phylum Echinodermata; worldwide distribution. Generally have rounded hard, calcareous shells and prominent spines. Many species are exploited for their gonads, which are a highly valued delicacy. Also known as echinoids.

Sea water Water from marine environments, characterized by a high salinity and complex physicochemical structure; covers nearly 75% of the earth’s surface. In some countries, desalination is used to produce potable water from sea water.

Seaweeds Multicellular marine algae which are fixed to marine substrates by root-like holdfasts; occur in intertidal or subtidal environments worldwide. Subdivided into 4 classes: green (Chlorophyta); brown (Phaeophyta); red (Rhodophyta); and blue-green (Cyanophyta). Many species are edible, providing an excellent source of vitamins and minerals. Agar, carrageenans and alginates are extracted from some species for use as food additives.

Secalins Major storage proteins of rye.

Secretion Physiological processes involving the modification and release of substances such as proteins from cells.

Sedimentation Settling of matter to the bottom of a liquid by gravitational force so as to separate suspended solids from fluids.

Seedless grapes Grapes that contain no seeds. The most commonly eaten varieties include Thomson seedless, flame seedless and ruby seedless. Eaten out of hand, in salads and in cooking, e.g. in Veronique dishes.

Seeds Produce of flowering plants; mature fertilized ovules. Contain an embryo and a seed coat, and often an endosperm. Examples include beans, peas, oilseeds and cereals.

Seer fish Group of predominantly marine fish of the genus Scomberomorus belonging to the family Scombridae (mackerels, tunas, bonitos). Widely distributed in tropical and subtropical waters. Species vary from minor to high commercial value, but all are important game fish. Marketed fresh, dried-salted or smoked, and consumed in a number of ways, including pan-fried, grilled, baked or as spicy fishballs.

Sei-kombu Japanese name for dried seaweed products formed from the kelp species Laminaria japonica; used in Japanese cuisine as an ingredient of stocks or seasonings. Contain significant amounts of glutamic acid, the basis of monosodium glutamate.

Sekts German sparkling wines available in various degrees of sweetness. Often made using the Charmat method from imported wine, but must be made entirely from German winemaking grapes for the label ‘Deutscher Sekt’ to be applied.

Selenites Selenium salts and one of the forms in which Se is taken up from soils by plants. Although poisonous in large amounts, sodium selenite (Na₂SeO₃) is used to provide Se in various items, including infant formulas, dog biscuits, animal feeds, supplements containing proteins or vitamins, and weight loss products.
Selenium

Essential trace element with the chemical symbol Se. Deficiency can cause Keshan disease, a fatal form of cardiomyopathy, and may increase the risk of cancer, while excess can cause balding, garlic breath, intestinal distress and impaired mental functioning. Food sources include sea foods, meat, and some grains and seeds.

Selenoproteins

A group of selenium-containing proteins that have one or more selenocysteine residue(s) in their amino acid chains. At least 25 human selenoproteins have been identified so far, which include glutathione peroxidases, iodothyronine deiodinases and thioredoxin reductases. To date, most selenoproteins with known functions have enzymatic activity. Involved in a wide range of physiological processes, including antioxidant defence, thyroid hormone metabolism, immune function and sperm development. Synthesis is reduced under selenium-deficient conditions.

SEM

Abbreviation for scanning electron microscopy.

Semicarbazide

A contaminant formed from azodicarbonamide used in bakery additives or as a blowing agent in foamed plastics gaskets used to seal glass bottles. A weak carcinogen in mice, but not thought to be a health risk at the low levels found in foods. Also a metabolite of the prohibited veterinary drug nitrofurazone, and used to detect this drug in animal foods. Synonym is carbamylhydrazine.

Semi skimmed milk

Milk from which some of the fat has been removed. This low fat product is preferred to whole milk by some health conscious consumers, and is used by processors to make low fat dairy products. Semi skimmed cow milk contains approximately 1.7% fat, compared with approximately 4% in whole milk.

Semolina

Purified granular middlings from durum wheat used principally in the manufacture of pasta and milk puddings.

Sencor

Alternative term for the herbicide metribuzin.

Senescence

Degeneration of plants due to maturation or ageing. Stress due to disease or attack by insects may induce early senescence.

Sensors

Apparatus used in detection by responding to a specific stimulus.

Sensory analysis

Analytical techniques used to determine the sensory properties of foods. The techniques fall into three main classes: discrimination/difference tests; descriptive tests; and hedonic/affective tests.

Sensory evaluation

Alternative term for sensory analysis.

Sensory perception

Recognition, acquisition and interpretation of sensory information, including the sensory properties of foods.

Sensory properties

Properties that can be detected by the sense organs. For foods, the term relates to the combination of concepts such as appearance, flavour, texture, astringency and aroma.

Sensory scores

Scores given to particular sensory properties of foods by panellists during sensory analysis.

Sensory thresholds

Term used in sensory analysis relating to the levels at which perception of increasing concentrations of a stimulus, such as aroma compounds or flavour compounds, begins. Classical methods for estimating sensory thresholds include probit, graphic, exact, logistic, Spearman-Karber, moving average and up-and-down methods.

Separation

Action or state of division into distinct elements, using techniques such as centrifugation, filtration, sieving, crystallization, chromatography and distillation. Separation of food components is fundamental for preparation of ingredients to be used in other processes. Some separation methods are used to sort foods into classes based on size, colour or shape, to clean them by separating contaminating materials, or to selectively remove water by evaporation or drying. Centrifugation is used for separation of immiscible liquids and for separation of solids from liquids. Filtration is used for removal of insoluble solids from a suspension. Components of gaseous or liquid mixtures may be separated by chromatography.

Separators

Equipment that facilitates the division of items or solutions into distinct elements. Examples include centrifuges, filters and sieves.

Septoria

Genus of ascomycetous fungi of the Mycosphaerellaceae family, which includes many species responsible for plant diseases. Some species cause leaf spot diseases on food crops (e.g. celery, tomatoes, wheat, rye and barley).

Sequencing

Examination of the sequence of components in a sample to aid in its identification. Components sequenced include bases in genes, and amino acids in proteins or peptides.

Sequestrants

Additives that bind to or form complexes with other chemicals, reducing their reactivity in order to prevent the occurrence of undesirable reactions. Examples of sequestrants include sodium citrate and EDTA which are used to chelate calcium ions (e.g. used to modulate the strength of gellan gels), and phosphates that bind to and enhance the stability of proteins at low pH.
Serine  Non-essential amino acid required for metabolism of fats and fatty acids, muscle growth and a healthy immune system. Abundant in meat and dairy products, wheat gluten, peanuts and soy products. 

Serological tests  Immunological techniques in which antibodies in blood serum samples are detected using specific antigens. 

Serology  Study of blood serum with particular reference to components important for immune response. Used to detect specific antigens or antibodies. 

Serotonin  Hormone derived from tryptophan found in humans, animals and plants. Acts as a vasoconstrictor and neurotransmitter. Present in some tropical fruits such as bananas and pineapples. Excessive intake in the diet may lead to myocardial lesions. Also known as 5-hydroxytryptamine. 

Serotype  Serologically (antigenically) distinct variety or strain of an organism, as defined by antisera against antigens expressed on cell surfaces. Also known as serovar, particularly when applied to microbial pathogens, whose antigens can include toxins, lipopolysaccharides and other virulence factors. 

Serotyping  Methods for distinguishing between closely related organisms, including strains of microorganisms, based on differences in their surface antigens. Using standard immunological techniques, the strains or isolates to be typed are exposed to antibodies specific for certain antigens and those that interact are detected, e.g. by agglutination tests or precipitation. Reactions to an appropriate range of antibodies distinguish a strain in terms of its surface antigens. More recently, the application of modern genetic techniques such as PCR and DNA microarrays has provided alternative molecular typing methods for serotype analyses. 

Serra cheese  Portuguese soft, almost spreadable, cheese made from ewe milk using vegetable rennets prepared from cardoon flowers. Traditionally, entirely hand-made, down to breaking of the curd by hand. Flavour has the slightly burnt toffee character of ewe milk. Ripening takes 30–40 days. Also known as Serra da Estrela cheese, after its place of origin. 

Serrano ham  Cured ham produced in Spain using methods similar to those used in Italy to produce Parma ham. Fresh hams are covered with salt for approximately 2 weeks to draw off moisture and preserve the meat, washed, hung for approximately 6 months and finally air dried. The name derives from the practice of carrying out the air drying phase, which lasts 6 to 18 months, in sheds located at high elevations. Good source of vitamin B₁, vitamin B₂ and thiamin. Served as a snack in thin slices and used to flavour soups, vegetable dishes or pasta dishes. 

Serratia  Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the Enterobacteriaceae family. Occur in water and soil, and on plants. Some species (e.g. Serratia liquefaciens and S. marcescens) may be responsible for the spoilage of foods (e.g. meat, dairy products, shellfish, vegetables and eggs), and some species also produce lipases. 

Serum  Blood fraction expressed from clotted blood. Also sometimes used as an alternative term for whey, which is produced by the clotting of milk. 

Sesame  Tropical, annual herb, Sesamum indicum, which bears small flat seeds, which are used as toppings and in flavourings for foods as well as being a source of edible oils. 

Sesame oils  Seed oils derived from sesame seeds, which are rich in oleic acid and linoleic acid and have high oxidative stability due to the presence of natural antioxidants. Contain sesamin and sesamolin. Due to their nut-like flavour, the oils are used as seasonings as well as cooking oils. Also known as gingelly oils or til oils. 

Sesame seed meal  Residue remaining when sesame oils are extracted from sesame seeds. Used as an animal feed, a source of proteins and sometimes as a partial substitute for wheat flour in baking. 

Sesame seeds  Small flat seeds with a nut-like flavour produced by sesame (Sesamum indicum). Used as toppings for bakery products, flavourings and as a source of sesame oils. Also known as gingelly seeds. 

Sesamin  One of the lignans found in sesame oils and sesame seeds. Possesses anti-inflammatory activity, anticarcinogenicity, hypolipaemic activity and antihypertensive activity, promotes oxidation of fatty acids and enhances vitamin E status by inhibiting tocopherol hydrolase. Food supplements containing sesamin are claimed to have fat burning properties. 

Sesamol  Natural phenol antioxidants prepared from sesame oils. 

Sesamolin  One of the lignans found in sesame oils and sesame seeds. Possesses antioxidative activity, anti-inflammatory activity and antitumour activity, and induces apoptosis. 

Sesbania  Genus of leguminous plants, the leaves, flowers and seeds of which are eaten commonly in India. Seeds and leaves are potential sources of protein. Gums extracted from seeds of some species have possible uses in the food industry, e.g. as thickeners.
Sesquiterpenoids Volatile compounds produced as secondary metabolites in certain plants, spices and essential oils.

Setting Firming of foods, usually as a result of cooling, as with gelatin-based dishes, such as jelly.

Sevin Alternative term for the insecticide carbaryl.

Sevruga Species of sturgeon (Acipenser stellatus) found in the Caspian Sea; the smallest of the sturgeon exploited commercially. Roes are used as caviar.

11S Globulins Globulins with a sedimentation coefficient of 11S which constitute one of the main groups of characteristic storage proteins in non-cereal grains, such as beans, peas and peanuts.

7S Globulins Globulins characterized by a sedimentation coefficient in Svedberg units (S) of 7. Important fraction of storage proteins in seeds, e.g. legumes, cereals and oilseeds, and includes vicilin, phaseolins and β-conglycinin. Some 7S globulins are allergens.

Shad Any one of several species of food fish of the herring family. The American species, Alosa sapidissima, is an important market fish. The European shad is less important. Shad roes are considered a delicacy in eastern parts of the US.

Shaddocks Alternative term for pomelos or pummelos, the largest of the citrus fruits, produced by Citrus maxima or C. grandis and ancestors of the modern grapefruit. Closely resemble the grapefruit in appearance, but the flesh is sweeter and less acidic, lacking the bitterness of a grapefruit. Rich in vitamin C and potassium. Eaten fresh or used to make jams, jellies and marmalades. Also known as Chinese grapefruit.

Shading Complete or partial protection of plants from sunlight using cloth or other materials. Prevents sunburn and other types of damage and has various effects on the composition and quality of fruits.

Shallots Type of onions (Allium ascalonicum) with many lateral, mild-flavoured bulbs. Eaten raw or cooked. Also used for pickling.

Shandy Blend of beer with lemonade.

Shaping To give a shape or form to a substance, sometimes with the aid of moulds (moulding).

Shark fins In culinary terms, can include dorsal, pectoral or tail fins from a few species of sharks which are considered a delicacy and are used in Asian, predominantly Chinese, cooking. The cartilage in the fin and the gelatin which it provides are the components of the fin utilized in cooking. Fins are sold dried, either whole or in shreds. Eaten mainly in shark's fin soups, the gelatin imparts a characteristic texture. Also sometimes served after braising as a main dish or used in small quantities in fillings or stuffings.

Sharks Any of numerous cartilaginous, predatory marine fish; worldwide distribution. Many species are exploited as a source of food; shark fins from several species are used to make soups. Marketed fresh, frozen and as dried, salted or smoked products. Liver oils are a rich source of vitamin A.

Sharon fruit Alternative term for persimmons.

Sharpness Sensory properties relating to the extent to which an item tastes sharp, i.e. acid, bitter or astringent.

Shashlik Meat products prepared from meat, or meat and offal. Ingredients vary between recipes, but may include lean meat, bacon, livers, kidneys, animal fats, onions, peppers and gherkins. The product is cooked on a spit or skewer. Traditional Turkish shashlik is made exclusively from mutton, without addition of offal or vegetables. In Germany, shashlik may contain pork, beef, bacon, offal, onions and other vegetables.

Shea nut butter Yellowish vegetable fats derived from the seed kernels of Butyrospermum parkii. Rich in stearic acid and oleic acid. Resembles cocoa butter in its melting profile, making it suitable for use in cocoa butter equivalents.

Shea nuts Seeds produced by the tree Butyrospermum parkii. Fats derived from the seeds are used to make shea nut butter.

Shear Force that one plane exerts on a neighbouring plane per unit area of contact, and which causes a deformation in a direction related to the direction of the applied force. Shear forces are applied during food processing such as mixing and extrusion and will affect the texture of the final product. Shear also occurs during mastication of foods.

Shear strength Measure of the resistance of a material, such as a food, to shear stress and the associated deformation caused by the application of this stress. Peak shear strength is the highest stress sustainable just prior to complete failure of a sample under load; after this, stress cannot be maintained and major strains usually occur by displacement along failure surfaces. For material not previously sheared there is a rapid decline in strength with increasing shear until the residual shear strength is reached. The shear strength of a food will influence the rheological properties and mechanical properties of the food during processing, and also the texture and other sensory properties of the food during consumption.

Shear values Measures of the forces experienced by a material, such as a food, undergoing shear. Often determined in meat after cooking as an indication of tenderness.
Sheatfish  

**Sheatfish** Freshwater catfish species (*Silurus glanis*) found in eastern Europe and Central Asia; occurs mainly in large lakes and rivers. Cultured in some regions on a semi-extensive basis. Marketed fresh, canned and frozen. Also known as wels catfish.

Sheep  

**Sheep** Ruminants (*Ovis aries*), the majority of which have been domesticated for the production of lamb, mutton, ewe milk and wool. There are many breeds; for example, in the UK there are approximately 50 recognized breeds, various local types and numerous crossbreeds. Different gender and age groups of sheep are known as rams (adult entire males), wethers (adult castrated males), ewes (adult females), tegs (2 years of age), shearlings (15-18 months of age), hoggets (1 year of age) and lambs (sexually immature animals which are generally less than 1 year of age).

**Sheep cheese** Cheese made from ewe milk. Alternative term for ewe milk, mutton and sheep milk cheese.

**Sheep meat** Alternative term for mutton.

**Sheep milk** Alternative term for ewe milk.

**Sheep milk cheese** Cheese made from ewe milk. Alternative term for ewe milk, mutton and sheep milk cheese.

**Sheep muscles** Alternative term for mutton.

**Shelf life** Time for which a stored item remains usable.

**Shellfish** General name referring to aquatic invertebrates possessing a shell or exoskeleton, including crustacea (crabs, lobsters, prawns and shrimps) and molluscs (gastropods, bivalves and cephalopods).

**Shelling** Removal of husks, shells or pods from foods such as nuts, eggs and peas.

**Shells** Generally refers to hard and rigid coverings of various invertebrates, mostly calcareous; in other cases chiefly or partially chitinous, horny or siliceous. Shells of some marine molluscs and crustacea are used by the food industry as a source of calcium carbonate, chitin or glucosamine. Also used to describe the outer coating of birds’ eggs (egg shells).

**Sherbet** Artificial fruit-flavoured effervescent powders eaten as sweets. When mixed with bicarbonate of soda, tartaric acid, sugar and flavourings, may also be used to make beverages. Also a US term for sorbets.

**Sherry** Fortified wines made in a defined region in the vicinity of Jerez de la Frontera in Spain. The main sherry types include Fino, Oloroso, Amontillado, Manzanilla and Palo Cortado. Sherries are aged by the unique solera system of sequential blending of successive vintages. Some sherry types undergo a secondary fermentation in which a layer of yeasts (flor yeasts) grows on the surface of the wines and subsequently dissolves in the wines, imparting a characteristic flavour and aroma.

**Shewanella** Genus of facultatively anaerobic, curved or straight rod-shaped Gram negative bacteria of the Shewanellaceae family. *Shewanella putrefaciens* is responsible for the spoilage of fish and meat.

**Shiga like toxins** Cytotoxins produced by enterohaemorrhagic *Escherichia coli* strains, which are similar to *Shiga toxins*. Inhibit protein synthesis in eukaryotic cells by cleaving the 28S rRNA subunit of ribosomes, and play a role in haemorrhagic colitis and haemolytic uraemic syndrome. Also known as verotoxins and vero cytotoxins due to their ability to kill vero (African green monkey kidney) cells in culture.

**Shiga toxins** Protein toxins produced by some *Shigella* spp. which have enterotoxic, neurotoxic and cytotoxic activity. Responsible for some of the symptoms of bacillary dysentery caused by *S. dysenteriae*.

**Shigella** Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the Enterobacteriaceae family that ferment sugar without production of gas. Occur in the gastrointestinal tract in humans and primates, and in soil, fruits, vegetables and fresh water. *Shigella sonnei*, *S. boydii*, *S. flexneri* and *S. dysenteriae* are causative agents of bacillary dysentery (*shigellosis*). Infection is typically via the faecal-oral route.

**Shigellosis** Bacillary dysentery caused by infection with *Shigella* spp. Characterized by abdominal cramps, diarrhoea, fever, vomiting, presence of blood, pus or mucus in stools, and tenesmus (a feeling of incomplete defecation). Transmission is via the faecal-oral route by consumption of contaminated foods (e.g. salads, vegetables, dairy products and poultry meat) and water.

**Shiitake** Alternative term for *Lentinus edodes* (renamed *Lentinula edodes*) or Japanese black forest mushrooms.

**Shikimic acid** One of the organic acids found in plant foods, particularly star anise and gooseberries. A precursor of several alkaloids, aromatic amino acids, indole derivatives, tannins and flavonoids. Systematic name is 3,4,5-trihydroxycyclohex-1-enecarboxylic acid.

**Shiokara** Fermented sea foods, normally made from squid, but also from viscera of skipjack tuna or other marine fish, or from sea urchin gonads. Fermenting the raw material with salt for up to one month produces a brown, salty viscous paste.

**Shochu** Japanese spirits made by distillation of fermented rice mashes.
**Shops**  Buildings or parts of buildings where goods or services are sold.

**Shortbread**  Sweetened biscuits prepared with a high ratio of butter or other shortenings to flour.

**Short chain fatty acids**  Fatty acids with aliphatic chains containing less than 6 C atoms. Examples include butyric acid and valeric acid. Some are products of dietary fibre fermentation in the lower gastrointestinal tract that play a role in human metabolism and may protect against colorectal cancer. Also known as volatile fatty acids.

**Shortening**  A process that results from changes occurring in numerous connected sarcomeres in the myofibrils of muscles. It occurs during muscle contraction in living animals, but also during rigor mortis. Degree of sarcomere shortening is influenced by muscle fibre type (e.g. oxidative vs. glycolytic) and post mortem ambient temperature. If ambient temperature decreases rapidly during the onset of rigor mortis, muscle fibres contract to a greater extent than at higher ambient temp. This physiological occurrence is referred to as cold shortening; severe shortening results in reduced meat tenderness. Electrical stimulation is used to reduce toughness associated with cold shortening in meat.

**Shortenings**  Solid or semi-solid animal fats or vegetable fats often used in baking. By dispersing as a film throughout batters, they impart crispness or flakiness to bakery products.

**Shoti**  Common name for Curcuma zedoaria, a plant related to turmeric. Young rhizomes are eaten as a vegetable. The dried rhizome is pulverized and used as a spice. Used as a condiment and in manufacture of flavourings and bitters. Also known as zedoary.

**Shoyu**  Alternative (Japanese) name for soy sauces.

**Shredding**  Tearing or cutting of items into strips of material (shreds). This can be achieved either by hand or by using a grater or a food processor fitted with a shredding disk.

**Shrikhand**  Fermented milk product usually prepared from buffalo milk and popular in India. Also known as srikand and srikhand. Traditionally, the milk is fermented with a mixed starter culture (Streptococcus lactis and S. lactis var. diacetylactis) and chakka is prepared by draining off whey from the resultant curd. Other ingredients, e.g. sugar, colorants and flavourings, are then added to the chakka.

**Shrimps**  General name used for many species of marine and freshwater crustacea within the infraorder Caridea. Often confused with prawns, shrimps may be distinguished by their lamellar gill structure and the presence of a side plate on the second abdominal segment that overlaps the segments both before and after it. They also have shorter legs and a bigger set of first pincers than second, whereas in prawns the reverse is true. Despite these differences, the term shrimps is often applied, on the basis of size only, to smaller species within the families Pandalidae, Penaeidae and Palaeonidae. Many species have commercial importance as foods, including Crangon crangon (common shrimps), Pandalus platyceros (spot shrimps) and Penaeus monodon (tiger shrimps). Marketed in a variety of forms, including fresh, frozen, smoked, canned and as pastes.

**Shrink packaging**  Transparent, clinging thermoplastic films used to enclose a product or package. When heated, the film shrinks to fit closely to the package.

**Shubat**  Fermented camel milk similar to, but thicker than, koumiss. Popular in Kazakhstan. Also known as chal.

**Shucking**  Removal of husks from corn, or shells from shellfish such as oysters and clams.

**Shuttle vectors**  Cloning vectors that can replicate in more than one type of organism, thus allowing propagation of DNA in either organism.

**Sialic acid**  Organic acid found in animal tissues and fluids, e.g. in glycolipids, mucopolysaccharides and gangliosides. Also found as a component of milk proteins. Terminal sialic acid residues in glycoproteins or glycolipids in cell membrane components serve as receptor sites. Also known as N-acetylgalactosaminic acid.

**Side dishes**  Dishes served as an accompaniment to a main dish, usually the main course of a meal, on a separate plate or dish.

**Sideritis**  Genus of plants of the family Lamiaceae, some species of which are used to prepare herb tea, especially in Mediterranean countries such as Greece and Turkey.

**Siderophores**  Natural compounds produced by microorganisms which chelate ferric ions, so enhancing iron solubility and uptake. Many are nonribosomal peptides. Different organisms utilize structurally varied siderophores to bind iron competitively and gain selective growth advantages. Some pathogens have evolved siderophore virulence factors that mediate the release of host iron for parasitic consumption, e.g. enterochelin from Escherichia and Salmonella.

**Sides**  A butchers’ term for the two halves of animal carcasses, divided along the backbone.

**Sieva beans**  Alternative term for lima beans.

**Sieves**  Utensils consisting of a wire or plastic mesh held in a frame used for straining solids from liquids, separating coarser from finer particles or production of pulps and purees. Also know as strainers.
Sieving  Process of straining solids from liquids or separating coarser from finer particles using sieves or strainers. Sieving also incorporates air to make ingredients (such as flour) lighter.

Sifters  Utensils consisting of a stainless steel or heavy weight plastic mesh used for removal of lumps or large particles from finer particles. Used in sifting ingredients such as flour or confectioners’ sugar.

Sifting  Process of passing a dry substance through sifters to remove lumps or large particles. Sifting also incorporates air to make ingredients (such as flour) lighter.

Sigma factors  Proteins present in bacteria which bind to DNA-directed RNA polymerases, promoting initiation of transcription at promoters of a specific class. Involved in response of the cell to heat shock or other types of stress.

Sikhe  Traditional Korean beverages made with rice which has been saccharified and fermented.

Silage  Fodder which is harvested while green and converted into succulent feed for livestock by fermentation in silos. May also be made from fish by-catch or wastes. The fish material is chopped or ground prior to addition of acids or of a carbohydrate source for fermentation, the material being preserved by the low pH which develops. Composition of silage fed to animals can affect milk or meat characteristics.

Silica  Silicon dioxide that occurs in crystalline, crypto-crystalline and amorphous hydrated forms. Ubiquitous component of the diet with numerous applications in the food industry, such as stabilization of beer, refining of vegetable oils, and immobilization of proteins and enzymes.

Silica gels  Gels formed from polymers of silicic acid. When dried, they are termed silica xerogels and are used as desiccators or as adsorbents, e.g. for clarification of beer by adsorption of cloud-forming proteins.

Silicates  Salts derived from silica or silicic acid, containing silica, oxygen, one or more minerals and possibly hydrogen. Uses include reducing the content of free fatty acids in frying oils, immobilization of enzymes and clarification of beverages.

Silicon  Essential, non-metallic element, chemical symbol Si. Always found in a combined state in nature.

Siljo  Traditional Ethiopian fermented food made with meal prepared from horse beans and an extract of safflowers. The cooked slurry made from these components is fermented by lactic acid bacteria in mustard powder.

Silos  Tall towers or pits which are used for storage. Commonly refers to stores for grain, e.g. on a farm or at a mill, but can also be used for storing other commodities including vegetables and milk. Also applied to airtight structures in which green crops are compressed and stored as silage for animal feeding.

Silver  Soft, white, metallic element, chemical symbol Ag.

Silver carp  A freshwater cyprinid fish, Hypophthalmichthys molitrix, native to Asia. Generally cultured and consumed fresh in producing countries. Has also been introduced into many other countries for aquaculture and for use in controlling algal blooms in reservoirs and other waters.

Simazine  Selective systemic triazine herbicide used for control of germinating annual grasses and broad-leaved weeds around a range of crops; also used as an algicide. Classified by WHO as unlikely to present acute hazard in normal use. Also known as gesatop.

Simmering  Heating of foods in a liquid, such as water, at a temperature that causes the liquid to bubble gently.

Simmondsin  Cyanide-containing glycosides found in defatted jojoba meal, a by-product of the manufacture of jojoba oils. Inhibits food intake in animals through satiation. May have potential for use in foods as an appetite suppressant.

Simplesse  Trade name for multifunctional dairy ingredients derived from whey protein concentrates that have undergone microparticulation. Marketed by CP Kelco. Used in a wide range of full fat and low fat foods for texture enhancement, provision of creaminess, stabilization of emulsions, thermal stability, moisture control and stabilization of foams. Product applications include dairy products, condiments, margarines and sauces.

Simulated foods  Processed foods that are modified to simulate another kind of food, e.g. by using textured vegetable proteins and flavourings, to mimic texture and sensory properties of the target food. Some of the most popular simulated foods are meat substitutes (e.g. for use in vegetarian foods), butter substitutes and imitation cream. Also known as imitation foods, analogues or artificial foods.

Simultaneous distillation-extraction  One of various analytical techniques used for sample preparation in food composition analyses, and of particular application with GC for the analysis of volatile compounds including flavour compounds and aroma compounds. Involves simultaneous heating of sample (after addition of water if a dry product) and organic solvent which are held in different vessels. The water and organic solvent vapours generated collect and are condensed together in the same condenser unit.
Extraction of analytes from the water vapour to the organic solvent occurs on condensation.

**Simultaneous saccharification and fermentation** Process which involves enzymic saccharification of celluloseous biomass and simultaneous microbial fermentation of the resulting glucose, e.g. to ethanol. Advantages over the traditional two-stage process include the ability to use lower temperatures, thus reducing operating costs. Although these processes can be performed by mixed cultures of an appropriate enzyme-producing microorganism and a fermentative microorganism, recent research has focused on genetic engineering of strains to enable the direct fermentation of cellulosates.

**Sinapic acid** Organic acid which is the major phenolic compound found in rapeseeds. Structural changes in sinapic acid have been associated with the darkening of rapeseed meal following extraction of rapeseed oils, and its presence limits the usefulness of rapeseed meal as a food source.

**Sinapine** An antinutritional ester with a hot, bitter taste found in the seeds of all Brassica spp. Elimination of sinapine from these seeds increases their potential as food sources.

**Single cell proteins** Protein-rich biomass produced by large-scale microbial fermentation using a variety of substrates, such as petroleum fractions or carbohydrates. Used as a source of proteins for use in foods and animal feeds. There is potential for future commercial exploitation of these proteins with advances in fermentation technology.

**Single cream** Cream with a fat content of approximately 18%.

**Single market** An association of countries trading with each other without restrictions or tariffs.

**Sinigrin** Antinutritional glucosinolate with a bitter taste found in Brassica spp.

**Sitao** Alternative term for asparagus beans.

**Site directed mutagenesis** In vitro mutagenesis at a specific site in a DNA molecule. Various methods can be used, e.g. oligonucleotides containing the mutated base sequence are annealed with single-stranded target DNA molecules, usually in plasmids, and used as primers for DNA synthesis; the molecules can then be introduced into host cells where subsequent DNA replication segregates the mutant and non-mutant strands.

**Sitophilus** Species of weevils of the family Curculionidae, which are pests of crops and stored grain and cereals. Include the grain weevil (Sitophilus granarius), the maize weevil (S. zeamais) and the rice weevil (S. oryzae).

**Skim milk** Milk from which virtually all the fat has been removed (fat content is less than 0.5%). Preferred to whole milk or semi skimmed milk by some health-conscious consumers and used by processors to make low fat dairy products. Almost total removal of fat means that skim milk differs greatly from whole milk in mouthfeel and also in appearance, having a bluish tinge.

**Skim milk powders** Products prepared by drying skim milk to a low moisture content, giving powders

**Sitophilus zeamais** Species of insect pests of the family Curculionidae, commonly known as maize weevils. Infest stored grains and cereal products, particularly corn.

**Sitostanol** Phytostanol occurring widely in plants. Can lower levels of total and low density lipoprotein cholesterol in blood by inhibiting absorption of cholesterol from the intestine. Used in the form of an ester in production of functional foods, such as spreads, food bars and yoghurt, which may have a cholesterol lowering action.

**Sitosterol** One of the phytosterols found commonly in plants and vegetable oils, and in certain algae. Has been shown to reduce the levels of total cholesterol and low density lipoprotein cholesterol in serum. Exist in α-, β- and γ- isomers.

**Size exclusion chromatography** Type of chromatography used for molecular weight analysis of polymers, including biopolymers, or separation of a mixture of polymers in solution on the basis of their hydrodynamic volume, one of the physical properties of a molecule influenced by the nature of the solvent and the molecular weight of the molecule. The stationary phase comprises an inert (non-adsorbing) porous matrix, e.g. cross-linked polystyrene beads. When the stationary phase is a gel, e.g. Sephadex®, the technique is known as gel filtration or gel permeation chromatography.

**Skate** General name for a number of flattened marine fish species in the order Rajiformes; worldwide distribution. Generally used synonymously with ray. Commercially important species include Raja binoculata (big skate), R. oxyrinchus (longnose skate) and R. immigrina (smooth skate). Marketed fresh, frozen, smoked and salted; fins are also consumed.

**Skatole** Biogenic amine which contributes to the development of taints in meat, particularly pork. It is produced by bacteria in the intestines of swine, then absorbed into the blood. Accumulation in fats leads to boar taint. Levels of skatole in swine may be reduced by castration, which improves metabolism of the compound, or by modification of the diet.

**Skimmed milk** Alternative term for skim milk.

**Skim milk** Milk from which virtually all the fat has been removed (fat content is less than 0.5%). Preferred to whole milk or semi skimmed milk by some health-conscious consumers and used by processors to make low fat dairy products. Almost total removal of fat means that skim milk differs greatly from whole milk in mouthfeel and also in appearance, having a bluish tinge.

**Skim milk powders** Products prepared by drying skim milk to a low moisture content, giving powders
with a long **shelf life**. Also called **dried skim milk** and non-fat dried milk.

**Skin** The outermost covering of the body, which consists of a thin outer layer, the epidermis, and a thicker inner layer, the dermis. Large quantities of gelatin are produced from **swine skin**. **Chicken skin** also has food uses, particularly in poultry products, such as **sausages**. Cattle skins (hides), are by-products of cattle processing, and are generally tanned to produce leather.

**Skinning** Removal of the **skin** from foods such as **poultry** and **fish** before or after cooking.

**Skin prick testing** One of several clinical techniques that can be used for the diagnosis of **allergies**, such as those to foods, **pollen**, animal dander and **mites**. Drops of fluid containing the suspected **allergens** are placed on the skin, and the skin beneath each drop is pricked with a needle. A positive reaction is identified when the skin around an allergen becomes red and itchy and a white swelling (a weal) develops.

**Skin spot** Disorder in **potatoes** caused by infection with the fungus **Oospora pustulans** (syn. **Polyscytalum pustulans**). Infection occurs in the soil and spreads during storage, particularly at low temperatures. Causes dark spots on the skin that become purple-black when wet.

**Skipjack tuna** Marine **fish** species (**Katsuwonus pelamis**) which forms the largest part of the world **tuna** catch by volume; widely distributed across the Atlantic and Pacific Oceans. Mainly marketed as a canned product, but also sold fresh, frozen, dried, salted and as a semi-preserved product.

**Skyr** Icelandic **fermented milk** similar to thick **yoghurt**. Served as a dessert with **cream** and **sugar** or **fruits**.

**Slaughter** The killing of animals and **poultry** for food. In developed and some developing countries, slaughter of animals for **meat** takes place under closely regulated conditions in **slaughterhouses**. Legislation often dictates that food animals should be slaughtered without undue stress and suffering, and that bleeding should be as complete as possible; effective **stunning** is of primary importance in achieving these aims. Both Judaism and Islam prescribe a ritual protocol for the slaughter of animals for human consumption; stunning is not used in kosher or halal slaughter.

**Slaughter by-products** Alternative term for **offal**.

**Slaughterhouses** Places where the **slaughter** of animals takes place in a hygienic fashion, and where **carcasses** are prepared for retail to consumers. The term includes **abattoirs** and **butchers**. Usually, carcasses are examined at slaughterhouses by qualified inspectors and only those carcasses that are free from disease are allowed to leave the premises for retail to consumers.

**Slendid** Trade name for a range of proprietary speciality **pectins** (either low ester or high ester pectins) derived from **citrus peel** and marketed by CP Kelco. Used as **fat substitutes** in a wide range of food applications (**low fat foods**), including **spreads**, **mayonnaise**, **salad dressings**, **meat products**, **ice cream**, **bakery products** and **dresses**, where they impart a smooth, creamy **mouthfeel**.

**Slicing** Cutting of thin pieces or slices of food from a larger portion using a sharp implement.

**Slime bacteria** Common term for **bacteria** which produce slimy **exopolysaccharides**. Includes species of **Xanthomonas**, **Leuconostoc**, **Alcaligenes**, **Enterobacter**, **Lactococcus** and **Lactobacillus**. Slime produced may be responsible for characteristic **texture** and **viscosity** of **fermented milk**. May lead to severe quality problems during the storage and processing of certain foods and beverages.

**Slivovitz Spirits** made by **distillation** of fermented **mashes** based on **plums**. Manufactured mainly in Serbia, Bosnia and adjacent countries.

**Sloes** Common name for the wild plum produced by **Prunus spinosa** (also called blackthorn). Too acid for use as a dessert, but commonly used to make **beverages** such as sloe **wines** and sloe **gin**.

**Slow cooking** A method of **cooking** that involves **heating** foods gently for a period of several hours in the presence of liquid with a high water content. A temperature of between 80 and 90°C is typically used and the liquid ensures that efficient **heat transfer** to the food takes place. A non-hermetic lid prevents **pressure** from building within the cooking vessel and retains **water vapour** so that the temperature of the contents is kept constant. Often used for the **tenderization** of tough **meat** cuts having a high content of **connective tissues**.

**Sludges** Usually thick, soft, wet mud or similar viscous mixtures, or alternatively any undesirable solids settled out from a treatment process.

**Slugs** Common name for gastropod **molluscs** of the family **Limacidae**, which have long fleshy bodies and in which the shell is either vestigial or absent. Occur in damp terrestrial habitats worldwide. Some are plant-eating **pests**.

**Small round structured viruses** **Viruses** within the **Caliciviridae** family of **viruses** (e.g. **Norwalk viruses**) which have well-defined surface structures. Responsible for viral **gastroenteritis** transmitted by the faecal-oral route via contaminated foods (e.g. **shellfish**) or water.
Small round viruses

Small round viruses are viruses with smooth edges and no discernible surface structures. Responsible for viral gastroenteritis transmitted by the faecal-oral route via contaminated foods (e.g. shellfish) or water.

Smear cheese
Cheese in which the rind is washed at intervals with water or brines to inhibit the growth of unwanted yeasts and fungi.

Smell
Alternative term for Smen with smooth edges.

Small round viruses
Small round viruses are viruses that infect animals and humans and are responsible for a range of diseases, including gastroenteritis.

Smetana
Sour cream product popular in Eastern Europe. Used as a drink or as toppings for many dishes. Also known as smatana.

Smoke
Smoke concentrates which have been smoked mackerel, mackerel, or fish fillets are smoked at high or low temperature, sometimes after brining, using smoke produced from various types of wood. The kind of wood used affects the flavour and colour of the product. Cold smoking is usually performed at a temperature not exceeding 30°C. Hot smoking is carried out at a temperature sufficient to cause thermal denaturation of the proteins, usually between 50 and 80°C. Common types of smoked fish include smoked salmon, smoked trout, smoked mackerel, smoked eels, smoked haddock and kippers. Some types are mainly eaten cold, while others, especially smoked haddock and kippers, are usually eaten hot.

Smoked fish
Fish which has been processed by smoking. Whole gutted or un gutted fish or fish fillets are smoked at high or low temperature, sometimes after brining, using smoke produced from various types of wood. The kind of wood used affects the flavour and colour of the product. Cold smoking is usually performed at a temperature not exceeding 30°C. Hot smoking is carried out at a temperature sufficient to cause thermal denaturation of the proteins, usually between 50 and 80°C. Common types of smoked fish include smoked salmon, smoked trout, smoked mackerel, smoked eels, smoked haddock and kippers. Some types are mainly eaten cold, while others, especially smoked haddock and kippers, are usually eaten hot.

Smoked foods
Foods preserved and flavoured by treating with smoke, e.g. kippers, yellow fish and smoked meats. In traditional methods, foods are placed directly in the smoke. Other methods use smoke flavourings or liquid smoke, which are applied to the food. Sensory properties of smoked foods are affected by the type of smoke and smoking method used.

Smoked mackerel
Mackerel which has been cooked by smoking. Fish can be smoked whole and gutted, or as fillets, by hot smoking at a temperature between 50 and 80°C or cold smoking at up to 30°C. Usually eaten cold in salads or made into pates.

Smoked salmon
Salmon which has been smoked by one of two methods, i.e. hot smoking or cold smoking. In hot smoking, the process is conducted at a high temperature (50-80°C) and lasts 6-12 hours, the time depending mainly on the size of the fish and strength of flavour desired. Cold smoking is performed at a much lower temperature (up to 30°C) and may take several weeks to complete. Smoked salmon is usually eaten thinly sliced and cold, often in salads and sandwiches, although it can be used as an ingredient in many dishes, hot or cold.

Smoked trout
Trout which has been cooked by smoking. The fish are most commonly hot smoked, whole or filleted, at a temperature of 50 to 80°C. Can be eaten cold in salads, made into pates and mousses, or used as an ingredient of soups and other hot or cold dishes.

Smoke flavourings
Flavourings produced by contact of a liquid, usually water or oils, with smoke produced by burning of wood, e.g. hickory, oak or maple.

Smokehouses
Sheds or rooms where smoking of foods, such as fish or meat, is performed.

Smoking
Curing or preservation, especially of meat or fish, by exposure to smoke produced by the burning of certain types of wood, such as hickory, maple or ash. Foods can be cold smoked or hot smoked. Hot smoking partially or totally cooks foods.

Smoothies
Thick and smooth textured beverages made by blending fruits with yoghurt, milk, ice, ice cream or frozen yoghurt.

Smoothness
Sensory properties relating to the extent to which a product has a smooth consistency, i.e. is perceived to be uniform and regular.

Sn
Chemical symbol for tin.

Snack foods
Sweet or savoury foods eaten to provide light sustenance in a quick and convenient format. Eaten between or as an alternative to main meals. Popular types include sandwiches, cereal bars and potato crisps. Also known as snacks.

Snacks
Alternative term for snack foods.

Snail meat
Meat from snails. The edible portion of snails accounts for <50% of live weight. Snail meat provides a valuable source of dietary protein; for example, snail meat from giant African land snails (Achatina achatina and Archachatina marginata) typically has a protein content >70%. Proteins from snail meat include all essential amino acids, but the amino acids tend to be present in lower quantities than in mammal meat; snail meat also contains considerable quantities of other nitrogenous compounds. Biological value of snail proteins is similar to that of soy proteins. Snail meat has a high content of polyunsaturated fatty acids (PUFA).

Snails
A large group of creeping terrestrial and aquatic gastropod molluscs; some are herbivorous whilst...
others are carnivorous. Several species of land snails and marine snails are harvested from the wild or farmed as a source of snail meat.

**Snake fish** Marine fish species (*Trachinocephalus myops*) belonging to the family Synodontidae (lizardfish) and of minor commercial importance. Distributed worldwide in tropical and warm temperate waters.

**Snakehead** Name given to a number of freshwater fish species from the genus *Channa*; occur in lakes and ponds across South East Asia. Have elongated, cylindrical bodies. Some species are utilized as food fish, including *C. micropeltes* (giant snakehead) and *C. striata* (murrel). Flesh tends to be firm and white with very few bones. Marketed fresh, also used to make fish pastes and soups.

**Snakes** Predatory reptiles belonging to the suborder Ophidia; there are many species. Snake meat resembles chicken meat, but is chewier and has many small bones. It forms a part of diets in countries including Cameroon, China and Papua New Guinea. In Korea, snakes are used to produce snake wines, including salmo-sa, dok-sa and nung-sa.

**Snap beans** Type of common beans (*Phaseolus vulgaris*).

**Snapper** Any of a number of marine fish within the family Lutjanidae; widely distributed across the Atlantic and Pacific Oceans. Commercially important species include *Lutjanus campechanus* (red snapper), *L. analis* (mutton snapper), *Apsilus dentatus* (black snapper) and *Ocyurus chrysurus* (yellowtail snapper). Flesh tends to be lean and firm. Normally marketed fresh.

**Snezhok** Trade name for Russian fermented milk beverages, which are sometimes flavoured with fruit syrups.

**SNF** Abbreviation for solids not fat.

**Snoek** Alternative term for pike, used in the Netherlands.

**Snow crabs** Marine crabs of the genus *Chionoecetes* that occur in cool waters of the north Pacific and northeast Atlantic Oceans. The most important species commercially is *C. opilio* (Atlantic snow crabs). Only male crabs have commercial value. Marketed in a variety of forms, including fresh cooked whole crab, cooked leg meat, canned meat and pastes.

**Snow peas** Type of peas (*Pisum sativum*) in which the entire pod is eaten with the seeds inside. The pods are flat and crisp, while the seeds are small and appear immature. Can be eaten raw or cooked (often stir fried). A common ingredient of Chinese dishes. Also known as mangetout peas.

**SO₂** Chemical symbol for sulfur dioxide.

**Soaking** Process by which an item is made thoroughly wet by immersion in a liquid.

**Soapiness** One of the sensory properties; relating to the extent to which a product tastes soapy.

**Socioeconomic factors** Social and economic characteristics of an individual or population within a social structure, including income, education and occupation. These factors can have a major impact on nutritional status, health and development of various diseases due to differences in health and nutrition knowledge, available resources and diet between socioeconomic groups.

**Socioeconomic groups** Groups of individuals that are categorized according to their social or economic status.

**Sockeye salmon** Pacific salmon species (*Oncorhynchus nerka*) found in coastal waters and rivers along the Pacific coasts of North America and Japan. Flesh is highly prized for flavour and texture. Most of the catch is canned; also marketed as a smoked or salted product. Also known as red salmon.

**Soda bread** Simple type of bread leavened with sodium bicarbonate and acid instead of yeasts. Often enriched with whey or buttermilk.

**Soda water** Water carbonated so that it is effervescent when dispensed.

**Sodium** Soft, silvery, highly reactive alkali metal with the chemical symbol Na, most commonly found in the form of salt (NaCl). An essential nutrient in the diet, albeit in moderate quantities; excess intake may result in high blood pressure (hypertension).

**Sodium acetate** Sodium salt of acetic acid. Anhydrous and trihydrate forms of this salt are both used as food additives. The anhydrous salt is hygroscopic and both forms are highly soluble in water. Uses in foods include as part of pH buffering systems, flavourings and preservatives.

**Sodium ascorbate** Sodium salt of ascorbic acid (vitamin C). In addition to being a source of vitamin C for fortification of foods, this salt has food industry uses in antioxidants and preservatives. It is also used in curing of meat.

**Sodium bicarbonate** Monosodium salt of carbonic acid prepared by reaction of sodium carbonate with carbon dioxide and water. In aqueous solution, the bicarbonate tends to decompose, releasing CO₂. Due to this property, sodium bicarbonate is used in raising agents for bakery products, as an ingredient of baking powders, and in the manufacture of carbonated beverages. Baking powders contain sodium bicarbonate and tartaric acid, reaction between which increases CO₂ production. Aqueous bicarbonate solutions are slightly alkaline; solution pH increases with agitation, time and increasing temperature due to loss of CO₂ from the solution. This salt is therefore...
Sodium caseinate

also used as an alkali and as part of pH buffering systems in foods. Also known as sodium hydrogen carbonate and baking soda.

Sodium caseinate

Sodium salt of casein. Used in a wide range of foods as a source of protein or to enhance functional properties such as water binding capacity, emulsifying capacity, whitening ability and whipping capacity.

Sodium chloride

Chemical name for salt. Chemical formula is NaCl.

Sodium cyclamate

One of the cyclamates, artificial sweeteners with approximately 30 times the sweetness of saccharin. White crystalline solid, highly soluble in water and stable at baking temperatures. It has a pleasant flavour profile and is often used in combination with aspartame, a molecule that is sweeter than cyclamate, but which produces a bitter aftertaste. Also known as sodium cyclohexylsulfamate and sucaryl sodium.

Sodium diacetate

Compound with GRAS status for use as one of the food preservatives, e.g. as an antifungal agent in bakery products and as an inhibitor of Listeria monocytogenes in meat and sea foods. In solution it converts to sodium acetate and acetic acid, leading to applications as flavour enhancers in various products, including snack foods, sauces, coatings and ketchups. Also known as imitation dry vinegar.

Sodium hydroxide

Highly caustic alkali, chemical formula NaOH.

Sodium lactate

Sodium salt of lactic acid. Hydroscopic, soluble in water and alcohol and odourless, but with a slightly salty flavour. Used in additives including preservatives, emulsifiers, flavour enhancers, humectants, and as part of pH buffering systems. Also known as 2-hydroxypropanoic acid mono-sodium salt and lacolin.

Sodium metabisulphite

Disodium salt of disulfurous acid that forms acidic aqueous solutions. Used predominately in preservatives, but also in antioxidants, flavourings and bleaching agents. Also called (di)sodium pyrosulfite.

Sodium metabisulphite

Alternative spelling of sodium metabisulfite.

Sodium pyrosulfite

Alternative term for sodium metabisulfite.

Sodium tripolyphosphate

Phosphate often used to improve the physicochemical properties, and increase the quality and shelf life of meat products.

Soft cheese

Cheese with a creamy, smooth texture made from milk with a relatively low dry matter content and range of fat contents, skim milk soft cheese having a butterfat content of <2% and full-fat soft cheese containing at least 20% butterfat. Can be ripened, e.g. Camembert cheese, or unripened (fresh), e.g. cottage cheese, cream cheese, fromage frais, quarg.

Soft drinks

Non-alcoholic beverages, commonly carbonated beverages, often with fruit or cola flavours.

Softeners

Additives that increase softness of foods. Examples include glycerides, which are added to bakery products as crumb softeners and to chewing gums to improve texture. Also used to describe chelating agents that remove ions, e.g. calcium or magnesium ions, from water.

Softening

Process whereby products such as fruits and vegetables lose their rigidity and firmness, often during ripening or ageing.

Soft frozen beverages

Frozen beverages which are served in a partially frozen or slush state.

Softness

One of the sensory properties; relating to the extent to which a product is firm in texture.

Soft pet foods

Soft-moist pet foods, usually with a moisture content of 30 to 35%. Texture closer to that of meat than that of dried pet foods. Cats and dogs often find them more palatable than dried pet foods. Usually packaged in air-tight pouches for storage at ambient temperature. May contain preservatives and other pet food additives, such as humectants.

Soils

Earth in which plants are grown. Growth rates of plants, and yield and quality of their produce, including fruits and vegetables, are influenced by the composition of the soils in which they are grown.

Solanine

Alkaloid present in the sprouts and skin of green potatoes (potatoes exposed to light). Formed by hydrolysis of solanine. Toxic to humans and not destroyed by cooking.

Solanium

Alkaloid present in all green parts of the potato plant, including potatoes that have been exposed to light. Inhibitor of cholinesterases. Poisoning causes gastrointestinal and neurological disorders. Solanine is not destroyed by cooking.

Solanium

Genus of plants which includes many species that produce commercially important fruits. These include aubergines, potatoes, naranjilla and pepino.

Solar dryers

Equipment used to carry out solar drying, a process that depends on the sun as the source of energy. There are two types of solar dryers: direct and indirect. In direct solar dryers, air is heated in the drying chamber, which acts as both the solar collector and the drier. An indirect drier comprises two parts: a solar collector and a separate drying chamber.
Solar drying  **Drying** method that depends on the sun as the source of energy, but which also involves the use of some sort of structure to collect and enhance the solar heat. Solar drying generates higher air temperatures and lower humidities than those produced by sun drying, resulting in faster product drying rates and lower final moisture contents.

**Solar energy** Radiant energy emitted by the sun that is captured and used during solar drying processes or converted into electrical energy.

**Solar radiation** Radiation emitted by the sun, made up of an extensive range of wavelengths of the spectrum.

**Sole** Any of a number of marine and estuarine flatfish species in the family Soleidae; worldwide distribution. Tend to have lean white or off-white flesh with fine texture and mild flavour. Commercially important species include *Solea solea* (common sole), *Buglossidium luteum* (yellow sole) and *Microchirus variegatus* (eyed sole). Marketed fresh and frozen.

**Solidification** Process by which an item becomes hard or solid; for example by freezing, cooling, drying or crystallization.

**Solid phase extraction** Extraction technique for preparation of samples prior to analysis, developed as an alternative to liquid-liquid extraction. Samples are dissolved in solvent and passed through a bed of adsorbent to effect separation of components of interest. Compounds are eluted with small volumes of solvent.

**Solid phase microextraction** Type of solid phase extraction in which samples are adsorbed onto a fused silica fibre coated with a stationary phase. The fibre is then inserted into a GC injector, where the sample is desorbed and analysed.

**Solids** Particles whose shape and volume are fixed and are not affected by the space available to them, and which have a tendency to resist forces that would alter their shape.

**Solids not fat** The solids content of milk excluding the fats content, i.e. the contents of proteins, lactose and salts. Used as an index of milk quality. Commonly abbreviated to SNF. Milk contains on average 8.6% SNF.

**Solid state fermentation** Fermentation of microorganisms on a solid support of low moisture content under non-septic conditions. Energy requirements are low but the process can yield high product concentrations. In addition, downstream processing is facilitated. A variety of agricultural residues (e.g. wheat straw, rice hulls and corn cobs) have been used as supports for production of enzymes and secondary metabolites.

**Solubility** Extent to which one substance dissolves in another. Normal solubility records the maximum mass of a solid that can be dissolved in a specified mass of water to form a saturated solution, and is measured in kilograms per metre cubed. When solubility is exceeded, excess solid appears as a precipitate. Solubility is temperature-dependent. Generally, for a solid in a liquid, solubility increases with temperature; for a gas, solubility decreases with temperature.

**Solubilization** Process by which a substance is made soluble or more soluble, especially in water.

**Soluble fibre** A water soluble dietary fibre fermented in the first part of the large bowel. Slows down the digestion of carbohydrates, resulting in better glucose metabolism. Found in varying quantities in all plant foods, including fruits, vegetables, legumes and cereals. Can help lower LDL cholesterol levels in the blood, so lowering the risk of coronary heart diseases.

**Soluble solids** Particles that can be dissolved in fluids, especially water.

**Solvents** Liquids or gases that dissolve other substances to form solutions. Polar solvents (e.g. water and liquid ammonia) dissolve ionic compounds or covalent compounds that ionize. Nonpolar solvents (e.g. ethoxyethane and benzene) do not dissolve ionic compounds, but will dissolve nonpolar covalent compounds. Solvents used commonly within the food industry include carbon dioxide, hexane, water and ethanol.

**Somatic cells** Animal cells that are not involved in reproduction. In milk, most of the somatic cells are white blood cells (leukocytes) that cross into milk from the bloodstream to destroy bacteria. The level of somatic cells in milk is an indicator of udder health, increasing in cases of infection, e.g. mastitis.

**Somatic cells counts** Microbiological techniques estimating the numbers of somatic cells in given samples. Used as an indicator of the quality of milk.

**Somatotrophin** Alternative term for somatotropin.

**Somatotropin** Alternative term for growth hormone, a substance produced by the anterior lobe of the pituitary gland which stimulates the synthesis of proteins, mobilizes reserves of fats and increases blood glucose levels. Recombinant bovine somatotropin may be administered to cattle to modify milk production, growth rate, or composition of cattle carcasses or beef. This application is permitted in some countries but prohibited in others due to concerns about the safety of food products.
Somen Thin, white Japanese noodles made from wheat flour and sometimes egg yolks. Often served chilled, as well as in soups.

Sonication Process of disrupting biological materials such as bacteria, plants or foods using high-frequency sound waves. Used widely in preparation and extraction of samples prior to analysis.

Sorbates Salts of sorbic acid. Sorbates, including sodium, potassium and calcium sorbates, are used as preservatives for foods, particularly cheese, and beverages, including wines.

Sobrestin Thermally stable preparation formed from fatty acid esters of sorbitol and sorbitol anhydrides. Used as a substitute for vegetable oils in applications such as frying oils, salad dressings and mayonnaise.

Sorbet Water ices made from water, sugar and sometimes eggs, flavoured with fruit purées or fruit juices and sometimes alcoholic beverages (e.g. champagne). Frequently served between courses of meals to act as a refresher.

Sorbic acid Organic acid, solutions of which exhibit antimicrobial activity. The free acid and its salts (sorbates) are used as food preservatives. Sorbic acid also has uses in acidulants and flavourings. Systematic name is 2,4-hexadienoic acid.

Sorbitan Emulsifier formed via cyclization of sorbitol. Many sorbitan-based food emulsifiers are available commercially. Most are sorbitan esters of fatty acids, such as sorbitan oleate and sorbitan stearate.

Sorbitol Sugar alcohol (polyol) produced by reduction of glucose or fructose. Occurs naturally and has approximately 0.5× the sweetness of sucrose. Digestion of sorbitol yields fructose, making it suitable for use as a sweetener for diabetic foods. Also known as glucitol.

Sorbitol dehydrogenases Alternative term for L-iditol 2-dehydrogenases.

Sorbose Monosaccharide of 6 C atoms (hexoses) that is also one of the ketoses. L-Sorbose is an intermediate in the synthesis of ascorbic acid.

Sorghum grain produced by cereal plants belonging to the species Sorghum vulgare and S. bicolor. Seeds are dark brown/red or white/yellow. Dark seeds have a high content of tannins, which decrease palatability and protein digestibility. White/yellow seeds are thus preferred for food applications, which include porridges, bread and beer. Also a source of starch and syrups.

Sorghum beer Beer brewed with sorghum as the main source of fermentable carbohydrates. Most sorghum beers are traditional African beer types, but conventional Western-style beer may be brewed with sorghum.

Sorghum flour A type of flour produced by milling or grinding of sorghum grains. After hull removal, the remaining fraction, containing endosperm and germ, is ground to produce flours of various particle sizes. Does not contain gluten and consequently is not suitable for making yeast bread. Can be substituted for wheat flour in a variety of bakery products. Used in India to make chapattis. Nutrionally similar to corn flour but has a higher concentration of protein.

Sorghum malt Malt prepared from red sorghum varieties, which has high diastatic activity. Usually rich in α-amylases. Used in brewing, weaning foods and breakfast cereals.

Sorghum starch A type of starch produced from sorghum by a wet milling process similar to that used for corn starch. Digestibility can be increased by processing the grain by methods such as steaming, flaking, puffing or micronization.

Sorgo Synonym for the sugar crop, sweet sorghum.

Sorption A term that encompasses the various processes by which one substance binds to another, especially the processes of absorption and adsorption.

Sorrel Common name for Rumex acetosa, the leaves of which are used as vegetables and spices in soups, salads and sauces. Sorrel has a sharp, astringent flavour, similar to that of rhubarb, due to a high content of oxalic acid.

Sorting Systematic arrangement of items in groups or grades.

Sotolon One of the furanones, and one of the major aroma compounds in maple syrups, molasses, brown sugar and old port wine. Also found in several other foods, including fenugreek, celery, honeys and citrus essential oils. Levels increase in wines during ageing. Used in flavourings for imparting caramel and maple syrup notes. Can pass through the body unchanged and can impart a maple syrup aroma to urine and sweat if consumed in large quantities.

Soudjouk Spicy fermented sausages popular in Turkey. Ingredients include beef mince, tallow, seasonings and spices. Eaten cooked or uncooked. Many alternative spellings, including soujouk, soudjut and soudjouck.

Souffles Light spongy egg products which may be flavoured with sweet or savoury ingredients such as jams or cheese. Usually made by incorporating beaten egg whites into sauces containing egg yolks, flavourings, flour and butter, and cooking the mixture.
Soup mixes  Mixes, usually powdered, that are recombined, typically with water, to form soups.

Soups  Liquid foods typically made from stocks to which are added various vegetables and sometimes cereals, pasta, meat or fish. The term covers many types of product, including: clear, e.g. consommés; creamy, with all ingredients liquidized and often with cream added, e.g. cream of chicken; or thick, with chunks of ingredients floating in the clear liquid base, e.g. broths. Soups are generally eaten hot, but some types, e.g. vichyssoise, are usually consumed chilled. Other popular types include borsch, bouillabaisse and minestrone. Some types are also available as soup mixes or instant soups.

Sour cherries  Cherries produced by Prunus cerasus. Suitable for cooking, they are commonly incorporated into pies and jams. Also used in manufacture of fruit juices and liqueurs such as kirsch. Available canned, frozen and dried. Include morello cherries and amarelle cherries.

Sour cream  Commercial product made by fermentation of homogenized pasteurized cream with lactic acid bacteria. Used in cooking and as a component of dips. Also known as soured cream and ripened cream.

Sourdough  Dough which has either been fermented by microorganisms naturally present in flour and/or other ingredients, or by added microbial cultures, e.g. lactic acid bacteria. Fermentation of the dough produces organic acids, which impart a desirable sour flavour to the dough. Used to make sourdough bread.

Sourdough bread  Bread prepared from sourdough, a dough containing a symbiotic culture of lactobacilli and yeasts used to leaven and flavour the bread. The sour flavour is mainly due to the presence of lactic acid and acetic acid which are produced by the lactobacilli. Pumpernickel is a type of sourdough bread from Germany.

Sour milk  Milk that has become rancid due to breakdown of fats or a fermented milk. The latter is produced by fermentation of milk (of various species) by lactic acid bacteria (starters). During fermentation, lactose is converted into lactic acid, aroma compounds are formed and milk proteins are partly decomposed to peptides and free amino acids, improving digestibility of the milk.

Sourness  One of the sensory properties; relating to the extent to which a product tastes sour, i.e. tart, bitter or sharp.

Soursop  Fruits produced by Annona muricata. Closely related to sugar apples and custard apples. The white flesh is embedded with black seeds and has a flavour reminiscent of pineapples and mangoes. Pulp is used in making beverages, such as fruit juices, and products such as sherbet and custards. Also known as guanabana.

Sous vide  Food processing and packaging technique in which fresh ingredients are combined into specific dishes or meals, vacuum packaged in individual portion pouches, cooked under vacuum and then chilled.

Sous vide foods  Vacuum-sealed pouches of chilled foods preserved by the sous vide process. Foods preserved in this manner undergo minimal heat processing and thus have improved shelf life compared with non-vacuum cook chill methods. Improved eating quality benefits have also been reported. Foods commonly processed in this way include fruits in syrups and some meals used in catering.

Sous vide meals  Individual meal portions preserved in vacuum-sealed pouches by the sous vide process.

Southern blotting  Method for detecting specific DNA fragments. DNA is digested with restriction endonucleases, separated by gel electrophoresis, denatured and transferred to a chemically reactive matrix (e.g. nitrocellulose or nylon), on which the DNA fragments bind covalently in a pattern identical to that on the original gel. After blotting, target molecules are detected through the use of labelled complementary single-stranded DNA or RNA molecules.

Southern peas  Type of cowpeas (Vigna unguiculata).

Sovetskii cheese  Hard cheese manufactured in the Altai region of the former USSR.

Sowing  Scattering of plant seeds on or in soils. Sowing date and rate can affect subsequent plant growth, as well as yield and quality of produce.

Sows  Adult female swine that have produced their first litter of piglets.

Soybeans  Alternative term for soybeans.

Soybean lecithins  Alternative term for soy lecithins.

Soybean oils  Oils extracted from seeds of Glycine max (soybeans). Contain palmitic acid, oleic acid, linoleic acid and linolenic acid. Used as salad oils or cooking oils, as well as in margarines and shortenings. By-products obtained during processing include lecithins, tocopherols and phytosterols. Also known as soy oils.

Soybeans  Seeds produced by the legume Glycine max. Rich in high quality soy proteins, unsaturated soybean oils, B vitamins and minerals. Eaten whole or split, or germinated to produce bean sprouts. Numerous soy products are made from the seeds, including soymilk, cheese-like products...
Soybean sprouts and meat substitutes (soy meal, soy protein concentrates, soy protein isolates). Soybean plants tolerant of specific herbicides were the first genetically modified crops to be produced on a large scale.

Soybean sprouts Legume sprouts produced by germination of soybeans. Rich in proteins, vitamins and minerals. Widely used in Asian dishes such as egg rolls and stir-fried meals. Also used in soups, casseroles, sauces, bakery products, and raw in salads. Dried sprouts can be eaten as snack foods or used as a substitute for nuts in bakery products or dishes.

Soy beverages Beverages derived predominantly from soybeans or their products. Include soymilk.

Soy cheese Creamy product made from soymilk. Used as a replacement for cheese or sour cream.

Soy curd Product made from soymilk, by coagulation, draining and pressing in a manner similar to that used in cheesemaking. Rich in protein. Available packed in water, vacuum packaged or frozen. Used in a variety of dishes, including soups, casseroles and sauces. Also called tofu.

Soy flour Alternative term for soy meal.

Soy globulins The major storage proteins of soybeans. Made up of four protein fractions, classified according to their sedimentation properties. The 2S, 7S, 11S and 15S fractions comprise 8, 35, 52 and 5% of the total protein content, respectively. The principal proteins, glycinein (11S) and β-conglycinin (7S), display differing physicochemical properties. Nutritional, physicochemical and functional properties of these proteins can be modified by physical, chemical and enzymic treatments, including heating, pH adjustment, hydrolysis and covalent attachment of other constituents. Glycinin and β-conglycinin have been identified as allergens. However, there is increasing evidence that consumption of soy proteins lowers blood cholesterol levels and may provide other cardiovascular benefits.

Soy glycinin One of the main soy proteins. An 11S storage protein that, along with β-conglycinin (7S globulin), makes up approximately 70% of storage proteins in soybeans.

Soy ice cream Frozen dessert made from soymilk and used as a substitute for conventional ice cream.

Soy infant formulas Products made by mixing soy protein isolates with fats and carbohydrates to give a composition similar to that of human milk. Used mainly to feed infants who are allergic to cow milk or suffer from lactose intolerance.

Soy lecithins Lecithins extracted from soybeans and used as emulsifiers in foods. Also called soy lecithins.

Soy meal Flour made by grinding roasted, dehulled soybeans. Full fat soy meal is made from soybeans that still contain oil. Defatted soy meal is made using soybeans from which soybean oils have been extracted. Good source of soy proteins, iron, calcium, B vitamins and fibre. Used in baking and in thickeners for sauces.

Soy milk Product prepared by cooking dehulled, ground soybeans in water and filtering of the solid matter (okara). Rich in B vitamins, protein and iron. Used similarly to milk as a beverage, as the basis of soy products such as soy yoghurt, soy ice cream and soy cheese, and in cooking and baking. Available in regular, low-fat and flavoured forms or as a powder.

Soy oils Alternative term for soybean oils.

Soy pastes Fermented products prepared from cooked soybeans. Include Japanese miso and Korean doenjang. Used mainly as seasonings.

Soy products Foods made using soybeans as the main ingredient. Many traditional Asian dishes include fermented soy products such as natto, miso or tofu. Soy products are also used as substitutes for meat or dairy products.

Soy protein concentrates Protein concentrates made by extracting sugars from defatted soy flakes, leaving proteins and fibre. Used to make meat substitutes and in a variety of products, such as cereal products, bakery products, beverages and gravy.

Soy proteins Storage proteins found in soybeans. Nutritional and health-promoting properties, combined with functional properties make them useful and widely-used ingredients in food processing.

Soy purees Preparations made by mashing or blending cooked soybeans. Used in infant foods and beverages.

Soy sauces Sauces produced by fermentation of a soybean mash prepared by grinding soybeans with water. A fungus, often Aspergillus oryzae, is added to the soybean mash to initiate fermentation. Duration of the fermentation process and addition of other ingredients influences sensory properties of the sauces. Soy sauces fermented for a shorter period have a less rich flavour than those fermented for a longer period. Addition of molasses produces richer, darker soy sauces, while inclusion of wheat in the fermentation produces lighter products.

Soy 11S globulins One of the two major types of soy proteins (the other group are the 7S globulins)
that make up approximately 70% of the total storage proteins in soybeans.

**Soy 7S globulins** One of the two major types of soy proteins (the other group are the 11S globulins) that together make up approximately 70% of the total storage proteins in soybeans. Trimeric glycoproteins comprising α, α' and β subunits, which together form conglycinin. Responsible for softness and adhesion properties of soy products.

**Soy yoghurt** Creamy product made from soymilk. Used as a substitute for cream cheese or sour cream.

**Space flight foods** Meals designed for consumption in the confined microgravity environment encountered on space flight programmes. Originally bite-sized cubes or squeezed from a tube, space flight foods have now evolved into more appetizing meals that can incorporate frozen, refrigerated and ambient foods. A typical meal tray could include a foil beverage pouch, and individual servings of lightweight easily rehydrated foods, intermediate moisture foods and thermostabilized, aseptic fill, natural form foods. Early research into providing assurance against microbial contamination in space led to development of the HACCP concept.

**Spaghetti** in the form of long strands approximately 2 mm in diameter.

**Spanish mackerel** Alternative term for chub mackerel.

**Sparkling winemaking** Processes involved in manufacture of sparkling wines such as cavas and champagne.

**Sparkling wines** Wines which contain sufficient dissolved carbon dioxide to result in effervescence when the bottle is opened. The high carbon dioxide content may be achieved by secondary fermentation (in the bottle or in a tank) or by carbonation.

**Spearmint** Common name for Mentha spicata, the leaves of which are used as spices. Has a sweet, minty (fresh and cool) flavour due predominantly to the flavour compound 1-carvone. Essential oils distilled from spearmint are also used as flavourings, particularly for chewing gums.

**Species identification** Recognition of the animal source of products containing meat, fish or milk. Used to detect adulteration or establish authenticity. Methods used to identify the species of origin include electrophoresis, isoelectric focusing and genetic techniques. Can also refer to determination of microbial and plant species.

**Specific conductivity** Electrical conductivity values that have been normalized to 25°C. Electrical conductivity is the measure of the ability of a substance (solid or liquid) to transport an electric charge. Conductivity values change substantially as temperature changes. This can affect attempts to compare conductivity values across different samples or seasons, particularly with respect to water analysis. Use of specific conductivity eliminates this complication. Specific conductivity is the reciprocal of the specific resistance of the sample measured between two electrodes 1 cm² in area and spaced 1 cm apart. The resistance is corrected to the resistance at 25°C. Units are μSiemens per centimetre.

**Specific gravity** Ratio of the density to the density of a reference material. For a liquid or solid, specific gravity is the ratio of its density (usually at 20°C) to the density of water (at its temperature of maximum density (4°C)). Synonymous with relative density. Abbreviated to sp. gr.

**Specific heat** Heat capacity of a substance per unit mass. The amount of energy required to raise the temperature of unit mass of an object by a unit increment in temperature (measured in Joules per Kelvin per kilogram).

**Spectinomycin** Broad-spectrum aminocyclitol antibiotic produced by Streptomyces spectabilis. Used in the treatment of a variety of enteric, respiratory and other infections in farm animals. Exhibits low toxicity and is normally excreted rapidly from animal tissues. Also known as actinospectacin.

**Spectra** Pattern of properties arranged in order of increasing or decreasing magnitude. In analytical applications, the property measured varies according to the analytical technique being employed. In mass spectrosocopy, a mass spectrum with a range of masses is produced. An emission spectrum represents the range of radiations emitted when a substance is heated, bombarded by electrons or ions, or absorbs photons. An absorption spectrum shows the energies absorbed from a continuous spectrum of radiation by an absorbing medium. Spectra produced by an unknown substance can be compared with those of a standard to give information about the composition of the sample.
Spectrofluorometry  Spectroscopy  technique in which the intensity of fluorescence of a sample is measured as a function of wavelength. A pair of monochromators is used, one of which selects the excitation wavelength and the other the emission wavelength.

Spectrometry  Alternative term for spectroscopy.
Spectrophotometry  Alternative term for spectrophotometry.
Spectrophotometry  Alternative term for spectrofluorometry.
Spectroscopy  Series of techniques in which absorption or emission of radiant energy of various wavelengths is used to measure chemical concentrations or structures. Includes atomic emission, atomic absorption or emission of radiant energy of various wavelengths is used to measure chemical concentrations or structures. Includes atomic emission, atomic absorption, IR spectroscopy and mass spectroscopy.
Spelt  Coarse, hardy type of wheat (Triticum spelta) cultivated predominantly in Europe. Unripe grains are used in soups. Also known as spelt wheat.
Spectrofluorometry  Spectroscopy  Spectrophotometry  Spiny lobsters
Spinal cord tissues  Tissues associated with the part of the central nervous system in vertebrates which is lodged in the vertebral canal and from which spinal nerves emerge. Due to concerns about a possible link between variant Creutzfeldt-Jakob disease (CJD) in humans and bovine spongiform encephalopathy (BSE) in cattle, controls are in place in abattoirs and slaughterhouses to exclude BSE risk materials, such as spinal cord tissues and other central nervous system tissues, from the human food chain. Measures include processing of carcasses without splitting the spine or removal of spinal cord tissues prior to splitting. BSE risk materials are considered a source of BSE prions, consumption of which could potentially result in the development of CJD. In addition, techniques have been developed to screen meat and meat products for the presence of spinal cord tissues.
Spinning  Texturization  process usually applied to protein isolates. For example, biodegradable films can be prepared by spinning soy protein isolates in a coagulating buffer, and wet spinning methods can be used to produce edible protein fibres from a variety of materials, such as soy proteins, casein and blood plasma proteins. The term can also be used to describe the process used in the manufacture of cotton candy. Chocolate can be spun moulded.
Spinosad  Selective insecticide used to control a variety of insects, including fruit flies, thrips, leaf miners and certain beetles in crops, including fruits and vegetables. Effective at low usage rates and of short residual activity. Classified by WHO as unlikely to present acute hazard in normal use.
Spiny lobsters  Alternative term for crawfish; marine lobster species within the genera Palinurus and Panulirus.
**Spiramycin**  Macrolide antibiotic produced by *Streptomyces ambrophaciens*. Used for treatment and control of a number of bacterial and mycoplasmal infections in animals. Distributes widely in tissues following absorption from the gut, but is normally excreted rapidly.

**Spirulina**  Genus of cyanobacteria. Occur in warm saline environments. Some species (e.g. *Spirulina platensis*) are used in the production of single cell proteins.

**Spleens**  A part of edible offal. The spleen is the largest lymphatic organ in the body, and has a sponge-like structure. In animal carcasses, it lies in the upper left abdomen, between the stomach and the diaphragm. Spleens of cattle, sheep and goats have been identified as risk materials in relation to the transmission of prion diseases; consequently, in many countries they are banned from the food chain.

**Splitting**  Breaking forcibly into parts. For example, the cutting of animal carcasses into left and right sides using a saw during processing. Also relates to undesirable processes, such as the damage that can occur to fruits (such as tomatoes, cherries and grapes) when their peel splits upon absorption of excess water, and fruit splitting, a physiological disorder of peel development in citrus fruits. Water stage fruit split is an erratic and complex problem often causing major crop losses to susceptible cultivars of pecan nuts. In the beverage industry, corks placed in wine bottles can be susceptible to splitting. Problems are also associated with premalting (splitting) of malting barley, which is thought to be caused by alternating periods of sunny and rainy weather during ripening of the grain. Egg shells can split during boiling; this results from excess internal pressure in the egg, due to the egg contents having a higher coeff. of thermal expansion than the shell. Canned kidney beans are liable to split during storage, and sausage casings can split during cooking.

**Spoilage**  Deterioration of a food by chemical, physical or microbial means.

**Spoilage bacteria**  Bacteria typically involved in the spoilage of foods.

**Spoilage fungi**  Fungi typically involved in the spoilage of foods.

**Spoilage yeasts**  Yeasts typically involved in the spoilage of foods.

**Spondias**  Genus of tropical plants, some species of which produce good quality fruits, including caja, jocote, ciruela fruit, ambarella and African plums. Fruits are eaten fresh, cooked or dried, and made into jellies or beverages, such as fruit juices. Flower clusters from *Spondias mangifera* are consumed as a vegetable or in salads. Some species of Spondias are a source of gums suitable for food applications.

**Sponge**  Dough used in breadmaking which contains a proportion of the flour, all of the yeasts, yeast foods, malt and sufficient water to make a stiff dough. Fats may also be added, together with a proportion of salt; this controls fermentation which takes place over 3-5 hours.

**Sponge cakes**  Light, porous cakes made using self-raising flour, sugar, beaten eggs and flavourings. Butter or oils may be added, although many sponge cakes contain no shortening.

**Spores**  Usually unicellular, dormant reproductive or resting bodies produced by microorganisms under conditions of environmental stress (e.g. extremes of temperature and dehydration). Resistant to unfavourable environmental conditions, and capable of germinating and developing into vegetative cells when environmental conditions are favourable, without fusion with another cell.

**Sporobolomyces**  Genus of fungi of the order Sporidiobolales. Common in the environment, and occur on decaying plant material. *Sporobolomyces roseus* is used as a biocontrol agent in the control of post-harvest diseases of fruits and vegetables.

**Sporotrichum**  Genus of filamentous fungi of the Basidiomycota phylum. Widely distributed in decaying wood and soil. *Phanerochaete chrysosporium* is the teleomorph of *Sporotrichum pruinosum*. Many *Sporotrichum* spp. are now classified under the *Sporothrix* genus. *S. thermophile* produces a range of enzymes, including phytases, xylan degrading enzymes, pectic enzymes, cellulases and feruloyl esterases.

**Sports drinks**  Soft drinks formulated to enhance or maintain the exercise performance of sports people, or to improve their recovery after a sporting event or training session. Generally contain ingredients such as sugars and electrolytes.

**Sports foods**  Products formulated to contain precise levels of nutrients and other ingredients intended to enhance exercise performance in athletes.

**Sports nutrition**  All aspects of nutrition that relate specifically to those involved in sports, such as athletes. A wide variety of products are available to support nutritional demands during physical activity or enhance exercise performance, including sports foods, sports drinks and sports supplements.

**Sports supplements**  Food supplements used to support nutrient demands during physical activity or...
enhance exercise performance. Can contain one or a variety of nutrients, including vitamins, minerals, herbs and amino acids. Available in different forms, including sports foods, sports drinks, powders and capsules. Commonly used by athletes.

Sporulation Process by which spores develop in microorganisms.

Spouted bed processing Processing technique for enhancing fluidization of solid particles in which the particles are mixed by the introduction of a stream of gas or liquid through the often conical lower region of the vessel holding them. Used in the food industry for drying or coating of particulate matter such as grain.

Sprat Small herring-like marine fish species (Sprattus sprattus) distributed across the northeastern Atlantic. Marketed fresh and frozen (whole, ungutted), smoked, canned (headed, tailed, gutted and packed in oils or tomato sauces) and as a component of fish pastes (dyed red to distinguish them from sardine pastes). Also known as brisling.

Spray dried foods Dried foods prepared by spray drying slurries or liquids. Foods dried in this manner include milk and eggs.

Spray driers Equipment for manufacture of dried foods from liquids, such as production of dried milk from liquid milk, by spray drying. Liquids are sprayed as a fine mist into a hot-air chamber, where they dehydrate; solids fall to the bottom of the chamber as dry powders.

Spray drying Process for manufacture of dried foods from liquids. The liquid food is generally preconcentrated by evaporation to reduce the water content. The concentrate is then introduced as a fine spray or mist into a tower or chamber with heated air. As the small droplets make intimate contact with the heated air, they flash off their moisture, become small particles, drop to the bottom of the tower and are removed. The advantages of spray drying over other types of drying include the need for only a low heat and short time, which leads to better quality product.

Spraying The discharge or scattering of liquids in the form of small droplets. This technique may be used to apply fertilizers to crops, to apply antimicrobial agents, glazes or flavourings to foods, or for cleaning.

Spreadability Texture term relating to the ease with which a product can be spread.

Spreads General term for preparations spread onto products such as bread or crackers, sometimes in place of butter. May be low in fat, and either sweet or savoury.

Springbok meat Meat from springboks. Springbok carcases are commonly used to produce fresh venison-type meat and biltong.

Springboks African gazelles (Antidorcas marsupialis) which are hunted, often as part of controlled culling programmes, for springbok meat production.

Springiness One of the sensory properties; relating to the extent to which a product springs back quickly when squeezed, bent, pressed or stretched.

Spring waters Mineral waters derived from springs or similar sources.

Sprouting Term synonymous with germination, meaning the process whereby seeds or spores begin to grow. Also describes the production of sprouts in potatoes and other tubers during storage. Sprouting can be controlled by storing susceptible vegetables in the dark and at low temperatures, or by the use of ant sprouting agents.

Sprouting inhibitors Alternative term for ant sprouting agents.

Sprouts Young shoots of germinating seeds, which are often eaten as a vegetable. Commonly consumed sprouts include bean sprouts, alfalfa sprouts and radish sprouts.

Squalene Phenolic compound with antioxidative activity that is found in olive oils and fish oils. Has also been found to exhibit antitumour activity in vitro and in animal models.

Squash Fruit juice beverages (mainly based on citrus fruits) containing comminuted whole fruits (including peel). Commonly retail as concentrates for dilution with water by the consumer.

Squashes Fruits produced by plants of the genus Cucurbita, including C. pepo and C. maxima. Produce of this genus also include marrows and pumpkins. Summer squashes are immature fruits with a soft skin that are mainly used as a table vegetable. Winter squashes are mature fruits used in a variety of ways, such as in pies and jams, as well as being eaten as vegetables. Contain mainly water (usually at least 90%), with small amounts of starch, sugar, fats, proteins, carotenes and B vitamins, and moderate amounts of vitamin C.

Squash seeds Seeds contained in fruits (squashes) produced by plants of the genus Cucurbita. Kernels are eaten raw or cooked, and used as a source of oils.

Squid Marine cephalopod molluscs within the family Loliginidae; worldwide distribution. Flesh is firm and chewy, with a somewhat sweet flavour. Commercially important species include Loligo vulgaris (European squid), L. pealei (longfin inshore squid), Todarodes pacificus (Japanese flying squid) and Ommastrephes bartramii (flying squid). Marketed fresh and
Stable isotope techniques  Analytical techniques

Srikand  Fermented milk product usually prepared from flesh and viscera of squid. Brown, salty viscous pastes made by fermenting the raw material with salt for up to one month; often flavoured with sake during fermentation.

Squid oils  Oils derived from squid viscera. Generally rich in docosahexaenoic acid and eicosapentaenoic acid.

Srikand  Fermented milk product usually prepared from buffalo milk and popular in India. Also known as shrikhand or srikhand. Traditionally, milk is fermented with a mixed starter culture (Streptococcus lactis and S. lactis var. diacetylactis) and chakka is prepared by draining off whey from the resultant curd. Other ingredients, e.g. sugar, colorants, flavourings, are then added to the chakka.

Srikhand  Alternative term for shrikhand or srikand.

Stabilization  Process of making or becoming stable. Stabilizers such as agar, alginates, carrageenans and gums are used for the stabilization of foods.

Stabilizers  Additives included in food formulations to prevent separation of ingredients and thus improve appearance and shelf life. Common uses include stabilization of oil and water components in emulsions, e.g. in salad dressings, of air incorporation into foams, e.g. in whipped cream, and of proteins in beer, precipitation of proteins producing cloudiness. Examples of stabilizers include gums and hydrocolloids.

Stable isotope techniques  Analytical techniques in which stable isotopes (all isotopes other than radioisotopes) are employed as tracers or measured as markers. A material may be characterized by the natural abundance or ratio of various stable isotopes, e.g. $^{13}$C/$^{12}$C, measured via MS, to aid its identification. Of particular use in food analysis for detection of adulteration or determination of authenticity or origin. Stable isotopes may be used as tracers for studying bioavailability or metabolism of nutrients or for monitoring the progress or effects of processing.

Stachybotrys  Genus of fungi of the class Hyphomycetes. Occur in soil, hay and other plant products. Stachybotrys alternans may be responsible for food spoilage. Ingestion or inhalation of satratoxins produced by S. atra on foods may cause stachybotryotoxicosis (a mycotoxicosis) in humans, horses, cattle and poultry.

Stachyose  Non-reducing tetrasaccharide found in legumes and other plants, hydrolysis of which gives two molecules of galactose, and one each of glucose and fructose.

Staining  Marking or discoloration with something that is not easily removed, such as penetrating dyes, pigments or chemicals.

Stainless steel  Type of steel which contains chromium. Resistant to tarnishing and rusting. Widely used in equipment and utensils for the food industry.

Staling  Process by which foods cease to be fresh or pleasant to eat. For example, bread becomes dry and hardened when stale, due to changes in the structure of starch.

Standardization  Process by which substances and procedures are made uniform. In the dairy industry, the term refers to adjustment of the fat content of milk to a given level. Milk from different batches is blended to produce products which may have a cholesterol lowering action. Reduce levels of total and low density lipoprotein cholesterol in blood by inhibiting absorption of cholesterol in the intestine.

Stanols  Hydrogenation products of sterols which occur naturally in plants (phytostanols). Less abundant than the corresponding plant sterols. Like plant sterols, stanols reduce levels of total and low density lipoprotein cholesterol in blood by inhibiting absorption of cholesterol in the intestine. Stanol esters are commonly used in enrichment of foods such as spreads, yoghurt and food bars to produce products which may have a cholesterol lowering action.

Staphylococcus  Genus of Gram positive, facultatively anaerobic, cocccoid bacteria of the family Micrococccaceae. Occur on the skin and mucous membranes of humans and animals. Staphylococcus aureus may be responsible for food poisoning due to consumption of contaminated foods (e.g. meat and meat products, eggs, salads, bakery products and dairy products). S. carnosus is used as a starter culture in the manufacture of fermented sausages.

Star anise  Common name for Illicium verum, fruits of which are used as spices. The main aromatic compound present is anethole. Used to flavour bakery products, beverages, meat products and sugar confectionery.
**Star apples** Apple-sized fruits produced by trees of the genus *Chrysophyllum*, predominantly *C. cainito* and *C. africatum*. Round, with a white or purple rind which is green at the calyx. A soft, white, sweet pulp surrounds a centre containing seed cells. Flesh is scooped out of the bitter tasting rind and eaten raw, often mixed with other fruits, or mixed with **orange juices**. May also be made into **jams**. *Oils* extracted from the **seeds** are sometimes used as **cooking oils**. Also known as cainito.

**Starch** Polysaccharide that is the main energy store of plants. Composed of molecules of **amyloses** and **amylopectins**. Amount of each polymer, which varies between plant species, influences the **functional properties** of starch, such as gel forming ability of starch pastes. In addition to its role in cereal **flour** or **meal** used as a base for **breading** and manufacture of other **bakery products** and **pasta**, starch has many applications in foods, including as **thickeners**, **anticaking agents**, **coatings** and **binding agents**. Starch is often chemically or physically modified in order to improve its applicability for food processing, e.g. to increase **thermal stability** or alter the **texture**.

**Starch granules** Native structure of starch, comprising discrete aggregates of **amyloses** and **amylopectins**. Arrangement of the starch polymers is highly organized and some crystalline regions are present due to strong interactions between amylopectin chains. Granules also contain minor amounts of protein, lipid, ash and moisture. Starch granule size and composition vary between plant species and varieties.

**Starch hydrolysates** Sugar syrups produced by **hydrolysis** of starch slurries. Starch hydrolysis is commonly achieved by the action of **acids**, e.g. hydrochloric acid, or **amyloses**; degree of hydrolysis determines the saccharide composition of the syrups. **Dextrose equivalent** of a hydrolysate is a measure of the degree of hydrolysis relative to the dextrose (D-glucose) content, i.e. 100% dextrose equivalent denotes full hydrolysis. **Glucose syrups**, **maltose syrups** and **maltodextrins** are starch hydrolysates and are substrates for other starch-based **sweeteners**, such as **fructose high corn syrups** and crystalline **sugars**.

**Starch synthases** EC 2.4.1.21. **Glycosyltransferases** which transfer the **glucose** moiety from ADP-glucose to glucose-containing **polysaccharides** by means of 1,4-α-linkages. The entry also covers glycogen synthases that utilize ADP-glucose. Several isoforms are found in plant tissues where they are responsible for synthesis of **starch**.

**Starch syrups** Sugar syrups produced from starch by **hydrolysis** with **acids** or **amylases**. Sugar composition of the syrups is dependent on the degree of hydrolysis, which is measured in terms of the dextrose content of the syrup (**dextrose equivalent value**).

**Star fruit** Fruits produced by *Averrhoa carambola*. Waxy in appearance, the juicy, yellow fruits are star-shaped in cross-section. Contain relatively high amounts of **vitamin C** and approximately 7% total sugar. Used in **beverages**, **fruit salads**, **tarts** and **preserves**. Also known as **carambolas** and **five fingers**.

**Starters** Microbial cultures used to initiate **fermentation**. Mixtures of specific strains are used to produce the desired properties in the product. Types include **cheese starters**, **yoghurt starters** and **butter starters**.

**Statistical analysis** Group of mathematical techniques by which analytical results can be examined on the basis of probability theory.

**Steaks** Thick slices of high-quality **meat** taken from the hindquarters of animal carcasses. They are usually cooked by **grilling** or **frying**.

**Steam** Hot vapour into which water is converted when heated. Condenses in the air into a mist of miniature water droplets. Used as a source of energy or in **cooking** of foods.

**Steamed bread** Bread prepared by **baking dough in ovens** which are heated to a constant temperature using closed pipes through which steam is passed.

**Steaming** **Cooking** of foods by heating in steam produced from boiling water. The food to be steamed can be placed in steaming apparatus over boiling or simmering water in a covered pan. Steaming has advantages over **boiling** in terms of retention of **flavour**, **colour**, shape, **texture** and **nutrients** content of foods.

**Stearic acid** A saturated fatty acid which contains 18 carbon atoms. Found abundantly in animals and plants. Even though consumption of **saturated fatty acids** has been linked with an increased risk of **coronary heart diseases**, data suggest that stearic acid may be neutral with respect to effects on serum cholesterol levels.

**Stearidonic acid** One of the **polyunsaturated fatty acids**, synonyms octadecatetraenoic acid and morotic acid. Contains 18 carbon atoms and 4 double bonds at positions 6, 9, 12 and 15. Converted to **eicosapentaenoic acid** and **docosahexaenoic acid** in the body. Shown to possess **anticarcinogenicity**, **antithrombotic activity** and **anti-inflammatory activity**. Found in **fish oils** and in seed oils from **hemp** and **blackcurrants**.
Stearin Triglycerides present in both animal fats and vegetable fats; found particularly in solid fats, such as tallow and cocoa butter. May also be synthesized by esterification of stearic acid with glycerol. Uses include as emulsifiers and surface-finishing agents for chocolate and sugar confectionery. Also known as tristearin, glyceryl tristearate and octadecanoic acid 1,2,3-propanetriyl ester.

Stearoyl lactylates Salts of the stearoyl lactylate anion prepared by reaction of stearic acid with lactic acid. The nature of the cation in the salt influences the functional properties of the lactylate, e.g. the sodium salt is soluble in water whereas calcium stearoyl lactylate is not. Uses include as emulsifiers, dough conditioners and stabilizers.

Steel Strong, hard grey or bluish-grey alloy made from iron with carbon and usually other elements. Used widely as a structural and fabricating material. Also refers to a rod of roughened steel which is used for sharpening knives.

Steeping Soaking of ingredients such as tea leaves, herbs and spices in water or other liquid until the flavour is infused into the liquid. The liquid used is usually hot. Also refers to soaking of barley or other cereals as part of the malting process, and during which imbition occurs prior to germination.

Steers Castrated, adult male cattle, which are widely used for beef production. Compared with bulls, steers are easier to handle and their carcasses are less affected by stress related conditions, such as the DFD defect. However, steers grow more slowly, convert feed less efficiently and achieve lower carcass weights than bulls. Steer meat tends to be lighter in colour than bull beef.

Stellar Trade name (A. E. Staley) for fully digestible fat substitutes derived by controlled acid hydrolysis of corn starch. Used in a wide range of low fat foods such as ice cream, salad dressings, condiments, sauces, bakery products, meat products and dairy products. Not suitable for frying.

Stems A structural organ of vascular plants. Typically an aereal component with spaced nodes from which grow other stems, leaves, flowers etc.

Stenotrophomonas Genus of aerobic, rod-shaped Gram negative bacteria belonging to the Xanthomonadaceae family. Stenotrophomonas maltophilia (previously known as Xanthomonas maltophilia) is a multidrug resistant opportunistic pathogen found in moist environments, including water and foods. Some strains found in fish can produce the biogenic amine cadaverine.

Sterculic acid One of the fatty acids; has a branched, odd-numbered, unsaturated C chain structure. A potent inhibitor of desaturases.

Stereoisomers Molecules with the same molecular formula and the same functional groups, but with different spatial arrangements, e.g. optical isomers.

Sterigmatocystins Carcinogenic and hepatotoxic mycotoxins produced by certain Aspergillus spp. (e.g. A. nidulans and A. versicolor) growing on foods (e.g. cereals, fruits, coffee beans and cheese).

Sterilization Destruction of all microorganisms and spores in or on a material, such as food, by various means, including the application of chemicals, heat, radiation or filtration. Conventional sterilization involves in-container sterilization, usually at temperatures between 115 and 120°C for 20-30 minutes. Commercial sterilization does not always meet this definition, because some harmless, heat resistant bacteria may still be present. The criterion for food sterility is a process that will ensure no surviving botulism bacteria or their spores. The common guideline is to use a multiple of 12 for the D-value (121°C) of Clostridium botulinum or its equivalent.

Sterilized milk Milk that has been heated at a high temperature (e.g. 110°C for 30-40 minutes, 130°C for 30 seconds or 150°C for less than a second) to kill all bacteria and increase shelf life. Similar to UHT (ultra high temperature) milk. Has a distinctive flavour.

Steroids Complex polycyclic lipids with a hydrocarbon nucleus, characterized by having a cyclopenta[α]phenanthrene carbon skeleton formed from four fused rings. Many distinct steroids are found in plants (e.g. phytosterols and brassinosteroids), animals (e.g. sex hormones, corticosteroids and cholesterol) and fungi (e.g. ergosterol). These steroids are distinguished from each other based on the functional groups that are attached to the rings.

Sterol esters Fatty acid esters of plant sterols, these phytochemicals have hypolipidaemic activity and antiatherogenic activity. Occur naturally in small amounts in vegetable oils, seeds, nuts, fruits and vegetables. Added to margarines, milk, yoghurt and salad dressings to produce functional foods claimed to reduce the risk of cardiovascular diseases. Their physiological effects are comparable to those of stanol esters.

Sterols Steroid alcohols found widely in animals and plants which have an aliphatic hydrocarbon side chain of 8-10 C atoms at the 17-β position and a hydroxyl group at the 3-β position.

Stevia rebaudiana Plants native to South America, the leaves of which have a sweet flavour. Analyses have revealed the presence of at least eight sweet com-
pounds in the leaves, the most widely used of which is stevioloside.

Steviol Diterpene metabolite of stevioloside, a natural sweetener found in leaves of *Stevia rebaudiana*. Formed by bacterial degradation of stevioloside in the human colon. Concerns have been raised about stevial safety. Demonstrates genotoxicity and mutagenicity in some studies, but shown to inhibit angiogenesis and to possess hypoglycaemic activity in others.

Stevioside One of the high intensity natural sweeteners. Obtained from the leaves of *Stevia rebaudiana*, where it is present at levels up to 13%. Stevioside is a glycoside of the diterpene derivative steviol. Has 250-300 times the sweetness of sucrose and is stable at baking temperatures. Possesses undesirable bitter and licorice-like aftertaste. Also known as steviosin. Not permitted for sale as a sweetener in the USA, UK, EU, Australia or Canada due to safety concerns; however, use is permitted in South America, Asia, China, Japan and Korea.

Stewing Cooking foods slowly and for a long period of time in a small amount of liquid in a closed dish or pan to make a stew. Stews usually contain meat, vegetables and a thick soup-like broth. Stewing not only tenderizes tough pieces of meat but also allows the flavour of the ingredient components to blend.

Stickness One of the rheological properties; relating to the extent to which an item is cohesive or adhesive. This term also relates to the extent to which a food adheres to the palate during mastication.

Sticking Process of adhesion.

Stiffness One of the rheological properties; relating to the extent to which an item is stiff, i.e. firm and rigid. When stress is applied to a material, strain is produced in the direction of the stress; stiffness is the ratio of the stress divided by the strain.

Stigmastadienes Dehydration products of sitosterol, formed in vegetable oils during high temperature processing steps of the refining procedure such as bleaching and deodorization. The main product is 3,5-stigmastadiene. Stigmastadienes are not usually formed in high levels in virgin olive oils, where production involves nonthermal processes such as centrifugation and pressing. Stigmastadienes can be used as indicators of the presence of refined vegetable oils in virgin olive oils or to differentiate thermally treated oils from those that have been cold pressed.

Stigmasterol Plant sterol, also found in milk, deficiency of which can cause muscular atrophy and calcium phosphate deposits in muscles and joints. Oxidation of stigmasterol (e.g. during the heating of vegetable oils) can result in formation of carcinogenic products.

Stilbenes Phenols such as resveratrol and piceatannol. Occur in vegetables, fruits, wines and nuts. Contain 1,2-diphenylethylene as a functional group. Possess anticarcinogenicity and antioxidative activity. May reduce risk of cardiovascular diseases and Alzheimer's disease.

Stillage Liquid wastes or by-products from distilleries, breweries or wineries. May be used as animal feeds or in culture media for microorganisms.

Stilton cheese English semi-hard cheese made from cow milk. Available in blue and white varieties. Stilton has a rich and mellow flavour and a piquant aftertaste, but is milder than Roquefort cheese or Gorgonzola cheese. The wrinkled rind is not edible. Maturation takes 6-8 months.

Stir frying Cooking method in which food is cut into small pieces and fried over a very high heat in a pan with a large surface area, e.g. a wok, with constant stirring. Very small amounts of oil or fat are used. Associated particularly with Asian dishes.

Stirred tank bioreactors Bioreactors which include a vessel and a stirring system (e.g. impellers) for causing agitation of the contents, generally cells or immobilized cells in media or immobilized enzymes in reaction mixtures. In industrial fermentation and reactions, stirring is usually performed using a turbine system. Agitation enhances mass transfer, useful in aerobic systems for maximizing the dissolved oxygen concentration of media, but also increases shear within the system, which may cause cell damage. Used for batch or continuous submerged fermentation or enzymic reactions.

Stirring Manual or automated processing action involving circular movements of a utensil (e.g. a spoon) within a food mixture. Allows ingredients to become well mixed together and where required, distributes heat throughout the mixture.

Stocks Juices obtained by simmering meat, bones, vegetables or fish, usually with seasonings, in water or other liquid. Used as a base for soups and accompaniments such as gravy and sauces. Available commercially as liquid products or in dried form.

Stollen Rich bread originating from Germany which is prepared by fermentation with yeasts. Usually contains dried fruits and nuts, and is topped with icing sugar. Traditionally eaten at Christmas. Sometimes called christstollen.

Stomachs A part of edible offal. Tripe, usually obtained from the rumen and reticulum of cattle, is used as an ingredient in some sausages. Swine stomachs are also used as an ingredient in some sausages.
Stone fruits  Fruits with a thin skin, middle fleshy region and a single, central stone, containing the seed. Include **plums**, **peaches**, **apricots** and **cherries**.

**Stones**  Alternative term for seeds found in the middle of some fruits, such as stone fruits.

**Stoppers**  Plugs for sealing holes, particularly for sealing the necks of bottles. Also known as stopples in the USA.

**Stone fruits**  **Fruits** that accumulate within the necks of **bottles**. Also known as bottles.

**Storage**  Maintenance of commodities, for example fresh or processed foods, under controlled conditions for extended durations while maintaining quality. Undesirable quality changes that may occur during storage include changes in nutrient levels or development of off flavour or loss of texture. Most foods benefit from storage at a constant, low temperature (cold storage or frozen storage) where the rates of most degradative reactions decrease and quality losses are minimized. However, some products, e.g. **canned foods** or **dried foods**, are processed in such a way that they may be kept at ambient temperature with no loss in quality. Careful control of atmospheric gases, such as oxygen, **carbon dioxide** and ethylene (controlled atmosphere storage), is important in extending the storage life of many products, such as fruits and vegetables.

**Storage life**  The time for which a stored item remains usable.

**Storage proteins**  **Proteins** that accumulate within **cereals**, **seeds** and **legumes**, and serve as nitrogen sources for germination. Usually occur in an aggregated state within membrane surrounded vesicles (e.g. protein bodies and aleurone grains), and often built from a number of different polypeptide chains. Possess no enzymic activity. In cereals, deposited in the endosperm; in legumes, deposited in the cotyledon. Synthesized in seeds in large quantities over a limited period of time. In dicots, deposited in the embryo as well as the endosperm of developing seeds. Deficient in several essential **amino acids** and generally have reduced **nutritional values**. Storage proteins of different cereals have distinct structural characteristics that are responsible for their unique functional properties.

**Stores**  Places, such as rooms or warehouses, where items such as foods are kept under controlled conditions for extended durations, for future use or sale.

**Stout**  Strong, dark, top-fermented **beer** brewed mainly in the UK and Ireland.

**Stoves**  Devices for **cooking** or **heating** of foods. Operated by burning fuel or using electricity.

**Strainers**  Devices for straining liquids, semi liquids or solid ingredients to separate out any undesirable solid matter. These utensils have a perforated or mesh bottom, and are usually made from stainless steel, plastic or aluminium. Available in a variety of sizes, shapes and mesh densities.

**Streptococcus**  Genus of Gram positive, anaerobic, coccoid lactic acid bacteria of the family Streptococcaceae. Occur on the skin, mucous membranes and in the gastrointestinal tract of humans and animals. **Streptococcus thermophilus** is used in **starters** for manufacture of **yoghurt** and **cheese** (e.g. Emmental cheese and Parmesan cheese). **S. agalactiae** and **S. uberis** may be responsible for mastitis in cattle. **S. pyogenes** is the causative agent of strep throat and scarlet fever, which can be transmitted via contaminated foods (e.g. dairy products, eggs and...
salads). Other species are responsible for diarrhoeal disease via ingestion of contaminated foods (e.g. meat products, milk and cheese).

**Streptomycyes** Genus of aerobic, filamentous Gram positive bacteria of the family Streptomycetaceae. Occur in soil, decaying vegetation and water, and some are parasites of humans, animals and plants. Members of this genus produce clinically useful antibiotics and industrially important enzymes. Some species may cause taints in wines, water and shellfish. Other species may cause diseases of crops (e.g. potatoes and sugar beets).

**Streptomycin** Aminoglycoside antibiotic produced by certain strains of *Streptomycyes griseus*. Active against many Gram negative bacteria. Used to treat systemic and enteric infections in animals and also for growth promoting purposes. Residues may persist for long periods in kidneys but normally deplete rapidly in other commonly consumed tissues.

**Streptovercillium** Obsolete genus, species of which have been transferred to the genus *Streptomycyes*.

**Stresnil** Trade name (Janssen Animal Health) for an injectable butyrophenone neuroleptic sedative for pigs for control of stress, including transport-related stress, and prevention of fighting. Contains 40 mg azaperone per ml. Pigs may only be slaughtered for human consumption at 10 days from last treatment.

**Stress** A broadly used term covering various external and internal pressures and challenges. Can also refer to a response to these demands, such as in the case of stress in animals and humans. Stress can be applied to materials, at the level of the whole organism and at the level of organism constituents, such as cells. Includes animal stress, osmotic stress, oxidative stress, stress relaxation and yield stress.

**Stress proteins** Proteins which are synthesized by an organism in response to environmental stress, e.g. heat shock, exposure to toxic substances, exposure to ultraviolet radiation or viral infection. Examples include the heat shock proteins. Produced to protect the organism from destructive consequences of the stress conditions encountered, but also play a role in normal cell physiology. Appear to act as molecular chaperones, assisting in the folding/refolding of other proteins. Prevent stress-induced protein aggregation by binding to surfaces exposed as a result of destabilization of protein structure. May also be involved in repair of damaged proteins.

**Stress relaxation** One of the rheological properties; relating to the process of stress decay, i.e. the stress response that is apparent after subjecting a material to a certain strain.

**Stress resistance** Ability of an organism to withstand environmental stress.

**Stretch** One of the rheological properties; relating to the ability of an item to be drawn out in length (extended).

**Stretching** Making something that is soft or elastic longer or wider without tearing or breaking. An integral part of the manufacture of some cheeses, e.g. mozzarella cheese, where the curd is stretched during processing.

**String beans** Type of common beans (*Phaseolus vulgaris*).

**Striped bass** Marine fish species (*Morone saxatilis*) belonging to the family Moronidae. Distributed in the western Atlantic Ocean and northern Gulf of Mexico. Produced commercially by aquaculture. Marketed fresh and consumed mainly broiled or baked.

**Stroke** Sudden attack of weakness often affecting just one side of the body. Brain tissue is damaged due to blockage of a blood vessel as a result of thrombosis, atherosclerosis or haemorrhage. Severity of the stroke depends on the region of the brain affected and the extent of damage. Hypertension and hypercholesterolaemia are major risk factors.

**Strontium** Metallic element with the chemical symbol Sr.

**Structural genes** Genes that encode substances such as enzymes, structural proteins and RNA molecules, rather than genes that serve regulatory purposes.

**Structured lipids** Lipids that have been modified to change the position and/or the composition of their constituent fatty acids. Typically triacylglycerols containing mixtures of medium and long chain fatty acids.

**Strudels** Sweet or savoury pastries made from a dough of high-gluten flour, eggs and a high proportion of liquid, causing the dough to become highly malleable. The dough is then stretched out to paper thinness, and used to enclose fruits, e.g. sliced apples, or cheese fillings.

**Stuffings** Savoury mixtures of chopped and seasoned ingredients which are either used to stuff poultry or other meat joints prior to roasting, or served as a meat accompaniment.

**Stunning** Methods used to immobilize animals and birds before slaughter. Includes electrical stunning, captive bolt (projectile) stunning and CO₂ immobilization. Stunning is carried out immediately before bleeding; it aims to render the animal unconscious without stopping the action of the heart, which aids the bleeding procedure. Although stunning procedures involve some stress, they decrease stress responses when
Sturgeon

Any of a number of marine fish or freshwater fish from the family Acipenseridae (subclass Chondrostei); found in temperate waters of the Northern Hemisphere. Most species live in the sea and migrate into rivers (possibly once in several years) to spawn in spring or summer; a few others are confined to fresh water. Flesh tends to be fatty with firm texture. Marketed fresh, frozen, smoked, salted and canned. Roe from some species are highly valued as caviar.

Styrene

Unsaturated liquid hydrocarbon, which is a by-product of petroleum manufacture. Polymerized to make resins and plastics that are used as packaging materials for foods. There is concern about health hazards associated with migration of styrene monomers, dimers and trimers from packaging materials into some types of foods.

Succinic acid

Dicarboxylic acid with a number of yeasts and/or sugars in citrus based beverages. Used for production of many fermentation products, including biomass, enzymes, bacteriocins and secondary metabolites.

Subtilins

Bacteriocins produced by Bacillus subtilis.

Sucrases

Alternative term for sucrose α-glucosidases.

Sucrose

Disaccharide comprising a molecule of glucose and a molecule of fructose. Sucrose occurs naturally and is extracted commercially from sugar cane and sugar beets to yield the crystalline sweetener marketed as sugar. Sweetness of sucrose is the milestone by which sweetness of all other sugars and/or sweeteners is compared.

Sucrose acetate isobutyrate

Mixture of esters of sucrose esterified with acetic acid and isobutyric acid. Produced by reaction of food grade sucrose with acetic anhydride and isobutyric anhydride in the presence of a catalyst. Used as a stabilizer or weighting agent to increase the specific gravity of flavouring oils in citrus based beverages. Commonly abbreviated to SAIB.

Sucrose α-glucosidases

EC 3.2.1.48. Glycosidases which hydrolyse sucrose and maltose by an α-D-glucosidase-type action. Also known as sucrases.

Sucrose-phosphate synthases

EC 2.4.1.14. Glycosyltransferases which catalyse the conversion of UDP-glucose and d-fructose 6-phosphate to UDP and for example, Agrobacterium radiobacter. Have properties similar to those of xanthan gums.
Sucrose polyesters  Esters of sucrose and fatty acids (C12 to >C20) that are not absorbed on their way through the gastrointestinal tract and may act as fat substitutes in shortenings, spreads and other foods.

Sucrose synthases  EC 2.4.1.13. Glycosyltransferases which catalyse the conversion of NDP-glucose and D-fructose to NDP (nucleoside diphosphate) and sucrose. The preferred substrate is UDP-glucose, although ADP-glucose may also be converted. Involved in sucrose and starch biosynthesis in plants.

Sucuk  Turkish, raw, cured sausages, prepared mainly from beef with added mutton and sheep fat. Sucuk are dry cured for 7-10 days and retailed unsmoked. They are usually eaten warm.

Sudan dyes  Aromatic compounds containing an azo group. Red dyes, used as colorants in a range of foods, including chilli powders, paprika, spice mixes, tomato products and palm oils. Illegal in most western countries. Detected in several products sold commercially in the United Kingdom, which have now been removed from sale. Include Sudan I, II, III and IV.

Suet  Hard, white fatty tissue surrounding the kidneys of cattle and sheep. Used in baking, frying and in the manufacture of tallow.

Sufu  Cream cheese-type fermented foods made from tofu and eaten widely in China. Fermentation of tofu is carried out commercially using Actinomucor elegans, followed by brining and ageing. Sufu is eaten as an appetizer, as a relish, cooked with vegetables or meat, or in the same manner as cheese.

Sugar  Commercial name for crystalline sucrose extracted from either sugar cane or sugar beets, purified to at least 98% purity.

Sugar alcohols  Products formed when aldehyde or ketone groups of sugars are hydrogenated (reduced) to alcohol groups. Examples include sorbitol, manitol and lactitol, produced by hydrogenation of glucose, mannose and lactose, respectively. Also known as polyols.

Sugar almonds  Shelled almonds covered with a hard sugar coating, which is often coloured. Often given as symbols of good luck at religious occasions such as weddings and christenings.

Sugar apples  Fruits produced by Annona squamosa and related to cherimoya, for which they are sometimes mistaken. The egg-shaped fruits have a thick, yellowish-green skin and sweet yellow custard-like flesh containing dark seeds. Rich source of vitamin C. The flesh is eaten with a spoon as a fresh fruit or used in fruit salads, milkshakes, yoghurt and desserts. Also known as sweet sop.

Sugar beet cossettes  Thin slices cut from sugar beets in the initial stage of sugar processing, from which sugar is extracted. Cossettes are used to increase the surface area available for, and efficiency of, sugar extraction.

Sugar beet juices  Alternative term for beet sugar juices.

Sugar beet molasses  Alternative term for beet sugar molasses.

Sugar beet pectins  Pectins extracted from the pulps of sugar beets, by-products of sugar production.

Sugar beets  Roots produced by Beta vulgaris, plants from which sugar is extracted commercially. Sugar is present in specific cells of the tap root of the plant. Major sugar beet producing regions in the world include Europe and the USA.

Sugar cane  Tropical grass of the genus Saccharum, stalks of which are a rich source of sugar. S. officinarum is the main species cultivated for commercial sugar production.

Sugar cane bagasse  Cane sugar processing waste that is composed of unextracted sugar and the remains of the sugar cane after milling. Used as a fuel source, in feeds, as a substrate for microbial fermentation and for paper and board manufacture. Also called bagasse or megass.

Sugar cane juices  Alternative term for cane sugar juices.

Sugar cane molasses  Alternative term for cane molasses.

Sugar cane spirits  Alcoholic beverages produced by distillation of fermented cane sugar juices or cane molasses, which may then be aged in wooden barrels. The most common sugar cane spirits are rum and cachaca, although arak may also be produced from sugar cane.

Sugar cones  Ice cream cones that have been formulated to have a particularly crisp texture.

Sugar confectionery  Collective term for foods which have sugar as a principal component, e.g. chocolate, candy, fudges, jelly confectionery, sweets and toffees.

Sugar crops  Plants that are cultivated for sugar production, including sugar beets, sugar cane and sweet sorghum.

Sugar cubes  Cubes produced by moulding or compression of moistened granulated sugar.
Sugar manufacture
Alternative term for sugar products
Sugar juices Sugar containing solutions obtained by crushing sugar cane, or by hot water extraction of sugar beet cossettes. Sugar is crystallized from the juices following removal of impurities.
Sugar manufacture Alternative term for sugar processes.
Sugar pans Vessels, usually made of metal, e.g. steel plate, in which evaporation of sugar juices and crystallization of sugar are performed.
Sugar processes Processes involved in the manufacture of sugar, such as carbonation, liming, evaporation and crystallization.
Sugar products Foods containing sugar as a main component. Includes products such as sugar confectionery, sugar syrups and honeys.
Sugar refineries Factories where raw cane sugar is purified to produce granulated sugar.
Sugars General term for saccharides or their derivatives that have a sweet flavour.
Sugar substitutes Chemicals used to mimic the flavour and applications of sucrose, e.g. sweeteners.
Sugar syrups Concentrated aqueous solutions of sugars. Include syrups of individual sugars, such as glucose syrups and fructose syrups, and syrups extracted from specified sources, e.g. corn syrups and maple syrups.
Sulfadiazine Sulfonamide antibiotic active against a range of microorganisms and used to treat diseases such as toxoplasmosis, meningitis and pneumonia.
Sulfadimidine Alternative term for sulfamethazine.
Sulfamates Alternative term for cyclamates.
Sulfamethazine Sulfonamide drug used primarily for control of atrophic rhinitis and other infections in swine and cattle. Also used as a growth promoter. Normally absorbed and excreted rapidly; elimination is generally more rapid when the drug is injected.
Sulfanilamide Sulfonamide drug used to treat a range of bacterial and protozoal infections in animals. Often used in combination with other sulfonamides.
Sulfates Inorganic salts of sulfuric acid.
Sulfathiazole Sulfonamide drug used as a coccidiostat in animals. Often used in combination with other sulfonamides. Also used as a growth promoter and for treatment of foul brood in bees. Normally absorbed and excreted rapidly by animals.
Sulfhydryl groups Reactive SH groups that are effective at chelating aluminium and other toxic minerals. Mediate the formation of disulfide bonds in proteins and other compounds.
Sulfides Sulfur compounds in which the S atom can be bound to inorganic or organic moieties. In inorganic sulfides, the S atom may be linked to metals or non-metals, while in organic sulfides, the S atom is linked to two hydrocarbon groups.
Sulfitation Use of salts of sulfurous acid, mainly sulfites, for applications including inhibition of bacterial growth, prevention of spoilage or oxidation, and control of browning in foods. Sulfites, which may be added as preservatives to packaged and processed foods, can cause a severe allergic response in certain individuals.
Sulfites Inorganic salts of sulfuric acid that are used as food preservatives since they exhibit antimicrobial activity and antioxidative activity, and prevent enzymic browning. However, they are potentially cytotoxic and mutagenic, and may be allergenic to hypersensitive individuals. Hence, their use is regulated strictly.
Sulfolobus Genus of aerobic or facultatively anaerobic, coccoïd or irregularly-shaped archaea of the family Sulfolobaceae, whose species are thermoacidophilic. Occur in sulfur-rich, hot, acid soils and springs. Sulfolobus solfataricus, found in volcanic areas, is used in production of several thermostable enzymes (e.g. thermostable β-glucosidases).
Sulfonamides Group of synthetic organic compounds with a broad spectrum of activity. Widely used for control of bacterial and protozoal infections in animals, particularly infectious diseases of the digestive and respiratory tracts. Administered to animals by all known routes, often at dosages noticeably higher than those for antibiotics. Residues are normally eliminated much earlier from livers, kidneys and milk than from muscle or adipose tissues. Examples include sulfamethazine, sulfanilamide and sulfathiazole.
Sulforaphane One of the isothiocyanates found in large amounts in broccoli, broccoli and cauliflower sprouts, and in smaller amounts in other Brassica spp. Has antioxidative activity and anticarcinogenicity, and may reduce risk from cardiovascular diseases. May act synergistically with selenium and with other phytochemicals found in these vegetables.
Sulfur Non-metallic element with the chemical symbol S. Essential in that it is a component of cysteine, methionine, vitamin B₅ and biotin. However, there appears to be no requirement for S in any other form.
Sulfur dioxide Gas that is used in preservatives and bleaching agents, e.g. for beet sugar, and in stabilizers for vitamin C. Degrades vitamin B₃, and thus it is not recommended for use in foods rich in this vitamin.
Sulfuric acid  

Sulfuric acid  Inorganic acid with the chemical formula H₂SO₄.

Sulfurous acid  Aqueous solutions of sulfur dioxide used in preservatives.

Sulphadimidine  Alternative spelling for sulfadimidine.

Sulphamates  Alternative spelling for sulfamates.

Sulphamethazine  Alternative spelling for sulfamethazine.

Sulphanilamide  Alternative spelling for sulfanilamide.

Sulphates  Alternative spelling for sulfates.

Sulphathiazole  Alternative spelling for sulfathiazole.

Sulphur  Alternative spelling for sulfur.

Sulphur dioxide  Alternative spelling for sulfur dioxide.

Sulphuric acid  Alternative spelling for sulfuric acid.

Sulphurous acid  Alternative spelling for sulfurous acid.

Sulphydryl groups  Alternative spelling for sulphydryl groups.

Sultanas  Dried fruits prepared from golden sultana grapes by drying in the sun or mechanically. Rich in iron with a high sugar content, a range of vitamins and minerals, and a moderate level of dietary fibre. Eaten out of hand or used in bakery products and various dishes. Also called seedless raisins.

Suluguni cheese  Georgian mild semi-soft cheese made from ewe milk. Often eaten fried or grilled, or in a variety of dishes.

Sumac  Common name for the plant Rhus coriaria and its dark purple-red berries, which are dried and used whole or ground as spices, giving a fruity, sour and astringent flavour to foods. Widely used in cooking in the Middle East, especially in Lebanese cuisine. Alternative names include sumaq, sumach, shumac and Sicilian sumac.

Summer sausages  Spicy, semi-dry fermented sausages, which are cooked and dried after fermentation. Commonly prepared from pork and/or beef, but may also be prepared from meat mixtures including chicken meat or turkey meat. Natural pigments, e.g. betalaines, may be used to simulate a cured meat colour in summer sausages. High quality is achieved by use of frozen concentrated lactic acid bacteria starters and control of lean to fat ratios in the meat. Varieties include landjaeger and thuringer.

Sunburn  Damage to plants and fruits (particularly apples) caused by exposure to intense sunlight. Causes necrotic lesions on the fruit and browning of the flesh underneath. May be controlled by shading or cooling. Also called sunscald.

Sunett  Trade name (Nutrinova) for the high-intensity, artificial sweetener acesulfame K. 200 times sweeter than sugar. Blends well with other caloric and non-caloric sweeteners. Possesses good storage, temperature and pH stability, and has rapid solubility. Approved for use in a wide range of foods in more than 100 countries worldwide.

Sunfish  A variety of freshwater fish and marine fish; particularly refers to North American freshwater fish of the genus Lepomis, e.g. L. macrochirus (bluegill sunfish), some of which are popular food fish. Also refers to the large marine fish species Mola mola.

Sunflower meal  Cake remaining after extraction of sunflower oils from sunflower seeds. Contains high levels of polyphenols, which must be removed before the meal is used in foods. Source of proteins, which may be isolated and used in foods.

Sunflower oils  Oils extracted from sunflower seeds (Helianthus annus). Rich in linoleic acid and oleic acid and low in saturated fatty acids. Used as salad oils and cooking oils as well as in the manufacture of margarines and shortenings.

Sunflowers  Plants belonging to the species Helianthus annus. Characterized by a long stem and large, composite yellow flower heads, which produce sunflower seeds rich in sunflower oils.

Sunflower seeds  Seeds produced by sunflowers (Helianthus annus). Rich in vitamin B₁, proteins, iron and niacin. May be eaten dried and roasted as snack foods, incorporated into bakery products or used as a source of sunflower oils.

Sunlight  Light emitted from the sun. Used in sun drying and solar drying of foods.

Sunset Yellow  Orange monoozo dye used in artificial colorants. Soluble in water or glycerol but only slightly soluble in ethanol. Has a reddish-yellow hue in concentrated solution that becomes yellow on dilution; the dye is colour stable at extrusion temperatures, pH 3-8 and in the presence of organic acids and alkalis commonly used in food processing, such as citric acid and sodium bicarbonate. Sunset Yellow is often blended with tartrazine and used in colorants for low fat spreads. Also used, in combination with other colorants, to colour a range of products, including bakery products, beverages (e.g. cola beverages), sugar confectionery and ice cream.
Supercooling  Cooling of liquids to a temperature below their freezing point without causing crystallization. Requires slow cooling and the absence of a nucleation seed. Of relevance to the food industry due to its impact on freezing, since the degree of supercooling affects the size and/or microstructure of ice crystals and hence the quality of frozen foods such as ice cream.

Supercritical CO₂ extraction  Extraction process that uses supercritical carbon dioxide (CO₂) as the selective solvent. The polarity of CO₂ limits its use to extractions of relatively apolar or moderately polar solutes. Thus, a small amount of a polar organic solvent (e.g. methanol, acetonitrile, water), called a modifier or entrainer, is usually added to the supercritical fluid for extraction of more polar compounds. CO₂ is frequently used as the extraction solvent in supercritical fluid extraction because it is in a supercritical state at a relatively low temperature (31°C) and pressure (73 atmospheres), making it a suitable choice from an instrumental point of view. Extraction using supercritical CO₂ also avoids the use of dangerous or toxic organic solvents and the gas is easily removed by reducing the pressure.

Supercritical fluid chromatography  Chromatography technique that uses a supercritical fluid as the mobile phase. Developed for analysis of substances not separated effectively using liquid chromatography or gas chromatography, including triglycerides and fatty acids.

Supercritical fluid extraction  Extraction process that uses supercritical fluids as selective solvents. Instrumentation for supercritical fluid extraction consists of a solvent supply, a pump, a cooler to cool the pump head, an extraction cell that is mounted in a ceramic heater tube, a heater controller to monitor the temperature of the extraction cell, a restrictor connected to the outlet of the cell, a restrictor heater and a collection vial. The possibility of varying the solvent strength of the supercritical fluid by alteration of pressure makes supercritical fluid extraction extremely versatile in its applications.

Supercritical fluids  Substances present in a state which forms on the application of temperatures and pressures above the critical temperature and pressure points of the substance, at which liquid and gas forms co-exist. Substances can be either liquids (e.g. water) or gases (e.g. CO₂) in their usual states. Supercritical fluids are widely used in supercritical fluid extraction and are also being used for other food industry processes such as pasteurization and micronization.

Supercritical HPLC  HPLC technique in which a supercritical fluid is used as the mobile phase.

Surface plasmon resonance  Surface active agents  Substances such as surfactants that reduce surface tension by interaction with non-mixing substances at phase boundaries.

Surface active properties  Functional properties relating to the ability of a compound to reduce the surface tension of a liquid, thereby increasing wetability or blending ability. Surfactants used as additives in the food industry have surface active properties.

Surface pasteurization  Any thermal processing method used to destroy microorganisms on the surface of solid foods, rather than within liquid foods as with traditional pasteurization methods. Used to improve shelf life and food safety. Most often used for treatment of meat and meat products, but other produce including fish, fruits, vegetables and cheese may also be surface pasteurized. The process may be carried out before or after packaging, and may involve exposure to steam, hot water or IR irradiation.

Surface plasmon resonance  One of the analytical techniques used as a detector in biosensors and immunoassays for determination of biopolymers, residues, microorganisms, etc. and for monitoring the kinetics of interactions between biopolymers, e.g. for determination of binding affinity. Surface plasmon resonance is an optical phenomenon that occurs on irradiation under certain conditions of a conducting film, commonly comprising a metal (Au or Ag), present at the interface between materials which have different refractive index values, e.g. an aqueous solution (sample) and glass (sensor support).
Survival curves

The presence of a biopolymer alters the surface plasmon resonance response; in a biosensor or immunoassay, a ligand, e.g. enzyme or antibody, respectively, is bound to the sensor support surface and binding of analyte alters the response.

Surface tension

Force on the surface of a liquid that makes it behave as if the surface has an elastic membrane. Caused by forces between the molecules of the liquid: molecules at the surface experience forces from below, whereas those in the interior are acted on by intermolecular forces from all sides. The surface tension of water is very strong, due to intermolecular hydrogen bonding. Surface tension causes a meniscus to form, liquids to rise up capillary tubes, paper to absorb water, and droplets and bubbles to form. It is measured in Newtons per metre.

Surfactants

Substances that concentrate at phase boundaries and reduce surface tension. Contain hydrophilic and hydrophobic regions which align at interfaces to promote mixing of phases. Above a particular concentration, the critical micellar concentration, surfactants form micelles which encapsulate one phase within the other. Used to produce oil/water emulsions and for encapsulation of lipid soluble flavourings in processed foods. Emulsifiers, such as fatty acid esters, are surfactants as are sodium dodecyl sulfate (SDS) and Tween.

Surfactin

Powerful cyclic lipopeptide surfactants produced by strains of Bacillus subtilis, which are commonly used as antibiotics. Possess significant antimicrobial activity. Used as emulsifiers, foaming agents and stabilizers in foods.

Surimi

Fish products comprising refined, stabilized, frozen fish mince. Refining and stabilization are achieved by washing repeatedly in fresh water to remove soluble protein, straining, pressing to restore water content to natural levels (approximately 80%), followed by incorporation of sugar, sorbitol and polyphosphates. Used to make products such as kamaboko, fish sausages and sea food analogues such as imitation crab meat.

Survival curves

A predictive modelling technique which plots the survival of organisms over time. Used to model the inactivation kinetics of microorganisms in foods during antimicrobial treatments such as thermal processing.

Susceptors

Alternative term for microwave susceptors.

Sushi

Japanese sea food dishes which normally consist of thin slices of fresh raw fish flesh or seaweed wrapped around a cake of boiled rice. The term is also used for dishes consisting of fresh raw fish flesh placed on boiled rice flavoured with vinegar.
incorporated into the glycolytic pathway in cells to produce energy, e.g. **starch**-derived sweeteners; **fruit**-derived sweeteners, e.g. **honey**, **lactose** and **maple syrup**; and non-nutritive or non-carbohydrate based sweeteners. Sweeteners may also be classified as natural (existing in nature), e.g. carbohydrate-derived sweeteners, **stevioside**, **thaumatin**, **glycyrrhizin**, or artificial (produced by organic synthesis and not present in nature), e.g. **sucralose**, **aspartame**, **acesulfame K**, **cyclamates**, **saccharin**.

**Sweet limes**  **Citrus fruits** produced by **Citrus limetoides** or **C. lumia**. Peel is greenish to orange-yellow when the fruits are ripe. The juicy pulp is pale yellow in **colour**, with a non-acid, faintly bitter **flavour**. Eaten out of hand, cooked or preserved. Peel is a source of essential oils with a strong **aroma** of **lemons**. Sometimes confused with the sweet lemon (**C. limetta**).

**Sweet potatoes**  Common name for edible tubers of **Ipomoea batatas**. Vary in shape and **colour** of skin and flesh. Rich in **vitamin C**, orange- and yellow-fleshed cultivars contain high levels of **carotenes**. Eaten cooked in the same way as **potatoes**. Also a good source of **starch** and can be fermented to produce **alcohol**.

**Sweet potato starch**  **Starch** isolated from tubers of **sweet potatoes**, **Ipomoea batatas**. Used as a food starch in **noodles**, and also in the manufacture of **starch syrups**, **glucose**, isomerized **glucose syrups**, lactic **beverages** and a range of other food products. Used in Japan for production of **shochu** (a distilled spirit). Granules vary from 4 to 40 µm in size.

**Sweet proteins**  **Proteins** which are perceived as having a sweet **flavour**, generally thousands of times sweeter than **sucrose**. Used as **sweeteners**, they are non-glycaemic so are suitable as ingredients of **diabetic foods**. Also suitable for use in low **sugar foods** and **low calorie foods**. Include various fruit proteins such as **curculin**, **brazzein**, **mabinlin**, **mo-nellin**, **neoculin** and **thaumatin**, as well as **egg whites lysozymes**.

**Sweets**  Small shaped pieces of **confectionery**, which are usually made with **sugar** or **chocolate**.

**Sweet sorghum**  Varieties of sorghum, *Sorghum bicolor* (L.) Moench, that are sweet and juicy. A tropical, drought-resistant grass crop with a sweet, juicy stalk from which **sugar** and **syrups** are manufactured.

**Swelling**  Increasing in size or volume due to any addition or uptake, for example uptake of a liquid or gas into a gel or solid, or to expansion.

**Swine**  Wild or domesticated omnivorous mammals belonging to the Suidae family; they include **pigs** and **wild boars**. Swine are farmed or hunted for the production of **bacon**, **ham**, **pork**, edible **offal** and other products. Different gender and age groups of swine are known as boars (adult entire males), barrows, hogs or bars (adult castrated males), sows (adult females after producing their first litter of piglets), gilts, hogs, ylts (young sexually mature females to the end of their first pregnancy) and piglets or piglings (sexually immature animals, usually <10 weeks old).

**Swine fever**  An infectious, notifiable viral disease of **swine**. Although it is caused by an RNA virus, *Salmonella* Cholerae suis and *Pasteurella multica* are commonly involved in the aetiology of the disease. Swine fever is characterized by a refusal to eat, fever, foul-smelling diarrhoea, distressed breathing, discharge from the eyes and general weakness. The disease may take an acute or chronic form. If swine are slaughtered in the incubative stage and **carcasses** are chilled immediately, the **viruses** can persist in **bone marrow**, frozen **pork** and **bacon**. Consequently, the disease may be transmitted to healthy animals if they are fed on **offal**, slaughterhouse wastes or waste food prepared from infected animals. Outbreaks of such **animal diseases** are controlled by animal slaughter, burning or burial of infected carcasses, and restriction of transportation and export of swine and swine products.

**Swine kidneys**  **Kidneys** from **swine**; they are a part of edible **offal**. Swine kidneys have a strong **flavour**, and are commonly used to add richness to **pates** and **terrines**.

**Swine livers**  **Livers** from **swine**; they are a part of edible **offal**. Swine livers are strongly flavoured, dark in **colour** and may have a meaty **texture**. Commonly, they are cooked by braising or are minced for use in **liver sausages**, **pates** and **terrines**.

**Swine muscles**  Alternative term for **pork**.

**Swine skin**  **Skin** from **swine**. The skin has a high content of soluble **collagen**. A large proportion of swine skin is used to prepare **gelatin** and **aspic** prod-
Swiss chard

Common name for a type of Beta vulgaris. Member of the beet family that is grown for its large leaves, which are eaten as leafy vegetables in a similar way to spinach. Can also be used raw in salads, or incorporated into savoury dishes and stuffings. Rich in vitamin A, vitamin C, potassium and iron. Also known as leaf beet, white beet, silver beet and spinach beet.

Swiss cheese

A pale yellow cheese with large holes and a slightly nutty flavour that is made in Switzerland, e.g. Emmental cheese and Gruyere cheese. Also a US term for any hard cheese that contains relatively large bubbles of air.

Swiss rolls

Thin sponge cakes which are covered on one side with jams and rolled into cylinders. Called jelly rolls in the USA.

Sword beans

Seeds produced by Canavalia gladiata. Used in a similar way to jack beans.

Swordfish

Large marine fish species (Xiphias gladius) with a long, flat, sword-like bill; found in tropical and temperate waters around the world. A commercially important food fish. Red flesh tends to be firm-textured with a mild flavour. Marketed fresh (whole, gutted or steaks) and frozen. Liver oils are used as a source of vitamins.

Syagrus

Genus of palms. Fruits of some species are used as food; seeds are the source of palm oils.

Symbiotic foods

Novel foods containing a combination of prebiotics (e.g. oligosaccharides) and probiotic microorganisms.

Synechococcus

Genus of unicellular cyanobacteria of the order Chroococcales. Generally found in marine habitats, but can also survive hypersaline environments and hot springs. Produce phycocyanin, and are sometimes grown in bioreactors for the production of this and other commercially useful pigments.

Synechocystis

Genus of cyanobacteria of the order Chroococcales. Used in biotechnology for the industrial production of enzymes, vitamin E and carotenoids.

Syneresis

Contraction of a substance, usually a gel, when allowed to stand, and the resulting exudation of liquid from the gel. Control of syneresis is a key step for increasing curd yield and improving cheese quality. Also important for yoghurt quality. Syneresis depends on a combination of specific and nonspecific interactions at the protein level, many of which also occur during curd formation.

Syringic acid

Phenolic isoflavone with radical scavenging activity and antioxidative activity. Found in various foods and beverages, including soy products, alcoholic beverages and olive oils. Has also been shown to possess antibacterial activity.

Syrups

Aqueous solutions of sugars or starch hydrolysates, for example fruit syrups.
**2,4,5-T** Herbicide which has been used to control weeds among a range of fruits, vegetables and cereals. Also known as 2,4,5-trichlorophenoxyacetic acid. Listed by WHO as obsolete.

**Table grapes** Species of grapes grown for eating as opposed to vinemaking or drying. They are seeded or seedless fruits of the genus *Vitis*, the most important species of which is *V. vinifera*. While most grapes are grown as vinemaking grapes, significant amounts are produced as table grapes. Table grapes have a firmer flesh and lower level of acidity than vinemaking grapes. All grapes are rich in sugar, but contain little vitamin C. Organic acids include tartaric acid and malic acid in approximately equal amounts. Black grapes contain anthocyanins. Table grapes are eaten out of hand, or used in salads, pies and other desserts.

**Table jellies** Fruit flavoured sweetened desserts set with gelatin or similar gelling agents. Known as jello in the USA.

**Table olives** Olives from suitable varieties of the olive tree which have been processed to make them edible. Debittering treatment is an important stage in table olive production because the presence of the bitter glycoside oleuropein in raw olives renders them unpalatable. Processing may also be required for preservation purposes, enabling olives to be stored for long periods and consumed as required. Processing methods include fermentation and/or curing in oils, water, brines or salt. Olives may also be flavoured by soaking in marinades or by stuffing. Only the highest quality fruit are processed as table olives, taking into account factors such as variety, size, ripeness and damage. Rejected fruit, e.g. small, misshapen or damaged olives, can be used for the production of olive oils. Green olives are harvested early in the ripening period and natural black olives are late harvested.

**Tacos** Pancakes made from corn flour which are filled with meat mince, cheese or beans, together with piquant sauces, before being fried.

**Taco shells** Crisp food products made from corn masa dough which are shaped into thin discs and formed into a U-shape before being fried. Often filled with cooked beef mince and sauces and topped with shredded lettuce and grated cheese.

*Taenia* Genus of parasitic tapeworms of the class Cestoda. *Taenia solium* is associated with pork, while *T. saginata* is associated with beef. Infection in humans is usually transmitted by eating raw or undercooked beef or pork.

**Tagatose** Ketose monosaccharide comprising six carbon atoms (hexoses); an isomer of galactose. Has sweetness similar to that of sucrose but no calorific value, making it suitable as a low-calorie sweetener and bulking agent. Formed by bacterial fermentation using galactitol as substrate or produced from lactose via isomerization of galactose.

**Tagliatelli** Pasta formed into narrow flat ribbons.

**Tahini** Paste made from ground sesame seeds. Used as an ingredient of humous and also as the base for sauces.

**Taints** Sensory properties relating to the perception of off flavour or off odour in a product. Taints in foods can be related to, for example, warmed over flavour in ready meals or boar taint in pork products.

**Take away foods** Cooked dishes, often fast foods, which are sold at restaurants or other catering outlets for consumption off the premises.

**Takju** Rice wines manufactured in Korea.

**Talaromyces** Genus of fungi of the family Trichocomaceae. Anamorphs include *Penicillium* and *Paeclomycyes* spp. Occur in soil and decaying plant material. Some species (e.g. *Talaromyces flavus*) may cause spoilage of fruits and fruit juices. A range of enzymes is produced by many species of this genus, e.g. *T. stipitatu* produces feruloyl esterases and xy- lan degrading enzymes, *T. emersonii* produces xy-lan-degrading enzymes, α-glucuronidases and endo-1,3(4)-β-glucanases, and *T. thermophilus* produces β-galactosidases.

**Taleggio cheese** Italian semi-soft cheese made from cow milk. Also known as Stracchino. Flavour is buttery and fruity. Rind is pinkish-grey and the interior is white. Ripening lasts 25-50 days. Also produced as a cooked curd variety that is firmer and simi-
lar to mozzarella cheese. Taleggio is an excellent dessert cheese.

**Tallow** Solid animal fats normally derived from cattle or sheep tissue, containing high levels of saturated fatty acids and monounsaturated fatty acids (triglycerides of stearic acid, palmitic acid and oleic acid). White, flavourless, odourless and solid at room temperature. Usually prepared by heating suet under pressure in closed vessels. Used for frying and in shortenings.

**Tamales** Concentric layered corn products, traditionally produced in Mexico. Some tamales include seasoned meat, for example beef tamales, but others are prepared without meat, for example green tamales.

**Tamarillos** Fruits produced by Cyphomandra betacea. Skin is yellow to deep red in colour, while the flesh varies from yellow-orange to purple. Contains numerous seeds. Rich in potassium and carotenes, with moderate amounts of vitamin E and vitamin C. Best eaten cooked, with the bitter tasting skin removed. Used in a range of products, including sauces, chutneys and relishes. Also known as tree tomatoes.

**Tamper evident closures** Closures designed to ensure that any unauthorized interference is evident.

**Tamper evident packaging** Packaging designed to ensure that any unauthorized interference is evident.

**Tangelo** Citrus fruits that are a cross between tangerines and oranges. Similar in flavour to oranges, but contain many seeds.

**Tania** Common name for Xanthosoma sagittifolium, the corm of which is processed in a similar way to taro. Nutritional similarity to taro also, although the starch is more difficult to digest. Sometimes used as the base for preparation of fufu. Also known as tannia, taniers, yautia or new cocoyams.

**Taniers** Alternative term for tania.

**Tanks** Large storage chambers or containers, particularly for gases or liquids. In the dairy industry, bulk milk cooling tanks are used for cooling and holding raw milk after collection.

**Tannases** EC 3.1.1.20. Esterases which catalyse the breakdown of hydrolysable tannins and gallic acid esters. Used in the manufacture of teas and other beverages, including wines and fruit juices. Also used to produce gallic acid and to remove unwanted tannins from foods and food processing wastes and effluents.

**Tannic acid** Polyphenol which displays antimitagenicity, anticarcinogenicity and antioxidative activity. Used as a food additive, a clarifying agent and a refining agent, but may inhibit the absorption of dietary iron.

**Tannins** Complex polyhydroxybenzoic acid derivatives found in many foods. Antinutritional factors inhibiting the bioavailability of vitamins and minerals, and may be carcinogenic. However, also possess antimicrobial activity, antioxidative activity and antitumour activity.

**Tanol** Thin Middle Eastern leavened flat bread made from high-extraction wheat flour.

**Tansheng** Common name for Salina miltiorrhiza, the roots of which are used widely in Chinese herbal medicine. Extracts display antitumour activity, antimitagenicity and antioxidative activity. Also known as dan shen.

**Tansy** Common name for Tanacetum vulgare, the leaves and tops of which are used as herbs with a bitter flavour. Leaves are used in preparation of herb tea, salads and herb stuffings. Tansy essential oils and extracts contain significant amounts of the toxin α-thujone. Only α-thujone-free tansy oils are permitted as food additives and their use is limited to alcoholic beverages.

**Tape** Indonesian alcoholic fermented foods made by inoculating steamed glutinous rice or mashed cassava with a combination of starters, and incubating in airtight containers. Tape (alternatively termed...
tapai (made with glutinous rice) is called tape ketan, and that made with mashed cassava is called tape ketela. Products have spongy texture and mild, sweet, wine-like aroma and flavour. Eaten as snack foods.

**Tapeworms**

Tape ketan  
Indonesian alcoholic fermented foods (general name tape) made by inoculating steamed glutinous rice with a combination of starters, and incubating in airtight containers. Eaten as snack foods.

**Tape ketela**  
Indonesian alcoholic fermented foods (general name tape) made by inoculating mashed cassava (also known as peuyeum) with a combination of starters, and incubating in airtight containers. Eaten as snack foods.

**Tape worms**  
Parasitic worms of the class Cestoda. As adults they live in the intestines of vertebrates and as juveniles they often live in the bodies of various animals. Species infecting man include Hymenolepis nana, Taenia solium (particularly from pork), Taenia saginata (particularly from beef) and Diphyllobothrium latum (from raw fish). Tapeworm infection can be asymptomatic, or may generate symptoms including increased appetite, weight loss, diarrhoea, constipation and abdominal discomfort. Cysticercosis, a complication of Taenia solium infection, may occur when larvae develop outside of the intestinal tract.

**Tapioca Starch**  
Extracted from tubers of cassava (Manihot esculenta). Also called cassava starch.

**Tapioca starch**  
Alternative term for tapioca.

**Tap water**  
Water supplied to consumers via the water mains system; usually suitable for use as drinking water.

**Tarag**  
Asian fermented milk of a variety of species.

**Tara gums**  
Gums obtained from seeds of the tara tree (Caesalpinia spinosa) by grinding of the endosperm. Composed mainly of galactomannans, on average there are 3 mannose residues to every 1 galactose residue. Used as stabilizers and thickeners.

**Tarama**  
Fermented fish product containing fish roes (usually from carp) mixed with salt, breadcrumbs, feta cheese, olive oils and lemon juices.

**Tarhana**  
Traditional Turkish version of kishk, a fermented wheat flour-yoghurt mixture used in soups. The Greek version of kishk is known as trahanas.

**Taro**  
Common name for Colocasia esculenta or C. antiquorum. The corm is eaten cooked; if not well enough cooked, irritation of the mouth results due to oxalate crystals. Used as a vegetable, in soups and stews, processed to make fufu or fermented to produce pol. Subsidiary corms (cormels), known as eddo in China and Japan, and leaves are also eaten. Taro is a good source of potassium and fibre. Leaves contain carotenes and are rich in vitamin C.

**Tarragon**  
Common name for Artemisia dracunculus, the leaves of which have a sweet, mild anise-like flavour and are used as spices. The predominant flavour compound is estragole, also known as p-allylanisole and methyl chavicol. Tarragon is used in flavourings for foods such as meat and meat products, flavoured vinegar and pickles. Leaf essential oils are extracted and also used as flavourings. Also known as estragon.

**Tartaric acid**  
Organic acid present in fruits and isolated from potassium tartrate films produced as a by-product in winemaking. Tartaric acid, as well as sodium and calcium tartrates, have many uses as food additives, including as flavourings (acidulants) imparting a fruity flavour, humectants, antioxidants, sequestrants and as part of a pH buffering system. Tartaric acid is also a substrate for production of the raising agent, cream of tartar (potassium hydrogen tartrate) which is an ingredient of baking powders. Systematic name is 2,3-dihydroxybutanedioic acid.

**Tartrates**  
Salts of tartaric acid. Crystallization of tartrates in wines is a problem, since the wines are then generally considered unacceptible by consumers.

**Tartrazine**  
Synthetic bright yellow pyrazole dye used in artificial colorants for foods and beverages. In aqueous solution, tartrazine shows high stability when exposed to acids and alkalis, moderate stability to light and heat (stable at extrusion and baking temperatures) and poor stability in the presence of ascorbic acid. Synonymous with FD&C Yellow 5 and CI 19140.

**Tarts**  
Open pastry cases made with shortcrust pastry, which are frequently baked blind (or empty) and then filled with sweet fillings such as fruits, jams or custards, or sometimes savoury mixtures, e.g. cheese or vegetables.

**Taste**  
Sensation produced by stimulation of the taste buds on the tongue. The tongue can distinguish five separate tastes (sweet, salt, sour, bitter and savoury/umami). Often used as an alternative term for flavour.

**Taste panels**  
Groups of individuals, untrained or trained, used to sample products and assess their flavour, with a view to providing an insight into consumer preferences. Taste panels are used in research, product development and for purposes of evaluating new and competitive products, and are not restricted to evaluating flavour. Texture, colour and many other quality factors can be measured meaningfully.
**Taste thresholds**

Alternative term for **flavour thresholds**.

**Taurine** Aminosulfonic acid synthesized from **cysteine** and **methionine**. Abundant in **animal proteins** but is not found in **vegetable proteins**. Hence, vegetarians with insufficient cysteine and methionine intakes may have difficulty producing taurine.

**Taxonomy** Study of the theory, practice and rules of classification and nomenclature of living and extinct organisms. The principles of taxonomy were established in the 18th century by the work of Linnaeus. As far as possible, organisms are arranged into a hierarchy of groups (called taxa) based on degrees of relationship (phylogeny). When knowledge of the evolution of a group is lacking, taxonomy is based on structural and other similarities. Under the Linnaean system, an organism is classified according to a hierarchical system as follows: kingdom, phylum, class, order, family, genus, species.

**TBA reactive substances** Abbreviation for thiobarbituric acid reactive substances (TBARS). Name applied jointly to **malonaldehyde** and the other substances formed during lipid oxidation, as measured in terms of **thiobarbituric acid values** (TBA values) determined from reaction with thiobarbituric acid (TBA). TBARS values are expressed as mg malonaldehyde equivalents per kg of sample. Care must be taken when comparing TBARS values between different studies because of the many variations that have been developed for performing the TBA test.

**TBARS** Abbreviation for **TBA reactive substances**.

**TBA values** Abbreviation for **thiobarbituric acid values**.

**TBHQ** Abbreviation for **tert-butylhydroquinone**.

**TDE** Persistent non-systemic organochlorine insecticide used to control a wide range of **insects**. Use on **crops** has generally been displaced by less persistent **insecticides**. Can occur as a degradation product of **DDT**. Classified by WHO as moderately hazardous (WHO II). Also known as DDD.

**Tea** Hot or cold **beverages** made by infusion of dry, prepared leaves of **Camellia sinensis** in water. The main types are **black tea**, in manufacture of which the fresh **tea leaves** have undergone **fermentation** before **drying**, and **green tea**, in which the fresh tea leaves have not undergone this fermentation. **Oolong tea** and **pouchong tea** have undergone partial **fermentation**, and are intermediate in character between green and black teas.

**Tea bags** **Tea** packaged in small portion-size permeable bags for easy preparation of **tea beverages**.

**Tea beverages** Hot or cold **beverages** prepared from **tea leaves** or infusions.

**Tea granules** **Instant tea** products comprising **granules** of dry tea extracts which are reconstituted into **tea beverages** on addition of water.

**Tea leaves** Fresh or processed leaves of the tea plant, **Camellia sinensis**.

**Tea powders** **Instant tea** products comprising powdered dry tea extracts which are reconstituted into **tea beverages** on addition of water.

**Teas** Hot or cold **beverages** prepared by infusion of dry plant leaves, flowers or other plant parts. The type usually referred to as **tea** is made from the leaves of **Camellia sinensis**; other types include **mate**, **roobos tea**, **honeybush tea** and a wide range of types of **herbal tea** and **fruit tea**.

**Tea seed oils** **Vegetable oils** extracted from the seeds of tea species such as **Thea sasangua** or **Camellia oleifera**. Used as **salad oils** and **cooking oils**.

**Tea tree oils** **Essential oils** distilled from leaves of **Melaleuca alternifolia**, a tree native to Australia and certain parts of Asia. Major constituents of the oils are terpinen-4-ol, **1,8-cineole** and **γ-terpinene**. The oils have a warm, spicy **flavour**. Tea tree oils exhibit **antimicrobial activity** and are used as an antiseptic. Although more commonly used for their therapeutic properties, tea tree oils are also used as food **flavourings**, including as a substitute for **nutmeg**.

**Tebuconazole** One of the triazole **fungicides**. Also known as Folicur. A broad spectrum, systemic fungicide used as a seed treatment for control of fungal infections of **barley**, **oats** and **wheat**, for prevention of **Fusarium** head blight on wheat crops and as a foliar spray for preharvest treatment of **fruits** and **vegetables**. Considered by the United States Food and Drug Administration to be safe, but listed as a potential carcinogen in the United States Environmental Protection Agency Office of Pesticide Programs Carcinogen List. Classified by WHO as slightly hazardous (WHO III).

**Technetium** Metallic element with the chemical symbol Tc.

**Tecto** Alternative term for **thiabendazole**.

**Teff** Tropical **millet**, **Eragrostis abyssinica** or **E. tef**, which is native to northeastern Africa and southeastern Arabia and is used as a cereal crop and livestock feed. Used to make the traditional flat **bread**, **injera**.

**Teherine** **Pastes** made from ground, dehulled, dry roasted **sesame seeds**.

**Teleme cheese** Greek **soft cheese** prepared from **ewe milk** or **cow milk**. Now also made in California, USA. Similar to **Brie cheese**, with a tangy flavour that develops as the cheese ages.
Tempeh

**Telemetry** Process of transmitting readings from instruments or measurements by radio or a telecommunication link.

**TEM** Abbreviation for transmission electron microscopy.

**Temephos** Non-systemic insecticide used primarily for control of mosquito and midge larvae and certain aquatic insects in urban and agricultural environments. Also used for controlling lice on animals (including humans). Residues may contaminate water supplies. Classified by WHO as unlikely to present acute hazard in normal use. Also known as abate.

**Temik** Alternative term for the insecticide aldicarb.

**Temp. abuse indicators** Devices used to give an indication of whether products have been exposed to inappropriate temperatures that could cause damage during transport, distribution or storage. For example, indicators can be used to show whether frozen foods have been thawed during handling or storage; thawing during distribution can potentially affect quality and safety. Indicator devices often produce a visible, irreversible colour change to show when temperature abuse has occurred. Microbial indicators may also be used to detect exposure to temperature abuse, especially in animal carcasses. For example, poultry products that have been maintained at the correct temperature will have fairly constant counts of coliforms, while those that have been warmed will have higher counts.

**Tempe** Alternative term for tempeh.

**Tempeh** Product generally made by fermentation of soybeans, sometimes mixed with cereals. Used as meat extenders or meat substitutes. Cooked in a variety of ways or added to dishes such as sauces, soups and casseroles. Some types of tempeh are made from other materials, e.g. bongkrek is made by fermentation of presscake of coconuts or coconut milk residue.

**Temper** Measure of the degree of crystallization of cocoa butter in chocolate and the type of crystals present.

**Temperature** Degree or intensity of heat present in a substance or object or its surroundings, usually measured using thermometers.

**Tempering** Stabilization of chocolate by application of a melting and cooling process. Chocolate is tempered to stabilize the cocoa butter, a fat that can form crystals and cause bloom in the finished product. The classic tempering method includes the following stages: melting of the chocolate; working two-thirds of the melted chocolate on a marble slab with a metal spatula until it becomes thick; transferring the thickened chocolate back into the remaining melted chocolate; and reheating the product.

**Tempura** Japanese dish prepared from vegetables, fish or shellfish, fried in batter.

**Tenox** Registered trade name for a series of natural and synthetic antioxidants manufactured by Eastman Chemical.

**Tensile strength** Measurement of surface tension.

**Tenuazonic acid** Mycotoxin produced mainly by Alternaria alternata growing on foods (e.g. fruits, vegetables and cereals).

**Tepary beans** Seeds produced by Phaseolus acutifolius, a plant that grows well under drought conditions. Vary greatly in shape and colour. Dried seeds are soaked before cooking or are ground into meal. Pinto beans may be substituted for tepary beans in recipes.

**Tequila** Mexican spirits made by distillation of fermented sap of the agave plant.

**Teratogenesis** Process leading to developmental abnormalities in the fetus.

**Teratogenicity** Capacity of a substance to produce teratogenic effects, i.e. to cause developmental abnormalities in the fetus.

**Teratogenicity** Capacity of a substance to produce teratogenic effects, i.e. to cause developmental abnormalities in the fetus.
Terbuthylazine Broad-spectrum triazine herbicide used for pre- or post-emergence control of weeds around a range of food plants. Classified by WHO as unlikely to present acute hazard in normal use.

Terfezia Genus of edible fungi including desert truffles and the poor man’s truffle.

Termitomyces Genus of edible fungi.

Terpenes Unsaturated hydrocarbons consisting of isoprene units found in many higher plants and essential oils. Typically, volatile compounds with pleasant odours used as flavourings. Terpenes are major components of citrus essential oils but, since they are not responsible for the characteristic flavour and readily oxidize and polymerize to produce unpleasant flavours, they are generally removed by distillation or solvent extraction.

Terpenoids Volatile compounds found in plants and essential oils which are important for flavour. Certain terpenoids exhibit antioxidative activity, antitumorigenicity and antimutagenicity.

Terpinene Flavour compounds found in plants and essential oils that have been found to inhibit food spoilage yeasts.

Terpineol Monocyclic monoterpenic alcohol used in flavourings. Found naturally in essential oils, citrus juices and wines, and can be produced by microbial transformation of limonene.

Terpinyl acetate Flavour compound with antifungal activity that is found in essential oils.

Terramycin Synonymous with oxytetracycline.

Terrines Foods, particularly pates, which are cooked and served in earthenware tureens (or terrines). A pate made in this way is also referred to as pate en terrine.

Terroir Total environment in which a grapevine is grown for the purpose of producing winemaking grapes. Includes a great many factors, including soil, climate, location and cultivation conditions.

tert-Butylhydroquinone Commonly abbreviated to TBHQ. An antioxidant used in foods, including meat products, vegetable oils, potato crisps and cereal products.

Testosterone Male sex hormone produced by the interstitial cells of the testis of mammals. Used to promote muscular development in certain animals.

Tetilla cheese Spanish semi-soft cheese made from cow milk. Rind is pale yellow and ridged. The cheese has a fresh lemony flavour and a creamy consistency; fat content is 25%. Ripening is completed in 2-3 weeks.

Tetrachlorodibenzo-p-dioxins Potent toxins released into the environment from, for example, industrial sources that can then find their way as contaminants into the food chain.

Tetrachloroisophthalonitrile Alternative term for the fungicide chlorothalonil.

Tetrachloromethane Synonym for carbon tetrachloride. Organic halogen compound and versatile organic solvent whose use has diminished since the discovery that it is carcinogenic. May be used in fumigants. Can occur as a contaminant of treated drinking water.

Tetracyclines Broad-spectrum antibiotics widely used in animals both for prevention and treatment of disease, and as feed additives to promote growth. Distribution is rapid and wide following administration, and residues may persist in some tissues. Tolerance values are specified for meat, livers, kidneys, animal fats, milk and eggs. Commonly used examples include chlortetracycline and oxytetracycline.

Tetradenf Non-systemic contact acaricide used to control plant eating mites on a wide range of fruits and vegetables, hops and tea. Classified by WHO as unlikely to present acute hazard in normal use.

Tetragenococcus Genus of lactic acid bacteria of the family Enterococcaceae. Includes the species Tetragenococcus halophilus, which is used in the fermentation of soy sauces and miso.

Tetrahydrofolate Biochemically active form of folic acid. Coenzyme of various reactions involved in the metabolism of amino acids, purines and pyrimidines. Many foods are rich in folates, including green leafy vegetables, livers, fruits and yeast extracts.

Tetrahydrophthalimide Primary degradation product of the fungicide captan.

Tetrazoles Group of organic nitrogen compounds derived from tetrazole, a synthetic organic heterocyclic compound comprising four nitrogen atoms and a single carbon atom. Dihydroxyphenoxyl-1H-tetrazoles and their salts have been investigated as non-nutritive artificial sweeteners.

Tetrodotoxin Highly toxic and potentially lethal neurotoxin found in many species of pufferfish. Produced by bacteria which colonize the fish. Responsible for poisoning caused by consumption of contaminated pufferfish.

Texture Sensory properties relating to the feel of a surface or product, or the impression created by a surface structure or the general physical appearance of a surface. A major factor affecting the mouthfeel and quality of a food.

Textured vegetable proteins Plant protein products that are shaped and textured to form particles, or shaped pieces, such as chunks and strips, usually by spinning or extrusion technology. Typically formulated with added colorants and flavourings, and
Texture profile analysis

used as meat substitutes. Soy proteins are most commonly used, although other proteins, such as wheat gluten, can also be used. Commonly abbreviated to TVP.

Texture profile analysis Analysis of the texture of a food in terms of mechanical properties, geometrical characteristics, and fat and moisture contents, at specific points during the mastication process.

Texturization Process by which sensory properties of a substance are altered, e.g. to produce a particular feel, appearance or consistency.

Texturizers Additives that improve the texture of foods. Examples include gums, hydrocolloids and polydextrose, used as fat substitutes to add body to low fat foods and calcium chloride, which is added to canned fruits and vegetables to maintain firmness of the product.

Texturizing agents Substances which act as texturizers, improving the texture of foods.

Texturometers Devices used to measure texture properties of foods, by analysis of physical attributes such as hardness, cohesiveness and crush resistance.

Thaumatin Non-nutritive natural sweeteners isolated from fruits of Thaumatococcus daniellii, a plant native to West Africa. The sweet flavour of T. danielli fruits is attributed to two sweet proteins of approximately 22 kDa, designated thaumatin I and II. Both thaumatin proteins are approximately 1000-2000 times as sweet as sucrose (weight for weight). Commercial thaumatin preparations are complexed with aluminium to improve their stability. Thaumatin is soluble in water and alcohols and is synergistic with ascorbic acid and saccharin. Aqueous solutions of the sweetener have high thermal stability and are stable over the pH range 2-10. However, factors which influence thaumatin structure, e.g. reducing agents, affect its sweetness. Although used as a sweetener, thaumatin has a liquorice-like aftertaste. It is commonly used in flavour enhancers, e.g. in chewing gums. Synonymous with katemfe and sold under the trade name Talin.

Thawing Transition of an item from a frozen to an unfrozen state.

Theaflavins Flavanoids which contribute significantly to the colour and flavour of black tea, and are used as markers of quality. Possess antitumour activity and antioxidative activity.

Theanine Amino acid found in tea. As well as improving the flavour of tea, theanine has a relaxing effect, improves learning ability and lowers blood pressure. Has also been found to help prevent D-galactosamine-induced liver injury in rats.

Thearubigins Flavonoid pigments found in tea which contribute to the flavour, depth of colour and body.

Theobromine Purine alkaloid similar to caffeine that is found in cocoa, chocolate, soft drinks and tea. Acts as a stimulant and may be toxic.

Theophylline Purine alkaloid that contributes to the flavour of and is used as a marker of quality in tea, coffee, soft drinks and chocolate. Acts as a stimulant.

Therapy Treatment of diseases. Includes diet therapy and immunotherapy.

Thermal capacity Thermophysical properties relating to the extent to which a material can retain heat.

Thermal conductivity Thermophysical properties relating to the rate of conduction of heat through a material, measured in Joules per second per metre per Kelvin.

Thermal diffusivity Thermophysical properties relating to the extent to which an item diffuses or spreads heat throughout its mass.

Thermal expansion Increase in size (e.g. length, volume, surface area) of a body in response to heating. For liquids, expansivity observed directly is called the apparent expansivity, as the container holding the liquid will have expanded also with the rise in temperature. Absolute expansivity is the apparent expansivity plus the volume expansivity of the container.

Thermal processes Processes involving heating that are used to produce desirable changes in products, such as protein coagulation, starch swelling, textural softening and formation of aroma compounds. Undesirable changes can also occur with application of thermal processes, such as loss of vitamins and minerals, and loss of fresh appearance, flavour and texture. Examples of thermal processes used in the food industry are: HTST processing; LTLT processing; electric heating; ohmic heating; microwave heating; and blanching.

Thermal processing Application of heating methods to the processing of foods. Techniques in the category include: HTST processing; LTLT processing; electric heating; ohmic heating; microwave heating; and blanching.

Thermal properties Properties that influence the heating rate and response to heating of a material.

Thermal stability Thermophysical properties relating to the ability of materials to maintain stability when subjected to various temperatures of applied heat. If food ingredients or additives are heat stable, it is possible for them to be used successfully in prod-
The production of heat, particularly Thermogenesis.

**Thermodynamics** Thermophysical properties

**Thermocouples** Devices for measuring or sensing a temperature difference, consisting of two wires of different metals connected at two points, between which a voltage is developed in proportion to any temperature difference.

**Thermodynamic properties** Thermophysical properties which relate to the response of systems to changes in temperature, pressure and volume.

**Thermogenesis** The production of heat, particularly within the body by physiological processes. Can be classified into exercise-associated thermogenesis and non-exercise-associated thermogenesis. May occur through the uncoupled oxidation of fatty acids by brown adipose tissues or shivering.

**Thermogravimetric analysis** Alternative term for gravimetry.

**Thermoluminescence** Luminescence produced by heating a solid substance. Caused by emission of photons of light by free electrons and holes trapped in the solid.

**Thermistors** Semiconductors used for measuring temperature on the basis that their electrical resistance decreases with increasing temperature.

**Thermization** Heat treatment of foods at a temp. lower than that used for pasteurization, with an upper limit of about 65°C for 20 s. Thermization is less severe for the product and associated microorganisms than pasteurization.

**Thermoanaerobacter** Genus of anaerobic, rod-shaped, thermophilic Gram positive bacteria of the Thermanaerobacteraceae family. Some species are used in the production of thermostable proteinases and other enzymes.

**Thermoanaerobacterium** Genus of anaerobic, rod-shaped, thermophilic Gram positive bacteria belonging to the Thermanaerobacteraceae family. Some species (e.g. *Thermoanaerobacterium thermosaccharolyticum*) are used in the production of thermostable proteinases and other enzymes.

**Thermococcus** Genus of archaea of the Thermococcales family. These hyper-thermophiles have biotechnological potential for production of enzymes with good thermal stability, including glycosidases and proteinases.

**Thermocouples** Devices for measuring or sensing a temperature difference, consisting of two wires of different metals connected at two points, between which a voltage is developed in proportion to any temperature difference.

**Thermodynamic properties** Thermophysical properties which relate to the response of systems to changes in temperature, pressure and volume.

**Thermogenesis** The production of heat, particularly within the body by physiological processes. Can be classified into exercise-associated thermogenesis and non-exercise-associated thermogenesis. May occur through the uncoupled oxidation of fatty acids by brown adipose tissues or shivering.

**Thermogravimetric analysis** Alternative term for gravimetry.

**Thermoluminescence** Luminescence produced by heating a solid substance. Caused by emission of photons of light by free electrons and holes trapped in the solid.

**Thermolysins** EC 3.4.24.27, formerly 3.4.24.4. Neutral, heat-stable metalloendopeptidases produced by *Bacillus thermoproteolyticus*, containing 1 zinc ion and 4 calcium ions. Most heat-stable proteinases available commercially, remaining active at temp. up to 80°C.

**Thermometers** Instruments for measuring and indicating temperature, typically consisting of a graduated glass tube containing mercury or alcohol which expands when heated and contracts when the temperature falls. Thermometers are tailored for different purposes. For example, specific instruments are available for use during the manufacture of sugar confectionery or cooking of meat (to ascertain that the meat has reached the desired degree of doneness), and also for temperature monitoring in freezers, refrigerators and ovens.

**Thermomonospora** Genus of aerobic, thermophilic, filamentous Gram positive bacteria of the family Thermomonomosporaceae. Occur in soil and compost. Some species may be used in the production of thermostable proteinases.

**Thermomyces** Genus of mitosporic fungi of the Ascomycota phylum. Species (e.g. *Thermomyces lanuginosus*) are used in the production of thermostable lipases.

**Thermophiles** Organisms, especially microorganisms, that grow best at relatively high temperatures. Their optimum growth temperature is generally accepted as being above 50°C.

**Thermophilic bacteria** Bacteria that are thermophiles.

**Thermophysical properties** Properties that influence the heating rate and response to heating of a material. Examples of thermophysical properties are thermal conductivity (the ability of a material to conduct heat) and specific heat (the ability of a material to store heat).

**Thermostats** Devices that automatically regulate temperature to a specified value or range, or activate devices at a set temperature.

**Thermotoga** Genus of rod-shaped, hyperthermophilic bacteria belonging to the family Thermotogaceae. *Thermotoga maritima* and *T. neapolitana* metabolize many simple and complex carbohydrates and are a source of a number of enzymes including glycosidases.

**Thermus** Genus of aerobic, rod-shaped or filamentous, thermophilic Gram negative bacteria. Occur in hot springs, hot water tanks and thermally polluted rivers. *Thermus thermophilus* is used in the production of thermostable proteinases. *T. aquaticus* is an extreme thermophile used in the production of a wide
range of thermostable enzymes, such as fructose-bisphosphate aldolases, DNA-directed RNA polymerases, DNA-directed DNA polymerases, alkaline phosphatases and isocitrate dehydrogenases.

**Thiabendazole** A systemic benimidazole fungicide with curative and protective action used to control fungal diseases in fruits, vegetables and cereals. Employed in food preservation, such as in dips for improving the postharvest freshness of fruits. Also used as a broad-spectrum anthelmintic to treat a range of roundworm and cestode infections in livestock. Classified by WHO as unlikely to present acute hazard in normal use. Also known as tecto.

**Thiamin** Synonym for vitamin B1 and vitamin F. Member of the water soluble vitamin B group. Active in the form thiamin pyrophosphate, a coenzyme for decarboxylation reactions in carbohydrate metabolism. Helps to maintain normal nervous system activity and regulates muscle tone of the gastrointestinal tract. Helps to maintain normal nervous system activity and regulates muscle tone of the gastrointestinal tract. Severe deficiency is clinically recognized as beriberi. Thiamin is found in unrefined cereals, beans, meat (especially livers, kidneys, hearts and pork), yeasts, potatoes, peas and nuts. Cooking losses can be as much as 50%.

**Thiamine** Alternative spelling for thiamin.

**Thiamphenicol** Synthetic, broad-spectrum antibiotic (chloramphenicol analogue) used for treatment and control of respiratory and intestinal diseases in livestock, excluding animals producing eggs for human consumption. May also be used in aquaculture. Particularly effective against anaerobes.

**Thiazoles** Volatile flavour compounds found, for example, in cooked meat and beer. May also cause off flavour.

**Thickeners** Additives that increase the viscosity of foods. Unlike gelling agents, do not promote the formation of gels. Gums and starch are important thickeners in the food industry.

**Thickening** Process of making or becoming thicker and usually more viscous. For example, sauces are thickened using corn starch.

**Thickness** As well as relating to consistency and viscosity, this term relates to measurement of the depth of a substance such as backfat on animal carcasses.

**Thidiazuron** Plant growth regulator with defoliation activity; used to stimulate fruit growth in a range of fruits, including apples, grapes and kiwifruit.

**Thielaviopsis** Genus of fungi of the order Microascales, which includes several agricultural pathogens. Species may cause spoilage of fruits and vegetables. Carrots, for example, commonly harbour spores of Thielaviopsis basicola and T. thielavioides on their surface. T. basicola also causes black root rot of carrots.

**Thin layer chromatography** Chromatography technique in which sample components are separated as the sample travels, under the influence of a solvent, up an inert plate coated with a sorbent. Commonly abbreviated to TLC.

**Thin layer drying** A drying technique that involves arrangement of the products to be dried in thin layers in order to optimize moisture transfer. Applied to a range of food particles or slices, particularly plant foods.

**Thinning** In plant cultivation, removal of young plants to allow remaining plants more room to grow, or removal of selected fruits from a plant so that the other fruits can increase in size.

**Thiobarbituric acid values** Values (commonly abbreviated to TBA values) used for assessing oxidation of lipids in foods and other biological systems, using thiobarbituric acid (TBA). Two molecules of TBA react with one molecule of malonaldehyde to produce a red pigment; the amount of pigment produced is measured using spectroscopy. Extent of lipid oxidation, reported as the TBA value, is expressed as milligrams of malonaldehyde equivalents per kilogram of sample, or as micromoles of malonaldehyde equivalents per gram of sample. The TBA test may be performed directly on the sample, its extracts or distillate.

**Thiocyanates** Alternative term for isothiocyanates.

**Thiodan** Alternative term for the insecticide endosulfan.

**Thioesters** Esters containing sulfur instead of oxygen. Important aroma compounds often added to processed foods. Can be prepared by lipase-catalysed esterification of fatty acids with short- and long-chain thiols.

**Thioglycosidases** EC 3.2.1.147, formerly 3.2.3.1. Glycosidases that hydrolyse S-glycosyl compounds. Have a wide specificity for thioglycosides, forming a thiol and a sugar. Responsible for hydrolysis of glucosinolates in cruciferous vegetables, producing organic sulfur compounds including isothiocyanates, some of which display anticarcinogenicity, but which also impart an undesirable flavour and which may also be toxic. Also known as myrosinases, sinigrinas and sinigrases.

**Thioglycolic acid** Toxic organic acid also known as 2-mercaptoacetic acid, α-mercaptoacetic acid and thiocanic acid.
Thioglycosides Sulfur-containing glycosides found in cruciferous vegetables that show anticarcinogenicity. They are useful as glycosyl donors in the synthesis of complex carbohydrates.

Thiols Compounds containing sulfhydryl groups, i.e. in which the oxygen of an alcohol is replaced with sulfur. These compounds have extremely unpleasant odours.

Thionins Low molecular weight proteins which occur in seeds of several plant species and show antimicrobial activity.

Thiophenates-methyl Systemic fungicide used for control of a wide range of fungal diseases on fruits, vegetables and cereals. Classified by WHO as unlikely to present acute hazard in normal use. Also known as methylthiophanate and Pelt 44. Thiophanate-methyl is also used for production of PUFA.

Thiophenes Sulfur-containing volatile compounds that contribute to the flavour of many foods and beverages.

Thioredoxin Small, widely distributed, dithiol protein with antioxidative activity. Facilitates reduction of disulfide bonds in food proteins to sulfhydryl groups, reducing their allergenicity and increasing their digestibility by trypsin and pepsins. Used as an ingredient in functional foods. Ingestion of isothiocyanates from cruciferous vegetables can increase thioredoxin expression in mammals, leading to reduced oxidative stress.

Thiouracil Drug which inhibits production of thyroid hormones and results in increased water retention in muscle tissue. Sometimes used illegally to increase meat yield in animals.

Thiourea Organic nitrogen- and sulfur-containing compound, molecular formula (NH₂)₂CS. Structurally similar to urea, with S replacing the O atom. Widely-used industrially, and can occur as an environmental contaminant in water supplies. Used in the food industry as an analytical reagent and an enzyme inhibitor, particularly with regard to polyphenol oxidases (catechol oxidases). Has moderate radical scavenging activity.

Thiram Protective dithiocarbamate fungicide applied to foliage or as seed treatments in order to control fungal diseases on a wide range of crops. Classified by WHO as slightly hazardous (WHO III). Also known as TMTD.

Thirst A desire or need to drink that is often accompanied by a sensation of dryness in the mouth and throat. Commonly caused by an insufficient intake of fluids.

Thistles Group of plants including many species used as vegetables. Such types include globe artichokes (Cynara scolymus), cardoons (C. cardunculus) and milk thistles (Silybum marianum). Parts which are eaten include flowers, leaves, stems and seeds. Extracts of dried cardoon flowers are used as vegetable rennets in cheesemaking.

Thixotropy Property of a material that enables it to stiffen in a relatively short time on standing, while, upon agitation or manipulation, it can change to a very soft consistency or to a fluid of high viscosity, the process being completely reversible.

Thomson's gazelles Swift-running, graceful African antelopes that may be shot or snared for food use. Thomson's gazelles (Gazella thomsoni) are similar in appearance to Grant's gazelles, but are smaller and yield less meat when dressed.

Thraustochytrium Genus of filamentous fungi-like microorganisms of the family Thraustochytriidae in the stramenopile taxonomic group. Fermentation products obtained from this organism include ω-3 fatty acids, such as docosahexaenoic acid and eicosapentaenoic acid, and carotenoids. Its cofermentation with other stramenopiles of the genus Schizochytrium is also used for production of PUFA.

Threadfin bream Any of several marine fish species in the genus Nemipterus; distributed across the Indo-Pacific. Commercially important species include Nemipterus japonicus (Japanese threadfin bream) and N. virgatus (golden threadfin bream). Marketed mainly fresh, but also frozen, steamed, dried-salted, dry-smoked, fermented or made into fish balls and fish meal.

Threonine Aminohydroxybutyric acid. One of the essential amino acids.

Threshers Machines that separate grain from other debris.

Thrips Common name for members of the insect order Thysanoptera. Pests of a wide variety of crops (e.g. citrus fruits, vegetables and cereals). Some species are important vectors of fungi and viruses responsible for plant diseases.

Thromboelastographs Instruments used in the food industry to monitor gelation, e.g. milk coagulation, by measuring gel firmness.

Thujone Toxic ketone present in absinthe, and certain herbal plants, essential oils and natural flavourings.

Thyme Common name for plants native to Mediterranean countries of the genus Thymus, leaves and flowering tops of which are used as spices. The most commonly used variety is T. vulgaris; other spice varieties include T. citriodorus (lemon thyme), T. zygis and T. serpyllum (wild thyme). The predominant flavour compounds of thyme are thymol and carvacrol.
Thyroxine - iodine-containing hormone derived from til oils charging units used to thyrists process control.

Thyme extracts and essential oils are used as flavourings in the food industry.

Thyme oils Essential oils obtained from thyme (Thymus spp.). In addition to their use in flavourings, these spice oils possess antimicrobial activity and antioxidative activity and hence may be used as natural preservatives and antioxidants. The flavour compound thymol is at least partially responsible for the antimicrobial activity of thyme oils.

Thymine Pyrimidine base that pairs with adenine in DNA. In RNA, it is replaced by uracil.

Thymol Phenolic derivative of cymene that is isomeric with carvacrol. Present in essential oils, and exhibits antioxidative activity and antimicrobial activity.

Thyrists Process control charging units used to convert three-phase power to direct current.

Thyroxine Iodine-containing hormone derived from tyrosine that is produced by the thyroid gland.

Tigernuts Stem tubers of Cyperus esculentus, cultivated in West Africa. Eaten raw or roasted, and used to make alcoholic and non-alcoholic beverages. Also a source of oils of potential food use. Alternatively known as chufa nuts; also spelt tiger nuts.

Tiger shrimps Species of shellfish (Penaeus monodon) which is the largest of the commercially available types of shrimps. As well as being widely distributed in the seas around Asia, Australia and the eastern coast of Africa, tiger shrimps are major aquaculture products of Australia and south east Asia. Characterized by grey/blue shells with black stripes and also stripes on the peeled meat. Shell turns red when cooked. White flesh is tinged orange or red depending on whether it is cooked in or out of the shell. Also known as black tiger shrimps and giant tiger shrimps.

Tilapia Any of a number of freshwater fish in the family Cichlidae, particularly those within the genus Oreochromis. Occur in lakes and rivers across Africa; introduced for aquacultural purposes in many other parts of the world. Commercially important species include Oreochromis niloticus (Nile tilapia) and O. mossambicus (Mozambique tilapia). Flesh tends to be white or light pink in colour and firm, with a sweet and mild flavour. Marketed fresh and frozen.

Tilmicosin Macrolide antibiotic used as a veterinary antibacterial agent in food-producing animals. Major residues in treated animals are of the parent compound, and are most persistent in kidneys and livers. In muscle, residues persist at the injection site. Due to persistence in milk, tilmicosin is not recommended for treatment of lactating cattle. Neither is it used to treat animals producing eggs for human consumption.

Til oils Alternative term for sesame oils.

Tilsit cheese German semi-hard cheese made from cow milk. Buttery and fruity flavour with a spicy tinge, and mildly pungent aroma. Rind is crusty and yellow-beige in colour. Interior is supple with small irregular holes. Tilsit is considered an excellent sandwich cheese.

Time intensity Sensory analysis techniques used to measure the intensity of a specific food attribute as a function of time. Usually used to investigate the temporal behaviour of flavour compounds, such as sweet and bitter molecules, and the release of volatile compounds from foods. Such techniques are important in the reformulation of foods that results in structural modification.

Tin Silvery-white metal, with the chemical symbol Sn. Also refers to various metal containers used for food storage or preparation. Examples include lidded airtight storage containers made of tin plate or aluminium, open-top metal containers used for baking food, e.g. cakes, and sealed containers made from tin plate or aluminium used for preserving foods. In the UK, the term is often used as being synonymous with the term cans.

Tin plate Iron or sheet steel which is coated with the chemical element tin. Used to make containers and cans for food storage and preservation.
Tipburn  Necrosis of plant apical or marginal tissues, affecting only a small part of the leaf. Possibly caused by internal water stress induced by salt or wind desiccation.

Titin  Family of very large proteins found in the sarcomere of striated muscle. Degradation of titin improves the tenderness of meat during post mortem storage.

Titratable acidity  Measure of the total acidity in a sample, both as free hydrogen ions and as hydrogen ions still bound to undissociated acids. Determined by addition of a standardized base to the sample until a predetermined endpoint is reached. The endpoint may be assessed by a change in the colour of an indicator at a particular pH. This test can be used to determine milk quality and to monitor the progress of fermentation in cheese and fermented milk.

Titrimetry  Alternative term for titration.

TLC  Abbreviation for thin layer chromatography.

TMTD  Alternative term for the fungicide thiram.

Toast  Sliced bread which has been cooked by toasting, i.e. placed in a toaster, or near a fire or a grill, so that it becomes brown and crisp.

Toasting  Cooking or browning of a food, e.g. bread, almonds or other nuts, by exposure to radiant heat.

Tobacco  Plants of the genus Nicotiana. Includes N. tabacum, a plant widely cultivated for its leaves which are used primarily for smoking (e.g. in cigarettes, cigars and pipes). Contains the alkaloid nicotine, which is known for its addictive properties. Long-term use is associated with increased risks of developing certain diseases, including cancer, especially lung cancer, cardiovascular diseases and respiratory diseases.

Tochu tea  Aqueous extract of Eucommia ulmoides leaves which is drunk as a herb tea in Japan. Displays antimutagenicity.

Tocols  Complex alcohols of the chromanol type. Tocols are generically termed tocopherols. Several tocopherols have been isolated, but only four have vitamin E activity.

α-Tocopherol  The major contributor to vitamin E activity in foods. Rich sources of this fat-soluble vita-

min include vegetable oils, margarines, wheat germ, nuts, seeds, sea foods, beef, eggs, fruits and vegetables. α-Tocopherol is a powerful antioxidant that protects polyunsaturated fats and vitamin A from oxidation in the gastrointestinal tract. α-Tocopherol also prolongs the life of red blood cells and protects lung tissue from the adverse effects of pollution. α-Tocopherol is included among GRAS substances and is one of the antioxidants used in the food industry to retard rancidity in foods containing polyunsaturated fats.

α-Tocopherol acetate  Alternative term for vitamin E acetate.

Tocopherols  Members of the vitamin E group that are fat-soluble and have antioxidative activity. In chemical terms, tocopherols are terpenoids. Four isomers exist that have vitamin E activity - α-, β-, γ- and δ-tocopherols, the most important of which is α-tocopherol. Tocopherols are found in wheat germ oils, butter, egg yolks and leafy vegetables, and are important in the stabilization of cell membranes by protecting them from the damaging effects of oxygen free radicals, which are produced by various disease processes and toxic substances.

α-Tocopheryl acetate  Alternative term for α-tocopherol acetate/vitamin E acetate.

Tocotrienol  One of the main groups of compounds with vitamin E activity (the other being tocopherols). Four isomers exist - α-, β-, γ- and δ-tocotrienols. Tocotrienols are found in vegetable oils, seeds and leafy vegetables. These compounds function primarily as antioxidants in cell membranes, protecting unsaturated fatty acids from oxidative damage.

Toddy  Type of palm wine made in Southeast Asia by fermentation of sap of coconut palms (Cocos nucifera) or other palm species.

Toffees  Hard sugar confectionery products made from boiling together butter or vegetable oils, milk and sugar. Similar to caramels, although the temperature used to boil the ingredients is higher than that used for caramels.

Tofu  Soy curd product with a texture similar to that of compressed cottage cheese. Made like cheese by coagulation of soymilk and draining of the curd. A good source of proteins and B vitamins. Available in firm, soft and silken forms that have different uses. Firm tofu is cubed and cooked or added to a variety of dishes. Other forms are used as substitutes for sour cream or yoghurt.

Tolerance  Maximum level of a given, potentially harmful, substance (e.g. mycotoxins, heavy metals, pesticides) permitted in foods or beverages.
**Toma cheese** Italian semi-hard cheese made from cow milk, originating from the Piedmont and Aosta Valley regions of Italy. Young cheeses have a sweet, milky flavour, while cheeses matured for 12 months have a tangy flavour. The final product is pale yellow in colour, with an elastic consistency and a yellow rind.

**Tomato concentrates** Catsups in which the main ingredient is tomatoes. Popular as an accompaniment for French fries, burgers and many other foods. Also known as tomato ketchups.

**Tomato concentrates** Products made by concentration of tomato pulps by processes such as reverse osmosis, evaporation and ultrafiltration. Uses include as flavour enhancers or in the manufacture of tomato juices.

**Tomatoes** Fruits produced by *Lycopersicon esculentum*. Vary in colour (red or yellow), size and shape, according to variety. Contain more than 90% water, the carotenoids lycopene and β-carotene, vitamin B complex, vitamin E and moderate amounts of vitamin C, as well as a range of minerals. Tomatoes also contain the non-toxic alkaloid tomatine, amounts of which decrease as the fruits ripen. Consumed raw, cooked, as ingredients of a wide range of products, including soups, sauces, casseroles, pastes and preserves, or in juices. Available canned and dried. Green tomatoes are used in pickles and chutneys. Genetic engineering has been used to produce tomatoes (e.g. Flavr Savr tomatoes) with improved shelf life, flavour and processing properties.

**Tomato ketchups** Ketchups in which the main ingredient is tomatoes. Popular as an accompaniment for French fries, burgers and many other foods. Also known as tomato catsups.

**Tomato pastes** Rich concentrates produced from tomatoes by cooking, straining and reducing. Used as the base for sauces and soups. Available commercially in cans, jars and tubes.

**Tomato powders** Powders produced by drying and pulverizing tomatoes or tomato pulps. Used as flavourings in many foods, including instant foods and sausages.

**Tomato products** Foods containing tomatoes as a main ingredient, including tomato purees, tomato concentrates and tomato ketchups.

**Tomato pulps** The soft, succulent parts of tomatoes or preparations made from them by mashing and concentration. Used in the preparation of many cooked dishes.

**Tomato purees** Smooth, thick liquids produced from tomatoes by cooking and straining. Used as the base for soups and sauces. Available commercially in jars, cans and tubes.

**Tomato sauces** Condiments produced from tomatoes, seasonings and other additives. Tomato based sauces are used as toppings for pizzas and pasta dishes and in many other dishes, such as stews and casseroles.

**Tomato seed oils** Vegetable oils extracted from tomato seeds produced as a by-product in canning of tomatoes. High in unsaturated fatty acids. Used as cooking oils.

**Tomato skins** Outer surface of tomatoes. Removed during manufacture of many tomato products and thus is a waste product of the tomato processing industry. Rich source of pigments, including the carotenoid lycopene, which is valued for its health benefits.

**Tomography** One of the analytical techniques used for non-destructive imaging of sections of a material. Data can be produced using different signals, including X-rays, NMR, electrons, gamma rays, ultrasound, etc., with computerized data analysis. Applications in the food industry include analysis of carcass composition, and food structure, foaming and flow. Also used for analysis of bone mineral density.

**Tongues** A part of edible offal, often sourced from calves, lambs, oxen and pigs. Tenderness, flavour and texture vary with species and age of the source animal. Tongues may be sold fresh or brined; brining produces a pink colour and intensifies flavour. They are eaten hot or cold after boiling, skinning and slicing, or are used to produce meat products, such as brawn.
Tonic waters  Carbonated soft drinks containing bitter compounds such as quinine.
Top fermenting yeasts  Brewers yeasts which are non-flocculent and remain at the top of the beer during fermentation. Commonly used for ale and other British style types of beer.
Topinambour  Alternative term for Jerusalem artichokes.
Toppings  Sweet or savoury food items such as sauces, pizza fillings or icings, used to garnish/top other foods.
Top shells  Any of a number of marine gastropod molluscs within the family Trochidae; found in intertidal and deeper waters around the world. A few species are consumed, including members of the genus Omphalius. Marketed fresh (shelled or unshelled) and frozen (unshelled).
Tordon  Alternative term for the herbicide picloram.
Tortellini  Pasta shaped into small rings, stuffed with meat or cheese and often served with sauces.
Torten  Rich cakes comprising either cake mixture baked in a pastry case or several thin layers of sponge cakes, filled with various ingredients such as fruits, nuts, chocolate and cream.
Tortilla chips  Popular salted snack foods. Typically prepared by cutting extruded corn masa into chips, frying and baking. Eaten in the same way as potato crisps or as an accompaniment to dips. Also available flavoured with a variety of flavourings.
Tortillas  Round, thin unleavened pancakes originating from Mexico which are traditionally made with corn flour and baked on a hot surface. Also known in Colombia as arepas.
Torulaspora  Genus of ascomycetous yeasts of the family Saccharomycetaeae. Occur in soil, faeces, wines, fermenting cucumber brines and fruit juices. Torulaspora delbrueckii (syn. Saccharomyces rosei), anamorph Candida colliculosa is used in winemaking and for brewing German-style wheat beer; it is also responsible for spoliation of fruit juice concentrates, cheese and wines. Many obsolete species in this genus have been reclassified as Zygosaccharomyces spp.
Torula yeast  Highly nutritious yeasts (Candida utilis) grown on media such as ethanol and sulfite liquor wastes. Rich source of proteins and vitamins (especially B vitamins). Used as an animal feed supplement and a food additive.
Torulopsis  Obsolete name for a genus of yeasts whose species have been reclassified into the genus Candida.
Total quality management  Management philosophy geared towards continuous improvement of product quality to meet, exceed and anticipate customer requirements.
Total solids  Total amount of solids in a product. Commonly abbreviated to TS.
Total soluble solids  Total amount of soluble solids in a product. Commonly abbreviated to TSS.
Toughness  Sensory properties relating to the extent to which a product such as meat is hard to chew or cut due to its innate resistance, hardness and leathery texture. In a physical sense, toughness is defined as the energy required to propagate a fracture by a given crack area, generally derived from the area under a force-extension curve.
Toxaphene  Alternative term for the insecticide camphchlor.
Toxicity  Quality or degree of being poisonous.
Toxicology  Scientific study of the nature, effects and detection of toxins, and the treatment of conditions caused by them.
Toxic substances  Alternative term for toxins.
Toxins  Poisonous substances, especially those that are produced by one living organism, and are poisonous to other living organisms.
Toxoplasma  Genus of parasitic protozoans of the class Coccidia. Species are intracellular parasites of birds and mammals, including domestic cats and humans. Toxoplasma gondii is the causative agent of toxoplasmosis.
Toxoplasmosis  Acute or chronic disease of humans and animals caused by Toxoplasma gondii. Transmission in humans is usually via ingestion of contaminated raw or undercooked meat (especially pork or mutton), or by contact with cat faeces. Symptoms range from an asymptomatic, or mild influenza-like disease, to an extensive fulminating disease that may cause damage to the brain, eyes, skeletal and cardiac muscles, liver and lungs. Can be transmitted transplacentally to cause congenital disease.
Traceability  The ease with which origin or developmental history of something can be found by investigation.
Trace elements  Elements that are essential nutrients but are required only in minute amounts (mg or micrograms/day) by humans. Examples are chromium, copper, manganese and zinc.
Trace metals  Alternative term for trace elements.
Trade agreements  Treaties designed to facilitate trade between two nations or a group of nations. In the absence of trade agreements, many nations impose special taxes (tariffs) and take other actions to discourage importation of foreign goods. Trade agreements usually seek to reduce or eliminate such barriers.
Trademarks  Words or symbols established by use or legally registered as representing a product or company. The term ‘trade name’ may sometimes be used to refer to a name that has the status of a trademark.

Trahanas  Greek name for kishk, a fermented wheat flour-yoghurt mixture used in soups. Known as tarhana in Turkey.

Trametes  Genus of fungi of the family Coriolaceae. Occur on dead hardwood logs and stumps. *Trametes versicolor* and *T. hirsute* are used in the production of several enzymes used in bioremediation processes, e.g. laccases and catechol oxidases.

Tranquilizers  General term for drugs that act on the central nervous system and are used primarily in the treatment of anxiety and psychiatric disorders that have an anxiety-related component. Major use in farm animals is for sedation prior to and during handling or transportation, usually in the form of barbiturates such as azaperone, nembutal and propiopromazine.

Transaminases  EC 2.6.1. Also known as aminotransferases, these enzymes transfer amino groups from a donor, usually amino acids, to an acceptor, usually 2-oxo-acids, in a cyclic process. Most are pyridoxal phosphate proteins. The reaction also involves oxidoreduction; donors are oxidized to ketones, while acceptors are reduced. However, since the transfer of the amino group is the most prominent feature of the reaction, these enzymes are classified as aminotransferases rather than oxidoreductases.

Transcription  Process by which RNA copies of template DNA strands are synthesized, catalysed by DNA-directed RNA polymerases. The initial products of transcription are typically processed and/or modified to give the mature RNA products, e.g. mRNA, rRNA and tRNA. In RNA viruses, RNA acts as the template for transcription; in this case the process is catalysed by RNA-directed RNA polymerases.

Transcription factors  Proteins other than DNA-directed RNA polymerases which control transcription of DNA and hence affect levels of gene expression. In eukaryotes, some are necessary for the initiation of transcription, since they facilitate binding of the polymerase to genes at a transcription initiation site in their promoters. Others regulate transcription efficiency by binding to specific sites within the promoters upstream of the transcription initiation site, and may stimulate or inhibit transcription constitutively or in response to a signal. Mutations in genes encoding transcription factors may result in genetic disorders. Targeted mutation of these factors or alteration of the level of the signal to which the regulatory factors respond may be used to alter expression of target genes. Gene-nutrient interactions may be mediated by transcription factors. In bacteria, proteins required for transcription initiation are termed σ factors.

Transducers  Devices that transform one type of energy to another.

Transesterification  Process by which fatty acyl residues are transferred to triglycerides in a mixture of triglycerides and fatty acids. Can be catalysed by lipases, and may be used to modify the composition and properties of fats and oils.

trans Fatty acids  Fatty acids produced during the hydrogenation of fats and oils, which are found in foods such as vegetable shortenings, margarines and partially hydrogenated vegetable oils. Thought to have several adverse effects on health, such as increased risk of coronary heart diseases, increased levels of cholesterol and low density lipoproteins, and reduced levels of high density lipoproteins.

Transferases  EC 2. Enzymes that transfer a group, e.g. a methyl, acyl or glycosyl group, from one compound (the donor) to another (the acceptor). In many cases, coenzymes carrying the group to be transferred act as the donor. Includes acyltransferases (EC 2.3) and glycosyltransferases (EC 2.4).

Transferrins  Proteins that transport Fe into cells. Found in the plasma of vertebrates and used as indicators of Fe status.

Transformation  Process by which exogenous DNA is taken up by recipient cells, sphaeroplasts or protoplasts. The DNA may be in the form of plasmids that can replicate autonomously, or may be a fragment that can integrate into the host chromosomes. Transformation can occur naturally in some bacteria, but in other bacteria and eukaryotic microorganisms, it can only occur after cells have been permeabilized by artificial methods. Also refers to conversion of cultured cells to a malignant phenotype.

Transgenes  Foreign genes introduced into the genomes of transgenic organisms early in development. Transgenes are present in both somatic and germ cells, and are inherited by offspring in a Mendelian fashion.

Transgenic animals  Genetically engineered animals or their offspring that contain genetic material from at least one unrelated organism inserted into their genomes.

Transgenic plants  Genetically engineered plants or their offspring that contain genetic material from at least one unrelated organism inserted into their genomes.

Transglucosylases  Members of sub-class EC 2.4.1; synonymous with glucosyltransferases. Enzymes that transfer a glucosyl group from a donor to an acceptor.
Transglutaminases  Alternative term for protein-glutamine γ-glutamyltransferases.

Transglycosylation  Transfer of glycosyl groups, or saccharides, from a donor to an acceptor, with enzymes of the group glycosyltransferases as catalysts. This type of modification is performed to alter the physicochemical properties or functional properties of a natural compound, e.g. to improve the solubility of neohesperidin dihydrochalcone or to decrease the bitterness of naringin.

Translation  Process by which polypeptides are assembled at ribosomes using mRNA molecules as templates. Amino acids are carried to the ribosome by specific tRNA molecules where they are incorporated into the growing chain in a sequence specified by the nucleotide sequence of the mRNA template.

Translucency  Optical properties relating to the extent to which an object diffuses light passing through it, so that objects cannot be seen clearly.

Transmissible spongiform encephalopathies  Alternative term for prion diseases.

Transmission electron microscopy  Electron microscopy technique in which the image forming rays are passed through or transmitted by the sample. Commonly abbreviated to TEM.

Transmittance  One of several optical properties which relates to the ratio of incident light that passes through a sample, such as foods, at a specified wavelength. Light transmittance can be used to determine product quality. The transmittance of packaging materials is relevant when estimating the shelf life of foods since these materials can slow down degradation by blocking a portion of the incident light which can degrade food components.

Transparency  Optical properties relating to the extent to which an item allows light to pass through it so that bodies can be clearly seen.

Transpeptidases  Enzymes that catalyse the formation of an amide linkage between a free amino group and a carbonyl group within an existing peptide linkage.

Transposable elements  DNA segments that can translocate from one site to another, either in the same replicon or in a different replicon in the same cell. Extensive sequence homology between transposable elements and their target sites is not required. Transposable elements are normal components of elements such as chromosomes, plasmids and phage genomes, and occur in both prokaryotes and eukaryotes. Some transposable elements are highly specific with respect to their target sites, whereas others appear to insert randomly.

Transposition  Process by which transposable elements translocate from one site to another. Different elements use different methods for transposition, which is normally a rare event, and insertion leads to duplication of a short sequence of the target DNA, resulting in the formation of direct repeats flanking the inserted element. Transposition can result in gene mutations and/or may have significant effects on gene expression. Occasionally, transposable elements can excise from their insertion sites.

Transposons  Transposable elements that can move from one site to another within chromosomes. They contain inverted repeats at either end and, in addition to encoding functions necessary for transposition (including the enzyme (transposase) that catalyses their insertion), also carry genes with unrelated functions, e.g. antibiotics resistance, production of toxins or lactose metabolism.

Trappist cheese  Cheeses made by Trappist monks worldwide. Include Port Salut cheese.

Travnik cheese  Cheese originating from Travnik, in Bosnia.

Treacle  Low purity, thick, brown syrup produced as a by-product of sugar refining. Called molasses in the USA and Canada.

Tree tomatoes  Alternative term for tamarillos.

Treflan  Alternative term for the herbicide trifluralin.

α,α-Trehalases  EC 3.2.1.28. Glycosidases which hydrolyse the disaccharide trehalose into 2 units of its monomer, D-glucose. Can be used for analytical determination of trehalose concentrations. Mutants with decreased trehalase activity may accumulate trehalose and display improved stress resistance.

Trehalose  Disaccharide composed of two molecules of glucose linked via an α-1,1-glycosidic bond. Isolated from fungi, including yeasts.

Trematodes  Liver flukes which belong to the class Trematoda, e.g. Fasciola hepatica.

Tremorgens  Neurotoxic mycotoxins (e.g. penitrem and alfaflam) produced by various fungi (e.g. Penicillium, Aspergillus and Claviceps spp.). Ingestion of contaminated foods and feeds by humans and animals can lead to weakness, tremors, convulsions and death.

Trenbolone acetate  Synthetic anabolic steroid with similar hormonal activity to testosterone but with greater anabolic activity. Used legally for growth-promoting purposes in animals, mainly in young cattle. Following administration, rapidly hydrolyses to two major metabolites; residues of these metabolites may persist in tissues for considerable periods.

Triacetin  Triester of glycerol and acetic acid. Also known as 1,2,3-triacetoxypropane or glycerin triacetate. One of the food additives, used as a solvent for
flavourings and as a humectant and plasticizer in chewing gums and chewy candy. Currently being considered as a source of food energy that could be produced by artificial food regeneration systems on long space missions.

**Triacylglycerol lipases** EC 3.1.1.3. Hydrolyse triacylglycerols to diacylglycerols and free fatty acids. Usually referred to as lipases.

**Triacylglycerols** Lipids composed of glycerol esterified at all three of its constituent carbon atoms with one or more fatty acids. Triacylglycerols are components of natural fats and oils and have multiple uses in the food industry, including as emulsifiers, coatings and encapsulating agents. Synonymous with triglycerides.

**Triadimefon** Systemic triazole fungicide used for control of a variety of fungal diseases in many different fruits, vegetables and cereals. Classified by WHO as slightly hazardous (WHO III).

**Triazophos** Non-systemic broad-spectrum organophosphorus insecticide and acaricide used for control of a wide range of insects and mites in fruits, vegetables and cereals. Also used for control of some free-living nematodes. Classified by WHO as highly hazardous (WHO Ib).

**Tribolium** Genus of small beetles of the family Tenebrionidae. *Tribolium castaneum* (red flour beetle) and *T. confusum* (confused flour beetle) are pests of flour, as well as stored cereals (e.g. rice and wheat).

**Tributyltin** Component of anti-fouling paints which are used on the hulls of ships. Can be released into the water and accumulate as contaminants in seafood.

**Tricaprylin** Triglyceride of glycerol esterified with three molecules of caprylic acid (octanoic acid). Used in transesterification reactions to synthesize structured lipids incorporating desirable fatty acids such as eicosapentaenoic acid or conjugated linoleic acid. Also called glyceryl tricaprylate and caprylyl acid triglyceride.

**Trichininae** Parasitic nematodes of the genus *Trichinella*.

**Trichinella** Genus of parasitic nematodes of the class Enoplea. *Trichinella spiralis* is the causative agent of trichinosis.

**Trichinosis** Infection caused by *Trichinella spiralis*. Transmission is via ingestion of larvae in undercooked meat (especially pork). Larvae, which hatch from eggs laid by female worms in the small intestine, bore through the intestinal wall and migrate around the body causing disease. Characterized by diarrhoea, nausea, delirium, fever, abdominal pain, muscle pain and swelling of the eyes. The lungs, nervous system and heart may be affected in more advanced cases. Sometimes fatal.

**Trichlorfon** Non-systemic organophosphorus insecticide used for control of a wide range of insect pests in crops, stored fruits, vegetables and cereals. Also used in animal husbandry. Rapidly hydrolyses in plants and degrades rapidly in soil. Classified by WHO as moderately hazardous (WHO II). Also known as chlorophos.

**Trichloroanisole** Chlorinated hydrocarbon with a very low sensory threshold which is most often associated with cork taints in wines.

**Trichloroethylene** Industrial solvent, prolonged exposure to which can cause cardiotoxicity and neurological impairment. Industrial pollution can cause contamination of drinking water sources with this compound. Irrigation of garden plants with contaminated water can result in uptake of trichloroethylene in fruits and vegetables.

**Trichloromethane** Also used in animal husbandry. Rapidly hydrolyses in water. Occupational exposure to which can cause cardiotoxicity and neurological impairment. Industrial pollution can cause contamination of drinking water sources with this compound. Irrigation of garden plants with contaminated water can result in uptake of trichloroethylene in fruits and vegetables.

**Trichloroethylene** Industrial solvent, prolonged exposure to which can cause cardiotoxicity and neurological impairment. Industrial pollution can cause contamination of drinking water sources with this compound. Irrigation of garden plants with contaminated water can result in uptake of trichloroethylene in fruits and vegetables.

**Trichoderma** Genus of fungi that occurs in soil and on wood. *Trichoderma hazianum* is responsible for the spoilage of citrus fruits and cereals (e.g. corn, rice and wheat). *T. viride* causes rots of citrus fruits and spoilage of stored grains (e.g. wheat, rice and barley) and peanuts. Some species (e.g. *T. virens*) parasitize disease-causing fungi, making them useful biocontrol agents.

**Tricholoma** Genus of edible fungi that contains a number of species varying in flavour and quality. *Tricholoma caligatum* is commonly known as matsu-take.

**Trichosporon** Genus of mitosporic fungi of the order Tremellales. Occur in water, soil and faeces, and on plants (including vegetables), wood pulp and human skin. Some species may cause spoilage of foods, e.g. meat and meat products, cheese and milk.

**Trichothecenes** Group of mycotoxins produced by various fungi, such as *Fusarium, Myrothecium* and *Trichothecium*. Include deoxynivalenol, T2 toxin, diacetoxyscirpenol, trichothecin, nivalenol and fusarenon X. Mainly infect cereal grains (e.g. wheat, barley and corn). Ingestion of contaminated foods and feeds can lead to haemorrhagic gastroenteritis, lung and brain haemorrhages, and bone marrow damage, accompanied by vomiting, headache, fever and nausea.

**Trichothecin** Trichothecene produced by *Trichothecium roseum*.
Triiodobenzoic acid

Trihalomethanes Volatile compounds that may be formed during chlorination of drinking water and which are thought to be carcinogenic. They are thought to be formed during roasted coffee giving rise to undesirable odours.

Trigonelline Alkaloid found in green coffee beans that has been implicated in mutagenic activity of roasted coffee.

Trihalomethanes Volatile compounds that may be formed during chlorination of drinking water and which are thought to be carcinogenic.

Triiodobenzoic acid Plant growth regulator that can increase the oil content of fruits. Associated with the onset of microbial spoilage in ice-stored fish. Hence, analysis of trimethylamine content is used to evaluate fish quality and freshness.

Trimethoprim Diaminopyrimidine drug used for treatment of respiratory and intestinal infections in cattle, swine, sheep, goats, poultry and farmed fish. It is often used in combination with sulfonamides. Rapidly and widely distributed around tissues following administration. Normally depletes rapidly in farm animals; rate of depletion in farmed fish is dependent on water temperature.

Trimethylamine Volatile compound found in sea foods that has a characteristic herring-like aroma. Associated with the onset of microbial spoilage in ice-stored fish. Hence, analysis of trimethylamine content is used to evaluate fish quality and freshness.

Trimming Making an item neat by cutting away irregular or unwanted parts. In the food industry, usually applied to removal of fats from meat.

Triolein Synonym for olein.

Tripalmitin Triglyceride of glycerol esterified with three molecules of palmitic acid (hexadecanoic acid). A natural component of fats and oils, tripalmitin is used in the food industry in additives for the manufacture of compressed sweets. Also known by other names, including glyceryl tripalmitate.

Tripe A part of edible offal, generally comprising the lining of the four-chambered stomach of ruminants, particularly of calves and oxen. Although, tripe is usually produced from cattle, sheep tripe is used to make haggis, and lamb tripe, thinner than that of oxen or calves, may be used as a wrapping for savoury stuffings. Different parts of the cattle stomachs are used to make different kinds of tripe: the rumen is used to produce blanket tripe, which has a rough texture and varies in thickness; the reticulum is used to produce charcuterie; on boiling, much of this is converted into gelatin. Cooked tripe has a mild flavour and slippery texture.

Tripolyphosphates Phosphates used to enhance the tenderness, juiciness and flavour of meat, and to inhibit oxidation of lipids. Include sodium tripolyphosphate.

Trisodium phosphate Phosphate that can be used in the food industry to sanitize meat, particularly chicken carcasses, and to prevent discoloration of ground garlic.

Tristearin Triglyceride of glycerol esterified with three molecules of stearic acid (octadecanoic acid). A natural component of fats and oils, tristearin is used in the food industry in food additives such as surface finishing agents, lubricants, emulsifiers, encapsulating agents and crystallization accelerator agents. Also known as glyceryl tristearate.

Triterpenoids Terpenoids arranged in a 4 or 5 ring configuration of 30 carbon atoms. Steroidal in nature. Include ginsenosides and other saponins, glycyrrhizin, ursolic acid, oleanolic acid, maslinic acid, lupeol, erythrodiol and uvaol. Found in a wide range of
fruits, vegetables, nuts and herbs. Many have potential antitumour activity and anticarcinogenicity.  

Triticale High-yielding hybrid of wheat (Triticum spp.) and rye (Secale spp.) which combines the resilience of rye with the particular elastic baking properties of wheat. Often used in multigrain bread.  

Triticale flour Flour produced by milling of triticale grains. May be used as a partial substitute for wheat flour in bread dough.  

Tritium Long-lived, radioactive isotope of hydrogen. Suitable for use in autoradiography and easy to incorporate into complex molecules for use in experimental studies.  

Tritordeum Hybrid of barley and wheat.  

Tropical fruits Fruits grown in countries of the tropics (on either side of the equator), or in hot and humid conditions. Include a great many species, such as mangoes, pineapples, pomegranates, bananas, papayas, lychees, guavas and tamarinds.  

Tropomyosin A family of closely related proteins present in muscle and non-muscle cells. Tropomyosin is an α-helical protein that forms a coiled-coil structure of two parallel helices containing two sets of seven alternating actin binding sites. Muscle isoforms contain 284 amino acid residues and possess a highly conserved N-terminal region. In striated muscle, tropomyosin mediates the interactions between the troponin complex and actins, so as to regulate muscle contraction. Some of the proteins in this family are allergens.  

Troponin Complex of three proteins found in striated muscle, where it is associated with tropomyosin and actins on the thin filaments. Controls the interaction of actins and myosin, and when combined with calcium ions, permits muscle contraction.  

Trout Any of several anadromous fish of the family Salmonidae, native to rivers and streams of Europe, Asia and North America; usually restricted to freshwater, though some types migrate to the sea between spawnings. The most important species commercially is Onchorhynchus mykiss (rainbow trout), which is cultured around the world. Other important species include Salmo trutta (brown trout/sea trout) and O. clarki (cutthroat trout). Flesh is usually pale orange-pink, sometimes a deeper red-pink (young trout are often white-fleshed), with a firm yet creamy texture and moderate to high fat content. Marketed fresh, frozen and as a smoked or canned product.  

Trub Precipitates, comprising coagulated proteins, polyphenols and carbohydrates, which form during boiling of worts in the beer brewing process. Also termed break; may be divided into hot break, formed during boiling, and cold break, formed during subsequent cooling.  

Trucks Alternative name, used especially in Canada and the USA, for lorries. Also describes vehicles used for carrying freight on a railway. Forklift trucks are vehicles with power operated horizontal prongs that can be raised and lowered, and are used for transporting goods, especially those stacked on pallets, in warehouses and factories.  

Truffles Alternative term for edible fungi of the genus Tuber.  

Trumpet shells Any of a number of marine gastropod molluscs within the family Cymatiidae; occur in intertidal regions and deeper waters in tropical and southern temperate areas. Flesh of some species is consumed; occasionally used to make preserves.  

Trussing Process of tying up the wings and legs of poultry carcasses in preparation for cooking. Skewers, thread, string or pins may be used. Helps the food to maintain a compact shape during cooking.  

Trypsin EC 3.4.21.4. Highly specific serine endopeptidases that hydrolyse peptide bonds in which arginine or lysine provides the carbonyl group.  

Trypsin inhibitors Proteins found in a range of foods, including soybeans, peanuts, peas, lentils, and raw egg whites, which inhibit the activity of trypsin. Denatured, and hence inactivated, by heating.  

Tryptamine Biogenic amine formed by microbial decarboxylation of tryptophan. May be formed in foods such as ripened cheese, chocolate, wines and fermented foods. Consumption of contaminated foods can cause increased blood pressure and migraine.  

Tryptophan Essential amino acid important in the synthesis of haemoglobin, plasma proteins and nicotinic acid.  

Tryptophol Phenolic compound found in beer and wines, the levels of which can be used to distinguish beer types.  

TS Abbreviation for total solids.  

TSS Abbreviation for total soluble solids.  

Tsukemono Japanese vegetable pickles. Popular types include pickled turnips, carrots, Chinese cabbages, aubergines, burdock and giant radishes. Ingredients can also include miso and sake.  

T2 toxin Acutely toxic trichothecenes produced by Fusarium spp. (e.g. Fusarium tricinctum and F. sporotrichioides).  

Tuba Alcoholic beverages made by fermentation of the sap of coconut palms.
**Tuber** Genus of edible fungi including the British truffle, *Tuber aestivum*, and French Perigord truffles, *T. melanosporum*. Grow underground in woods, and are irregularly shaped. The solid flesh is light brown with white veins. Perigord truffles are used to make foie gras.

**Tuberculosis** Infectious disease most commonly caused by the bacillus *Mycobacterium tuberculosis* and characterized by the formation of nodular lesions (tubercles) in the tissues. Tuberculosis is associated with poor living conditions, such as nutritional deficiency and inadequate housing. Transmission of tuberculosis is by inhalation of infected droplets. Treatment is by long-term administration of antibiotics.

**Tubers** Swollen and fleshy underground stems of plants, usually high in starch. Include potatoes.

**Tulum cheese** Turkish cheese made from goat milk or cow milk. Crumbly texture. Used in dishes or as an appetizer.

**Tumbling** As well as being a process by which surface irregularities are removed from an item by rotating it in a tumbling barrel, this term also refers to a process by which the quality of meat can be improved. The mechanical action of tumbling alters the structure of muscle proteins. Tumbling can also be used to increase the rate of uptake of marinades by meat pieces.

**Tumours** Growths in the body caused by the abnormal proliferation of cells. Some food components are thought to possess antitumour activity. Tumours may be benign (i.e. grow at one site only) or malignant (i.e. they destroy the tissue in which they arise and spread to other parts of the body). Benign tumours, which are covered by a capsule, are usually harmless but may become very large, exerting pressure on neighbouring tissues and producing severe effects. In malignant tumours, which are not enclosed by a capsule, cell division is rapid; cells show partial or complete loss of function and bear little resemblance to the tissue cells from which they originated. Malignant tumours cause extensive damage.

**Tuna** Any of several species of large pelagic marine fish in the family Scombridae; worldwide distribution. Most species have high commercial importance, particularly *Thunnus alalunga* (albacore), *T. obesus* (bigeye tuna), *T. albacares* (yellowfin tuna) and *Katsuwonus pelamis* (skipjack tuna). Marketed in a variety of forms, including fresh and frozen (whole, gutted or fillets), canned, salted, dried and semi-preserved. Also used in a variety of prepared dishes, such as tuna sausages, tuna roll and tuna pastes. Also known as tunny.

**Tuna oils** Fish oils which are one of the richest sources of docosahexaenoic acid.

**Tunny** Alternative term for tuna.

**Turban shells** Any of a number of marine gastropod molluscs within the family Turbinidae; distributed in intertidal zones and deeper waters across the Indo-Pacific. Flesh of several species is consumed; typically served grilled with soy sauces.

**Turbidimetry** Measurement of turbidity of a solution, usually using a turbidimeter, an instrument that records the loss of intensity of a light beam passed through a solution containing suspended particles.

**Turbidity** Optical properties relating to the extent to which a solution is turbid, i.e. cloudy or hazy. Turbidity in solutions is caused by the presence of finely suspended matter.

**Turbot** Name given to a number of marine flatfish species within the family Pleuronectidae; most occur in the northern Atlantic. Commercially important species include *Scopthalmus maximus* (European turbot) and *Reinhardtius hippoglossoides* (Greenland turbot). Flesh of most species is highly esteemed and tends to be white, firm with low fat content and delicate flavour. Marketed fresh and frozen.

**Turgor** Alternative term for osmotic pressure.

**Turkey frankfurters** Frankfurters prepared from turkey meat. They are often prepared from turkey thigh meat and/or turkey meat trimmings or mechanically recovered turkey meat. Other ingredients may include turkey fat, pork fat or beef fat.

**Turkey ham** Cured turkey products prepared from boneless thigh meat after removal of the skin and surface fat. They may contain other ingredients, such as salt, dextrose, sodium nitrate and sodium. Turkey mince, prepared from trimmings removed from the turkey thigh during boning and trimming, may be added as a binder.

**Turkey livers** Livers from turkeys which form part of the edible offal in turkey carcasses. Used to make stocks and gravy or eaten in a variety of other ways, including fried or as ingredients in stuffings and pates. May contain high levels of vitamin A, particularly if poultry are given retinol-supplemented feeds. Also rich sources of iron and the vitamin B group.

**Turkey meat** Meat from turkeys. Many turkeys are sold whole, sometimes they are injected with butter or vegetable oils and are marketed as self-basting. Turkey breast meat contains less myoglobin than turkey drumstick or thigh meat. As a result of genetic selection based on the economic traits of turkey carcasses, the turkey industry suffers from the occurrence of several metabolic and musculoskeletal disorders. Poor water holding capacity in turkey breast
meat is thought to be caused by similar factors to those underlying the PSE defect in pork.

Turkey mince Meat mince prepared from turkey meat. It may be prepared specifically from light or dark turkey meat. Mince prepared from light coloured turkey meat has a lower content of saturated fats than mince prepared from dark turkey meat. Also known as ground turkey.

Turkey patties Meat patties prepared from turkey mince.

Turkey products Foods produced using turkey meat as a main ingredient, such as turkey ham and turkey patties.

Turkeys Large birds (Meleagris gallopavo) which belong to the pheasant family. Turkeys are reared throughout the world for turkey meat production. Different gender and age groups of turkeys are known as toms, stags or cocks (adult entire males; >26 weeks of age), hens (adult females; >26 weeks of age), turkey growers (sexually immature young birds; 8-26 week of age) and poult (sexually immature birds which have come down rather than feathers).

Turkey sausages Sausages, both fresh and cured, made from turkey meat. Varieties include turkey frankfurters, bratwurst, hot dogs, kielbasa, salami and wiener. The majority are prepared from coarsely comminuted dark turkey meat or mechanically recovered meat. Products may contain binders and extenders, such as calcium lactate, carrageenans, cereals, soy meal, soy proteins, starch and whey.

Turkish delight Soft jelly confectionery originally of Turkish origin, made by cooking flavoured syrups and corn starch together slowly, leaving the mixture to set, cutting into cubes and rolling in icing sugar. Flavours are usually based on orange juices or lemon juices, with rose water or orange flower water. Alternatively, a mint flavour is produced by adding peppermint essential oils or creme de menthe liqueurs. Colour varies according to the ingredients used, but is usually white, pink or green. Also known as lokum, lukum or rahat.

Turmeric Common name for a plant native to Asia, Curcuma longa, the dried ground rhizomes of which are used as spices. Turmeric is deep yellow in colour due to the presence of curcumin, desmethoxycurcumin and bisdesmethoxycurcumin. Used in natural colorants, particularly in mustard, pickles and other spicy condiments, curry seasonings, and fats and oils. The predominant flavour compound of turmeric is turmerone. The majority of commercially available turmeric is cultivated in India, leading to the alternative name, Indian saffron. Also known as CI natural yellow 3 and CI 75300. Extracts and essential oils of C. longa rhizomes are also used as colorants and flavourings.

Typhoid Infectious disease of the digestive tract caused by Salmonella Typhi. Transmission is by drinking infected water, usually where there is no clean water supply. Symptoms, which begin 10-14 days after ingestion of the bacterium, include fever, headache, cough, loss of appetite, and constipation; a characteristic red rash may appear. If left untreated, increasing production of toxins causes delirium, coma and death.
Tyramine

Treatment is by administration of fluids and the anti-

otic chloramphenicol.

Tyramine  Biogenic amine formed by microbial de-

carboxylation of tyrosine. May be formed in foods

such as ripened cheese, chocolate, wines and

fermented foods. Consumption of contaminated

foods can cause increased blood pressure and mi-

graine.

Tyrophagus  Genus of mites of the class Arachnida.

Tyrophagus putrescentiae and T. longior are common

pests of stored foods (e.g. corn, wheat, barley, bran and wheat flour).

Tyrosinases  Catalyse the oxidation of L-tyrosine.

Exhibit activity of both catechol oxidases and

monophenol monooxygenases.

Tyrosine  Non-essential amino acid which can be syn-

thesized from phenylalanine in humans. Important

precursor of adrenaline, noradrenaline, thyroxine

and melanins. Tyrosine isomers can also be formed by γ-irradiation of phenylalanine and their detection

can therefore be used as an indicator of irradiation of

foods.

Tyrosol  Phenolic antioxidant compounds found in

olive oils. Tyrosol is able to preserve cellular de-

fences despite possessing weak antioxidative activ-

ity, possibly as a result of its good bioavailability

and intracellular accumulation.

Tzatziki  A Greek speciality yoghurt dip containing

cucumbers, mint and garlic.
UASB bioreactors  Abbreviation for upflow anaerobic sludge blanket bioreactors.

Ubiquinone  Alternative name for the coenzyme Q group. Consist of quinones with isoprenyl sidechains. The number of isoprene units varies, as reflected by the name, so coenzyme Q₁₀, the main form present in all human cells, contains 10 such units. These coenzymes play a role in generation of energy via ATP production. Used as a dietary supplement for treatment of metabolic disorders. Claimed to provide relief from migraine and cancer side effects and to possess antihypertensive activity. Food sources include fish, offal and the germ portion of wholegrain foods.

Udon  Thick Japanese noodles prepared from wheat flour, often used in soups or broths.

Ugba  Protein-rich product produced by solid state fermentation of African oil beans. Used as snack foods or condiments.

UHT cream  Cream heated by UHT treatment to prolong its shelf life. Also known as long life cream.

UHT milk  Milk heated by UHT treatment to prolong shelf life. Also known as long life milk.

UHT treatment  Abbreviation for ultra-high temperature treatment, a brief, intense heat treatment (direct or indirect) used to sterilize foods prior to packaging. Kills all microorganisms that would otherwise spoil the product. Following UHT treatment, foods are filled into pre-sterilized containers in a sterile atmosphere. Food products processed by UHT treatment include liquid products (e.g. milk, some fruit juices, cream, yoghurt, wines, salad dressings), foods with discrete particles (e.g. infant foods, tomato products, some fruit juices and vegetable juices, soups), and foods containing larger particles (e.g. stews).

Uji  Thin, fermented porridges made from corn flour, sorghum flour or cassava meal, either singly or in mixtures. Often used in Ghana and Kenya in infant foods. Also known as koko.

Ulcerative colitis  An inflammatory bowel disease that causes inflammation and ulcers in the lining of the colon. Common symptoms include abdominal pain and bloody diarrhoea. Diet therapy may be one approach used to relieve or manage symptoms.

Ulluco  Common name for Ullucus tuberosus, an important tuber crop of the Andean region. Tubers are produced in a wide range of shapes and bright colours. Their flesh is white to yellow in colour with a smooth texture and nutty flavour. Leaves, which are similar in texture to spinach, are also eaten as a vegetable, representing a good source of protein, calcium and carotenes.

Ultracentrifugation  Centrifugation in centrifuges which have the ability to develop centrifugal fields of up to 100,000 times that of the gravitational field. Ultracentrifugation is generally used for analytical purposes, such as the determination of physico-chemical properties of food polysaccharides using sedimentation analysis.

Ultrafiltration  Selective membrane separation process, driven by a pressure gradient, in which suspended solids, colloids, emulsified solids such as fat-protein complexes, and dissolved macromolecules with molecular weight in the range 10,000-100,000 Da are retained by the membranes. Molecules that do not pass through the membranes constitute the retentate. Lower molecular weight dissolved materials that pass through the membrane under a driving force of relatively low hydrostatic pressure (1-10 bar) are the permeate. Ultrafiltration is generally used in the concentration and fractionation of large molecules from materials such as cheese whey and milk.

Ultrapasteurization  Process of heating foods, especially milk and liquid egg products, at a high temperature for a short time, sufficient to kill any pathogens present. Used to extend the shelf life of the product without greatly affecting its nutritional properties. A typical process for ultrapasteurization of milk would involve heating at 138°C for at least 2 seconds. Ultrapasteurized products are aseptically packaged and stored under refrigeration.

Ultrasonics  The science and application of ultrasonic waves that have a frequency above those that are audible, generally defined as above 20,000 hertz.

Ultrasound  Sound or other vibrations having an ultrasonic frequency. Generally, ultrasound is classified as any acoustic wave above the normal range of human hearing, i.e. above 20,000 hertz, but, in practice, the
Ultrastructure  Detailed structure of organic materials or objects that can be observed by electron microscopy.

Ultraviolet  Relating to electromagnetic radiation that has a wavelength in the range 100-400 nm, which is just shorter than that of violet light but longer than that of X-rays. Abbreviated to UV.

Ultraviolet radiation  Electromagnetic radiation in the ultraviolet range that has a wavelength in the range 100-400 nm, and which is just shorter than that of violet light but longer than that of X-rays. Abbreviated to UV radiation.

Ultraviolet spectrophotometry  Alternative term for UV spectroscopy.

Ulva  Genus of green seaweeds (Chlorophyta) with a global distribution in seas and estuaries. Type species is Ulva lactuca which is characterized by a broad green frond and a disc-shape hold-fast; this and other Ulva species are edible and known as sea lettuces. Used as foods and feeds.

Ulva lactuca  Species of green seaweeds distributed on rocky shores worldwide. Consumed raw, cooked, dried, in soups or as a deep fried product. Rich source of vitamins and minerals, particularly vitamin B1, vitamin C, iron and iodine. Also known as sea lettuces.

Umami  Sensory properties relating to the perception of savoury flavour, particularly that of monosodium glutamate, proteins, certain amino acids, and the ribonucleotides inosinate and guanylate. Derived from the Japanese word for savoury taste.

Ume  Alternative term for Japanese apricots.

UMP  Abbreviation for the nucleotide uridine monophosphate, also known as uridylic acid.

Undaria  Genus of brown seaweeds occurring on natural and man-made substrates along coasts of many parts of the world. The most important species in commercial terms is Undaria pinnatifida, which is cultured on a large scale in parts of Asia, particularly Japan. Used in soups; also consumed as a toasted, sugar-coated and canned product. Also known as wakame and wakami.

Undecanone  Aroma compound found in foods such as milk, cheese and spices, which can also be produced by microbial biotransformations.

Unsaponifiable matter  Substances present in fats and oils which are not glycerides and which are resistant to saponification with strong alkalies. Content varies among different types of oils and fats, and can thus be used as a source of information for their characterization and authentication.

Unsaturated fats  Fats, found at high levels in vegetable oils, that contain one or more carbon-carbon double bonds. Thought to lower plasma cholesterol levels and reduce the risk of cardiovascular diseases when used to replace saturated fats in the diet.

Unsaturated fatty acids  Fatty acids containing one or more carbon-carbon double bonds. Those that contain one double bond are termed monounsaturated fatty acids and include oleic acid, while those that contain two or more double bonds are termed polyunsaturated fatty acids and include linoleic acid. Found at high levels in vegetable oils and fish oils, and thought to lower plasma cholesterol levels and reduce the risk of coronary heart diseases.

Unsaturation  State in which an organic compound contains double or triple bonds and thus shows increased capacity for reaction relative to saturated compounds. Used especially with respect to fats and oils. The degree of unsaturation refers to the number of double and triple bonds within the compound. This is expressed in terms of iodine values, determined by the weight of iodine absorbed by the substance under investigation. With respect to fats and oils, degree of unsaturation is important for their characteristics and health considerations, unsaturated forms having benefits with respect to blood cholesterol levels and risk of cardiovascular diseases development.

Upflow anaerobic sludge blanket bioreactors  Bioreactors in which anaerobic digestion is performed by microorganisms that form thick flocculations maintained in a suspended state near the bottom of the reactor. Used for bioremediation of wastes and waste water from the food industry.

Uracil  Pyrimidine base that replaces thymine in RNA, where it pairs with adenine. Also a constituent of uridine.

Uranium  Radioactive metallic element with the chemical symbol U.

Urda beans  Alternative term for black gram.

Urea  Synonym for carbamide. The excretory product of nitrogen metabolism produced in the livers of mammals following the breakdown of amino acids. Formation during the fermentation of wines is a cause for concern, since it is a precursor of ethyl carbamate, a carcinogen. As well as being used as a fertilizer, it is also utilized as a feed supplement for ruminants leading to its presence in milk.

Ureases  EC 3.5.1.5. Convert urea to CO2 and NH3. Used in the food industry for removal of urea from
foods and beverages, and for preventing formation of the carcinogen ethyl carbamate. Also used to measure urea concentrations and have been used to control pH during lactic fermentation, thus enhancing lactic acid production. These enzymes are important virulence factors in certain bacterial pathogens.

Urethane Synonym for ethyl carbamate. Organic nitrogen compound derived from urea, which in pure form is a white or colourless, crystalline solid. Soluble in water, alcohol and ether, and slightly soluble in oils. A possible carcinogen that is used in pesticides and fungicides. Formed in wines, other alcoholic beverages and fermented foods during processing or storage.

Uric acid End product of purine metabolism in certain mammals, and the main nitrogenous excretory product in birds, reptiles and some invertebrates. Responsible for gout in humans. It is thought that consumption of caffeine-rich beverages such as tea and coffee may reduce serum levels of uric acid. May be useful as an indicator of insects infestation of cereals and extruded products.

Uridine Nucleoside in which uracil is bound covalently to ribose.

Uridine monophosphate Nucleotide usually abbreviated to UMP and also known as uridylic acid.

Uronic acids Carboxylic acids, e.g. glucuronic acid and galacturonic acid, formed by oxidation of hexoses. Found in certain polysaccharides, such as pectins and alginates.

Ursolic acid One of the pentacyclic triterpenoids. Positional isomer of oleanolic acid. Found, together with its derivatives, in a wide range of plant foods, including cherries, blueberries, cranberries, prunes, apple peel and herbs, such as lavender, peppermint, oregano and thyme. Shown in various studies to possess antioxidative activity, antitumour activity, anticarcinogenicity, anti-inflammatory activity and hypolipaemic activity. Also used as one of the food emulsifiers.

Urticaria Itchy skin rash of raised spots (weals) on a reddened background, resulting from release of histamine by mast cells. Acute urticaria represents an immediate response to such allergens as sea foods or strawberries. Also known as nettle rash or hives.

UV Abbreviation for ultraviolet.

UV radiation Electromagnetic radiation in the ultraviolet range, having a wavelength just shorter than that of violet light but longer than that of X-rays. Abbreviation for ultraviolet radiation.

UV spectroscopy Spectroscopy technique in which samples are identified on the basis of absorption of light of ultraviolet wavelength.
**Vaccenic acid** One of the *trans*-18:1 fatty acids present at significant levels in milk fats as well as in other foods.

**Vacuum** A space entirely devoid of matter or from which the air has been completely removed. In practical terms, a vacuum is an enclosed region of space in which the pressure has been reduced (below normal atmospheric pressure) so that processes occurring within the region are unaffected by the residual matter.

**Vacuum cooling** Technique based on liquid evaporation which produces a rapid cooling effect in products containing free water. Suitable only where removal of the free water will not cause structural damage and where there is no barrier, e.g. a thick wax cuticle, to water loss. Subjecting suitable products to vacuum pressure allows part of the water contained in them to boil out at relatively low temperatures. Used successfully in reducing postharvest deterioration in fruits and vegetables, thus prolonging shelf life, during processing of some products, including liquid foods and bakery products, and rapid cooling of cooked meat, fish products and ready meals.

**Vacuum drying** Removal of liquid from a solid material while in a vacuum system, to lower the temperature at which evaporation takes place and thus prevent heat damage to the material.

**Vacuum evaporation** Concentration technique in which the use of high temperatures is avoided by subjecting the substance to a vacuum, causing it to boil at a lower temperature. The process is performed in a chamber surrounded by a water jacket through which water is circulated to control temperature. Particularly useful for products where heat-induced protein denaturation should be avoided, e.g. liquid egg whites and skim milk.

**Vacuum impregnation** The direct introduction of ingredients into foods in a controlled manner, by way of their pores. A vacuum is applied to a solid-liquid system so that the gas within the pores of the solid expands and flows out. Atmospheric pressure is then restored to compress residual gas and draw the liquid into the pores. Vacuum impregnation can be used to improve the rate of mass transfer in processes such as osmotic drying, salting and acidification.

**Vacuum packaging** Packaging process in which some or all of the air is removed from flexible or rigid containers before sealing. This form of packaging is used to preserve flavour, inhibit bacterial growth and prolong the shelf life of food.

**Vacuum pans** Sealed devices that control the crystallization of solids from liquids by lowering the pressure within the sealed container. Vacuum pans are widely used for crystallization during the manufacture of sugar.

**Valeraldehyde** Synonym for pentanal. Organic compound present in many foods that has an unpleasant odour and a low odour threshold value. One of the main compounds that can cause off odour in sake.

**Valeric acid** Synonym for pentanoic acid. Volatile fatty acid comprising 5 carbon atoms and a single carboxylic acid group. Contributes to the aroma of mature cheese. Uses include as a reactant in production of aroma compounds and flavourings. Also one of the main malodorous pollutants from livestock houses.

**Valine** Essential amino acid important for growth. Good sources include soy meal, brown rice, cottage cheese, fish, meat, nuts and legumes.

**Vallitella Casera cheese** Italian semi hard cheese made on an artisanal or semi industrial scale from semi skimmed cow milk. Granted controlled Denomination of Origin status. Rind has a characteristic straw-yellow colour which intensifies with ripening. Flavour is sweet with a note of dried fruits. Eaten on its own or as an ingredient of a range of local cooked dishes and salads.

**Valves** Mechanical devices, either manual or automatic, for controlling the passage of fluids through pipes or ducts.

**Vanadium** Element with the chemical symbol V that is intermediate between the metals and non-metals.

**Vanaspati** Grainy hydrogenated vegetable oils used as an alternative to ghee in India and Pakistan. Similar to margarines and often fortified with vitamin A and vitamin D.

**Vancomycin** One of the glycopeptide antibiotics produced by *Streptomyces orientalis*. Used to treat serious life-threatening human infections caused by
Vanilla

Gram positive bacteria. Acts by inhibiting proper cell wall synthesis. Guidelines for its use have been produced as a consequence of the increasing emergence of vancomycin-resistant enterococci.

Vanilla Natural flavourings produced by curing of fully grown but unripe beans (pods) of Vanilla planifolia or V. tahitensis. Curing causes hydrolysis of glucovanilla to produce glucose and the flavour compound, vanillin. Glucose is then involved in nonenzymic browning via the Maillard reaction with bean proteins. Major vanilla producing countries are Mexico, Madagascar, Indonesia and Tahiti, each country producing vanilla with a distinctive flavour profile. Although vanillin is the main flavour component of vanilla it comprises only about 3% of the total flavour compounds and aroma compounds. Thus composition of minor flavour and aroma compounds is an important determinant of flavour.

Vanilla beans Seed pods of the orchids Vanilla planifolia, V. tahitensis or V. pompona. Harvested while green, then cured for 3 to 6 months before being used in the production of vanilla. Major vanilla producing countries include Madagascar, Mexico, Indonesia and Tahiti.

Vanillic acid Phenolic compound produced as an intermediate in biocorrections of ferulic acid to vanillin. Also found as a pollutant in olive oil mills effluents.

Vanillin Substituted phenol that is the main flavour compound of vanilla. Synthetic vanillin is also manufactured for use in flavourings. Used as a cheaper alternative to vanilla in a wide range of foods, such as ice cream, bakery products, sugar confectionery and beverages.

Vapona Alternative term for the insecticide dichlorvos.

Vaporization Process by which moisture or another substance is diffused or suspended in the air, becoming converted into vapour. Examples include the rapid change of water into steam, especially in boilers.

Vapours Gaseous state of a substance, e.g. water vapour, at a temperature lower than its critical point, that can be made into a liquid by the application of pressure. Vapours are produced from liquids by evaporation and from solids by sublimation.

var Abbreviation generally applied to variety.

Variety Taxonomic rank below subspecies, usually abbreviated to var. Varieties are usually the result of selective breeding and diverge from the parent in relatively minor ways. Varieties may be distinguished within a given subspecies by, for example, metabolic and/or physiological properties (biovar. or biotype), morphology (morphovar. or morphotype), pathogenicity for specific hosts (pathovar. (pv.) or pathotype), susceptibility to lysis by specific bacteriophages (phagovar. or phagotype) or serological characteristics (serovar. or serotype). However, these terms are often used loosely, in a non-taxonomic sense.

Varnishes Resins dissolved in liquids which are used to coat wood or metals. Form a transparent, shiny, hard surface when dry. Varnishes based on epoxy resins are often used for coating the interior of food cans.

Vats Large tubs or tanks used to hold or store liquids. Examples include fermentation vats used in winemaking and vats used during cheesemaking.

Veal Meat from young calves, usually cattle which are slaughtered at <20 weeks of age. Commonly, veal is produced under semi-intensive systems in which calves are fed on milk-based concentrated feeds to produce very light-coloured (white or pink) meats. Veal calves are prevented from feeding on fibrous feeds in order to prevent development of darker coloured, stronger flavoured meat. Typically, veal is very lean and tender, and has a delicate flavour. The highest quality veal tends to be produced from calves slaughtered at 12-16 weeks of age at body weight of 70-90 kg; these calves are often of French lineage, being from breeds such as the Belgian blue or Charolais. Veal is expensive to produce and, sometimes, calves are treated with growth promoters (e.g. anabolic steroids) to increase the weight of veal carcasses.

Vectors Autonomously replicating DNA molecules (e.g. plasmids, cosmids, viruses and yeast artificial chromosomes) into which foreign DNA fragments can be inserted. They can then be transformed into suitable host cells and propagated. In addition to origins of replication, vectors usually contain selectable markers that allow selection of recombinant cells. They may also contain sequences that direct expression of cloned genes in host cells.

Vegan diet Strict vegetarian diet which contains no animal foods of any kind.

Vegan foods Vegetarian foods suitable for a vegan diet, i.e. excluding meat, eggs, milk, butter, cheese and all other animal foods.

Vegetable burgers Patties made from mashed or chopped vegetables, sometimes also containing cereal or nut ingredients, eaten as an alternative to meat-based burgers such as beefburgers. Commonly used ingredients include beans, mushrooms, onions and carrots. Spices and condiments are added to produce the desired flavour. Health benefits compared with meat-based burgers include low fat and sodium contents, little or no cholesterol content and increased dietary fibre levels. Also known as veggie burgers.
Vegetable fats Lipid-rich vegetable products that are solid at room temperature. May be produced by hydrogenation of vegetable oils. Used in cooking and as food ingredients. Include cocoa butter, salad fats, shea nut butter and vanaspati.

Vegetable juice beverages Beverages prepared from vegetable juices with addition of other ingredients.

Vegetable juices Juices extracted from vegetables. Drunk as beverages in a similar way to fruit juices. Include carrot juices and cabbage juices.

Vegetable nectars Vegetable juice beverages made by addition of water and/or sugar, and optionally other ingredients, to vegetable juices.

Vegetable oils Lipid-rich vegetable products that are liquid at room temperature. Extracted from plant material including seeds, fruits or nuts. Often contain phytosterols. Used widely as cooking oils and salad oils and as flavourings. Include cottonseed oils, olive oils, sunflower oils, soybean oils and essential oils.

Vegetable pickles Vegetables preserved in liquids such as brines or vinegar and eaten as an accompaniment to a meal. Examples include pickled onions and cucumber pickles.

Vegetable preserves Vegetables that have been preserved by immersing in brines, vinegar or oils.

Vegetable products Foods derived from vegetables, or containing vegetables as the main ingredients. Includes a wide range of foods, such as soups, salads, vegetable oils and pickles.

Vegetable proteins Proteins sourced from vegetable tissue. Preferred by some consumers due to health benefits. Quality of vegetable proteins, especially with respect to amino acids composition, varies according to source, but many plant breeding programmes have aimed to improve protein quality of individual crops. Legumes, particularly soybeans, are especially rich in protein. Textured vegetable proteins, usually derived from soybeans, are used as meat substitutes and meat extenders.

Vegetable pulps Preparations made from vegetables by mashing the cooked flesh. Used as ingredients in various dishes, such as soups, sauces and casseroles.

Vegetable purees Vegetables that have been mashed, usually after cooking, to a smooth, thick consistency by various means, such as forcing through sieves or blending in food processors. Used as garnishes, side dishes or ingredients in dishes such as sauces and soups, or beverages.

Vegetable rennets Enzymes sourced from plant materials that are used as substitutes for animal rennets in coagulation of milk for cheesemaking. Include enzymes extracted from flowers of cardoons or curdle thistle (Cynara cardunculus).

Vegetables Plants cultivated for an edible part, e.g. root, tuber, leaf or flower buds (as in broccoli and cauliflowers), or the edible parts of such plants.

Vegetable salads Dishes prepared from a mixture of vegetables, raw or cooked, sometimes served in sauces or dressings.

Vegetable soups Soups containing vegetables as the main ingredients, e.g. gazpacho or minestrone. Marketed in cans or retort pouches, and also as frozen or instant soups.

Vegetarian diet Diet based on plant foods, and which excludes meat and fish, and, in some cases, other animal foods. Lacto-ovo vegetarians consume dairy products and eggs, while those following a vegan diet consume no animal products at all. Vegetarianism is adopted for a variety of reasons, including ethical and religious beliefs as well as for nutritional/health benefits. The positive health effects reported for the diet have been attributed to relatively low contents of fats and cholesterol and the high contents of some vitamins and minerals. Inclusion of supplements in the diet may be necessary to prevent the risk of deficiency in vitamin B12 and some minerals, such as iron, zinc and iodine.

Vegetarian foods Meat-free foods suitable for inclusion in a vegetarian diet. Include pasta, soy products, vegetable burgers and simulated meat substitutes. Much of the recent growth in the vegetarian food market has been fuelled by non-vegetarians who are keen to cut down on meat consumption and who perceive vegetarian foods as a healthy option.

Veillonella Genus of anaerobic, cocoid Gram negative bacteria of the Veillonellaceae family that possess lactate fermenting abilities. Occur as parasites in the mouth, and gastrointestinal and respiratory tracts of humans and animals. Species may be included in competitive exclusion cultures, which are fed to animals (e.g. poultry) to prevent intestinal colonization by pathogens (e.g. Salmonella spp.).

Velvet beans Seeds produced by Mucuna pruriens rich in proteins and fibre but containing antinutritional factors that must be destroyed by cooking prior to consumption.

Vendace Freshwater fish species (Coregonus albula) from the family Salmonidae; distributed across northwest Europe. Normally marketed fresh; in Sweden, roes are used as caviar substitutes.

Vending machines Machines that dispense articles such as packaged foods or beverages, usually when a coin or token is inserted.
Venison Meat from deer. It is very lean and has a strong gamey flavour and aroma, which may be decreased by marination before cooking. The prime cuts are from the loin areas of deer carcasses. Pre-slaughter stress, particularly the holding of farmed or harvested wild deer in unfamiliar surroundings before slaughter, is associated with high ultimate pH values in deer carcasses and venison with a dark cutting appearance. In broader use, the term is used to describe meat from antelopes, caribou, elks, moose and reindeer. Also known as deer meat.

Veratryl alcohol Aryl alcohol (3,4-dimethoxybenzyl alcohol) synthesized by white rot fungi and involved in activation of their ligninolytic enzyme systems. Enzymes act on plant material and can be used for various functions, including removal of phenols from fruit juices, treatment of olive oil mills effluents and detoxification of lignocellulosic hydrolysates.

Verbascose Produced by enterohaemorrhagic Verotoxins, Cytotoxins, Vero cytotoxins. A potent neurotoxin produced by Verrucosidin, a more accurate estimation of the risk of foodborne diseases.

Verruculogen Tremorgenic mycotoxin produced by V. fischeri, which is often transmitted via contaminated shellfish. V. parahaemolyticus and V. vulnificus are responsible for gastroenteritis, and are often transmitted via contaminated shellfish.

VERATRUM Genus of mitosporic fungi of the order Hypocreales and class Sordariomycetes. Commonly isolated from soil and decaying vegetation. May be responsible for plant diseases and food spoilage.

Versicolorin Precursors in the aflatoxin B1 biosynthesis pathway in fungi. Occur as versicolorin A and versicolorin B.

Verticillium Genus of mitosporic fungi of the order Hypocreales and class Sordariomycetes. Commonly isolated from soil and decaying vegetation. May be responsible for plant diseases and food spoilage.

Vetch seeds Seeds produced by plants of the genus Vicia, especially V. sativa, common vetch. High in protein, making them a popular feed for ruminants. Resemble lentils when split, making them a potential low cost substitute for lentils in human nutrition. However, there is concern over toxicity to monogastric species due to the presence of neurotoxins such as γ-glutamyl-β-cyanoalanine and other precursors of cyanide formation. Toxins may be removed by appropriate steeping and cooking procedures.

Veterinary inspection Governmental surveillance of food producing animals to ensure a clean, wholesome, disease-free meat supply that is without adulteration. There are approximately 70 diseases that animals can transmit to man; for this reason, inspections are made by veterinarians at places of animal slaughter and at meat processing facilities.

Viability Capacity of cells for survival. Use of microbiological techniques which differentiate between viable and dead microorganisms in foods may give a more accurate estimation of the risk of foodborne diseases.

Vibrio Genus of Gram negative, facultatively anaerobic, straight or curved rod-shaped bacteria of the family Vibrionaceae. Occur in freshwater and marine habitats. Vibrio cholerae is the causative agent of cholera, which is often transmitted via contaminated foods (e.g. shellfish) and water. V. parahaemolyticus and V. vulnificus are responsible for gastroenteritis, and are often transmitted via contaminated shellfish.

Vicilin One of the main storage proteins of legumes.

Vinegar Liquid wastes remaining in the still after fermentation of beverages such as wines in the manufacture of spirits.

Vinclozolin Dicarboximide non-systemic fungicide. Classified by WHO as unlikely to present acute hazard in normal use.

Vineyard fermented condiment that is essentially a solution of ≥4% acetic acid. The word is derived from the French, meaning sour wine, as vinegar was originally produced as an unwanted by-product of

Vinasse Liquid wastes remaining in the still after fermentation of beverages such as wines in the manufacture of spirits.
Virginiamycin. A preparation of the insecticide.

Viniculture. Describes the year and vineyard or vine leaves. Also used in viniculture.

Viscometers. Instruments for measuring the viscosity of liquids. Also called viscosimeters.
Viscometry  Measurement of viscosity of a liquid, usually performed with viscometers.

Viscosity  Measure of the ease with which a fluid can flow when subjected to shear stress, measured in Newton seconds per square metre or Pascal seconds. Low viscosity, e.g. that of a gas, allows flow through a fine tube to be quite rapid, whereas high viscosity (as with thick oils) makes motion sluggish. Viscosity arises from the intermolecular forces in a fluid (internal friction); the stronger these forces, the greater the viscosity. With a rise in temperature, attraction between the molecules is reduced, enabling them to move more freely.

Vision systems  Systems of visual feedback based on various devices, such as video cameras, photo cells, or other apparatus, allowing a robot to recognize objects or measure their characteristics. Vision systems are widely employed in quality control processes in the food industry.

Vital gluten  Wheat protein complex separated from starch in a wheat flour dough and dried. Used to improve strength of bread dough.

Vitamers  Group of compounds varying in structure but displaying qualitatively similar biological activities with respect to specific vitamins. Collectively referred to by the name of the vitamin involved.

Vitamin A  Group of fat-soluble compounds (retinoids) which exist in several isomeric forms and occur preformed only in foods of animal origin. The two vitamin A forms are: retinols, which predominate in mammals and marine fish; and dehydroretinols, which predominate in freshwater fish. Vitamin A is present in yellow and green leafy plants as provitamin A, of which there are several forms. The most important ones in human nutrition are the carotenoids, α- and β-carotene and cryptoxanthin. These are converted to the active vitamin in the intestinal wall and liver. Richest sources of preformed retinols are fish liver oils, egg yolks and fortified milk. Biologically active carotenoids are found in dark green leafy vegetables and yellow fruits and vegetables, such as squashes and carrots. In humans, common signs of vitamin A deficiency are poor growth, lowered resistance to infection, night blindness and rough scaly skin. Severe deficiency leads to keratomalacia and xerophthalmia.

Vitamin antagonists  Antinutritional factors which are present in some natural foods and do not function as vitamins, even though they are chemically related to them. As a result, they cause vitamin deficiencies where the body is unable to distinguish them from true vitamins, and incorporates them into essential body compounds.

Vitamin B1  Former name for thiamin.

Vitamin B12  Synonym for cyanocobalamin. Member of the vitamin B group, found in foods of animal origin such as livers, fish and eggs. Vitamin B12 is the coenzyme for methionine synthase (EC 2.1.1.13), an enzyme important for the metabolism of folic acid, and methylmalonyl coenzyme A mutase (EC 5.4.99.2).

Absorption of this vitamin requires the presence of an intrinsic factor. Failure of absorption, rather than dietary deficiency, is the major cause of pernicious anaemia.

Vitamin B13  Synonym for orotic acid. An intermediate in the biosynthesis of pyrimidines, and growth factor for some microorganisms.

Vitamin B2  Former name for riboflavin.

Vitamin B6  Vitamin which exists in three forms - pyridoxine (the alcohol form), pyridoxal (the aldehyde form) and pyridoxamine (the amine form). The relative proportion of each of the three forms in foods varies considerably. All are equally biologically active.

Vitamin B complex  Alternative term for vitamin B group.

Vitamin B group  Group of water soluble vitamins generally found together in nature and basically related in function, although unrelated chemically. These include vitamin B1 (thiamin), vitamin B2 (riboflavin) the vitamin B6 group (pyridoxine, pyridoxal and pyridoxamine), the vitamin B12 group (the cobalamins), nicotinic acid (niacin), folic acid (pteroylglutamic acid), pantothenic acid and biotin.

Vitamin C  Synonym for ascorbic acid, an antioxidant nutrient present in a wide range of foods. Necessary for growth of bones and teeth, for maintenance of blood vessel walls and subcutaneous tissues, and for wound healing; dietary deficiency results in scurvy. Used in food additives, with applications in food antioxidants and bakery additives.

Vitamin D  Group of several related sterols exhibiting qualitatively the biological activity of calciole (cholecalciferol). The most important members are vitamin D2 (ergocalciferol or calciferol) and vitamin D3 (cholecalciferol). The former is synthesized by irradiation of the plant provitamin ergosterol, and the latter is produced from the provitamin 7-dehydrocholesterol (found underneath the skin) on exposure to UV light from the sun. Vitamin D is also considered to be a prohormone. Fish liver oils and foods fortified with vitamin D are the major dietary sources; smaller amounts are found in livers, egg yolks, sardine and salmon. Severe deficiency in children results in rickets; deficiency in adults leads to osteomalacia.
Vitamin E

Vitamin D2 Synonym for calciferol and ergocalciferol; one of the group of sterols which constitute vitamin D. Synthesized by irradiation of the plant provitamin ergosterol.

Vitamin D3 Synonym for cholecalciferol; one of the group of sterols which constitute vitamin D. Fat-soluble vitamin necessary for formation of the skeleton and for mineral homeostasis. Produced on exposure to UV light from the sun from the provitamin 7-dehydrocholesterol, which is found in human skin.

Vitamin E Fat-soluble vitamin comprising compounds which exhibit qualitatively the biological activity of α-tocopherol. Two main groups of compounds have vitamin E activity - tocopherols and tocotrienol. There are 4 isomers of each: α-, β-, γ- and δ-tocopherols; and α-, β-, γ- and δ-tocotrienols. Each has differing vitamin potency. Vitamin E functions primarily as an antioxidant in cell membranes, protecting unsaturated fatty acids from oxidative damage. Vitamin E contents of foods are expressed as mg α-tocopherol equivalent; leafy vegetables, seeds and most vegetable oils are good sources.

Vitamin E acetate Esterified form of vitamin E which has no antioxidative activity until the acetate is removed in the intestine as it is absorbed. The acetate form is more stable with respect to storage time and temperature than unesterified forms.

Vitamin F Obsolete name for thiamin.

Vitamin G Obsolete name for riboflavin.

Vitamin H Obsolete name for biotin.

Vitamin K Group of fat-soluble vitamins essential for production of prothrombin and several other proteins involved in the blood clotting system, and the bone protein osteocalcin. Deficiency causes impaired blood coagulation and haemorrhage; vitamin K is sometimes called the antihaemorrhagic vitamin. Two groups of compounds have vitamin K activity: phyloquinone, found in all green plants; and a variety of menaquinones synthesized by intestinal bacteria. Dietary deficiency is unknown, except when associated with general malabsorption diseases.

Vitamin K₁ Synonym for phyloquinone. Fat-soluble vitamins found in all green plants. Especially abundant in alfalfa and green leafy vegetables. Essential for production of prothrombin, and several other proteins involved in the blood clotting system, and the bone protein osteocalcin. Deficiency causes impaired blood coagulation and haemorrhage.

Vitamin K₃ Synonym for menadione. Synthetic compound with vitamin K activity, used in prevention and treatment of hypoprothrombinaemia, secondary to factors that limit absorption or synthesis of vitamin K. Two to three times more potent than naturally occurring vitamin K.

Vitamin K₂ series Synonym for menaquinones. Variety of metabolites with vitamin K activity synthesized mainly by intestinal bacteria. Also found in meat, livers, eggs and cheese. Formerly called farqunoquione.

Vitamin P Group of plant bioflavonoids, including rutin, naringin, hesperidin, eriodictin and citrin, which affect the strength of capillaries in the body. Bioflavonoids are found as natural pigments in vegetables, fruits and cereals. In addition to their effect on capillary fragility, it is claimed that bioflavonoids function as follows: they are active antioxidative compounds in foods; they possess a metal-chelating capacity; they have a synergistic effect on ascorbic acid; they possess bacteriostatic and/or antibiotic activity; and they possess anticarcinogenic activity.

Vitamin PP Obsolete name for niacin.

Vitamins Groups of nutrients which are essential in small amounts for most living organisms to maintain normal health and development.

Vitamin U Synonym for S-methylmethionine. A compound found in raw cabbages, other green vegetables, beer and citrus juices. Thought to assist in healing of skin ulcers and ulcers in the digestive tract; also has an effect on secretory, acid-forming and enzymic functions of the intestinal tract.

Viticulture Cultivation of vines for production of winemaking grapes or table grapes.

Vitreosity Extent to which a substance resembles glass with respect to properties such as hardness, brittleness, transparency and structure.

Vitrification Phenomenon whereby a substance is cooled rapidly to a low temperature such that the water it contains forms a glass-like solid without undergoing crystallization. The temperature at which the transition into a glassy solid occurs is the glass transition temp. Glass formation can result in stabilization of non-equilibrium systems, including most foods. In the glassy state, physicochemical deterioration is inhibited, effectively preserving the system. Vitrification temperature can be used as an indicator of food safety and storage stability.

Vla Dutch custard-type viscous dairy dessert made with milk, carrageenans, modified starches and flavourings.

Vodka Spirits, originating in Russia and northeast Europe, made from grain or potatoes. Generally rectified to have neutral flavour and aroma, but some types contain added flavourings.
Volatile compounds  Compounds that are readily vaporized. Often have a characteristic aroma and are therefore often flavour compounds and aroma compounds.

Volatile fatty acids  Fatty acids that, apart from being present in some foods, are produced by bacteria in the human intestine and the rumen of cattle from undigested starch and dietary fibre. To some extent, they can be absorbed and used as a source of energy. Volatile fatty acids formed in the colon may show anticarcinogenicity.

Volatile organic compounds  Non-methane hydrocarbons produced as industrial pollutants.

Volatile sulfur compounds  Sulfur-containing flavour compounds found in garlic (e.g. methyl mercaptan, allyl mercaptan), onions, Brassica spp. such as cabbages, cauliflowers and broccoli, wines and fruit juices. Some compounds can cause an off odour in wines, e.g. H2S can lead to a rotten egg odour. However, other compounds improve wine aroma, e.g. 3-mercaptoethanol enhances fruitiness.

Voltammetry  Electrochemical technique in which the relationship between voltage and current flowing between electrodes in a reaction solution is measured. Utilizes a working electrode, where the reaction occurs, an auxiliary electrode for current flow and a reference electrode that is used to measure the potential of the working electrode.

Volumetric analysis  Titration technique based on measurement of the volume of reagent required to react completely with the analyte.

Volvariella  Genus of edible fungi that include padi straw mushrooms (Volvariella volvacea) and straw mushrooms (V. diplasia). Another widely consumed species is V. speciosa, easily confused with some poisonous Amanita spp.


Vomitoxin  Synonym for deoxynivalenol. A tricho-thecene produced by Fusarium spp.
Wafers  Light, thin, crisp biscuits served as an accompaniment to desserts or ice cream, or eaten sandwiched together with sweet or savoury fillings or coated with chocolate.

Waffles  Light, crisp, indented raised cakes leavened with baking powders or yeasts and typically baked in a special waffle iron, which cooks both sides simultaneously. Often consumed as a breakfast food, accompanied by maple syrups. May also be eaten as desserts, topped with cream or ice cream.

Wakame  Common name for Undaria pinatifida, one of the the brown seaweeds. Used in soups and also consumed as a toasted, sugar-coated and canned product. Alternative spelling is wakami.

Wakami  Alternative spelling of wakame; one of the brown seaweeds in the genus Undaria.

Walleye  Freshwater fish species (Stizostedion vitreum) belonging to the family Percidae; distributed across North America. Flesh is highly esteemed for its flavour and texture. Cultured in some parts of North America. Marketed fresh and frozen.

Walleye pollack Alternative term for Alaska pollack.

Walnut oils  Relatively expensive oils extracted from walnuts. The distinctive nutty flavour and aroma make them popular for use in salad dressings, drizzling on to cooked foods and in cooking. Sometimes used as an alternative to olive oils. To prevent development of rancidity, walnut oils are best stored in a cool, dry location, out of direct sunlight.

Walnuts  Nuts produced by trees of the genus Juglans, the most economically important species being J. regia (common or Persian walnuts), J. nigra (black walnuts) and J. cinerea (butternuts or white walnuts). Ripe nuts are rich in vitamin E and B group vitamins, while younger fruits also contain vitamin C. Used as dessert nuts, and as ingredients in confectionery, bakery products and ice cream. Oils extracted from the nuts contain a high proportion of unsaturated fatty acids and have a range of food uses.

Walruses  Large, carnivorous marine mammals (Odobenus rosmarus) belonging to the family Odobenidae in the order Pinnipedia. They are hunted for their meat, particularly by the northern Inuit and Indian communities in the Canadian Arctic and northern coastal British Columbia regions. Characteristics of walrus meat include: a high content of protein, with a biological value similar to that of beef; a darker colour than beef; and a distinctive flavour. Walrus blubber forms a part of traditional diets in some areas, but may be associated with health risks due to bioaccumulation of organochlorine pesticides and other contaminants. In Arctic regions, trichinosis is commonly associated with consumption of raw or inadequately cooked walrus meat.

Warehouses  Large buildings in which raw materials or manufactured goods are stored.

Warmed over flavour  Characteristic off flavour primarily associated with cooked meat and poultry meat in chilled ready meals and other cook chill foods. In cooked meat and poultry held at chilled storage temperatures, this stale, oxidized flavour becomes apparent within a short time (48 hours), particularly if the product is stored under air. Modified atmosphere packaging under low oxygen levels helps to delay the onset of oxidative warmed over flavour.

Warming  The process by which an item is heated slightly to the point of being warm.

Wasabi  Pungent spices produced from the roots of Wasabia japonica. Used most commonly in Japanese cuisine and for flavouring of condiments. Also known as Japanese horseradish.

Wastes  Unusable, unwanted or discarded materials. In the food industry, wastes can result from application of processing procedures, and consist of solids such as pomaces, feathers and sludges. By recycling, some materials in wastes can be reclaimed for further use.

Waste water  Unusable, discarded water (effluents) resulting from processing procedures. In the food industry, waste water is commonly produced by breweries, dairies, distilleries, olive oil mills and palm
Water

A measure of the amount of dissolved mineral salts, especially calcium and magnesium salts, in water, including drinking water. Hard water has a high content of dissolved minerals, while soft water has a low mineral content. Water hardness is an important factor in food processing since it can affect product quality.

Water holding capacity Extent to which a substance can hold and retain water. Related to the solubility of the sample.

Water ices Frozen sugar confectionery made from water and sugar and flavoured with fruit juices, fruit purées or other fruit flavourings. Used to make some types of ice lollies.

Water supplies Drinking water supplied to the public and industry by a water supply company or authority.

Water Convolvulus

Common name for Ipomoea aquatica, a plant grown in China, Taiwan and Vietnam, also known as water spinach. Stems and leaves are eaten as vegetables, either boiled or stir fried; stems are also used as ingredients in pickles.

Water core Internal defect that affects mainly apples, but also pears and sometimes other fruits. Characterized by water-soaked appearance of some or all of the flesh.

Watercress

Dark green leafy plant (Nasturtium officinale or N. microphyllum x officinale). Rich in proteins, iron, carotenes and vitamin C; also contains vitamin E, group B vitamins and other minerals. Used in salads, garnishes, soups and cooked as a vegetable.

Water dropwort Common name for Oenanthe stolonifera. Young shoots and leaves from the plant are used in China as flavourings for fish soups and poultry dishes.

Waterfowl

Wetland birds such as ducks, geese and swans, which belong to the order Anseriformes. The term is most commonly used for wetland game birds, some of which are hunted for their meat.

Water hardness A measure of the amount of dissolved mineral salts, especially calcium and magnesium salts, in water, including drinking water. Hard water has a high content of dissolved minerals, while soft water has a low mineral content. Water hardness is an important factor in food processing since it can affect product quality.

Water supplies Drinking water supplied to the public and industry by a water supply company or authority.

Water activity Measure of the water vapour generated by the moisture present in a hygroscopic product. Defined as the ratio of the partial pressure of water vapour to the partial pressure of water vapour above pure water at the same temperature. In foods, it represents water not bound to food molecules; the level of unbound water has marked effects on the chemical, microbiological and enzymic stability of foods. Commonly abbreviated to aw.

Water chestnuts Seeds of Trapa natans or T. bicor-nis, which are cooked and eaten as vegetables. Commonly used in Chinese cooking.

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Weaning foods  Infant foods

Weaning  

Weevils  Common name for various insects of the family Curculionidae. Also known as snout beetles. Often highly destructive pests of crops and stored cereal grains, e.g. the alfalfa weevil (Hypera postica), the grain weevil (Sitophilus granarius) and the rice weevil (S. oryzae). Larvae of some species can be destructive to fruits, nuts and grain.

Weighing machines  Devices, also called scales, used to determine the weight of an object. The simplest weighing mechanism is the equal-arm balance, which consists of a bar with a pan hanging from each end and a support (fulcrum) at the centre of the bar. Precision balances used in scientific laboratories can measure the weight of small amounts of material down to the nearest 1 millionth of a gram. Such weighing machines are enclosed in glass or plastic to prevent wind drafts and temperature variations from affecting the measurements. Electronic scales, which use electricity to measure loads, are faster and generally more accurate than their mechanical counterparts; in addition, they can be incorporated into computer systems, which makes them more useful and efficient than mechanical scales.

Weissella  Genus of Gram positive lactic acid bacteria of the Leuconostocaceae family. Found in a range of foods, including fermented foods. Weissella viridescens can cause spoilage of cooked ham. W. cibaria, isolated from the Thai fermented fish product plaa-som, produces weissellicin 110, a bacteriocin that is active against some Gram positive bacteria.

Weisswurst  White German sausages made with veal, cream and eggs. Eaten fried or poached and traditionally served in Germany during the Oktoberfest, accompanied by sweet mustard, rye bread and beer.

Well water  Water derived from wells. May be used as drinking water.

Welsh onions  Common name for Allium fistulosum. Rich in vitamin C; also contains a range of other vitamins, carotenones and group B vitamins. Very small bulbs, but hollow, cylindrical leaves that are used is salads and soups. The whole plant may be cooked. Also known as Japanese leeks, Japanese bunching onions, ciboule and cibol.

Western blotting  Method for detecting specific proteins. Proteins are separated by gel electrophoresis and transferred to a suitable matrix (e.g. nitrocellulose or PVDF), on which the proteins bind in a pattern identical to that on the original gel. After blotting, target molecules are detected through the use of labelled antibodies specific for the proteins of interest. Alternatively, proteins can be detected through the use of specific, unlabelled primary antibodies followed by addition of labelled secondary anti-antibodies.

Wet milling  Process for separation of a substance into its constituent parts by a combination of chemical and mechanical means. Used mainly in processing of corn, but can also be applied to other cereals such as sorghum, wheat and rice. Cereals are steeped in water with or without sulfur dioxide to soften the kernels before removal of the germ and separation of the other components. The main product is starch, which can be further processed in the case of corn to manu-
Wheat bread  Bread made from wheat flour. White wheat breads are made from finely sifted wheat flour, while whole wheat bread is prepared by incorporating the fibre-rich outer layers of the wheat grain.

Wheat baking  Process by which bread is made from wheat flour.

Wheat dough  Unbaked, thick, plastic mixture of wheat flour and a liquid, such as water or milk. May contain yeasts or baking powders as leavening agents. Used predominantly to make bread; dough made to use other products, e.g. pizzas, biscuits, noodles, may vary in composition from bread dough.

Wheat flour  Product resulting from grinding wheat grains. Wholemeal flours are obtained by grinding whole wheat grains, while white flour is produced by separating wheat germ and wheat bran from the endosperm. Used to prepare a range of bakery products such as bread, cakes and biscuits.

Wheat germ  Vitamin- and lipid-rich embryo (sprouting portion) of the wheat grain. Milling of grain to produce white wheat flour results in separation of the germ, which may then be used to enrich bread and breakfast cereals. Also used in dietary supplements.

Wheat germ oils  Oils extracted from seeds of wheat (Triticum aestivum). Rich in linoleic acid and tocopherols; also contain a-linolenic acid.

Wheat gluten  Complex formed when wheat proteins are mixed with water. Consists of glutenin and gliadins. Gluten forms an elastic network during kneading of dough, which is important for the texture of the bread. Gluten content of wheat varies among varieties.

Wheat malt  Germinated wheat grains used in brewing and distillation, essential for making wheat beer. Wheat malt contains more protein than barley malt, and this can give beer a fuller mouthfeel and enhanced beer head stability. However, it can also result in beer haze problems.

Wheat starch  Starch isolated from wheat.

Whelks  Shellfish, including several species of marine gastropod molluscs of the family Buccinidae; worldwide distribution. Flesh of many species is tenderized by pounding prior to consumption. Commercially important species include Buccinum undatum (common whelks) and Neptunea antiqua (red whelks).
Whey

Marketed fresh (in shell; cooked or uncooked), semi-preserved (in vinegar and salt) and canned.

Whey Liquid formed by coagulation of milk during cheesemaking. The solid portion (curd) is processed further to make cheese. Whey is sometimes used in making whey cheese, but is produced in large amounts as a waste, disposal of which poses problems for the dairy industry. Although mainly used in animal feeds, whey can be utilized as an ingredient in some foods and as a fermentation substrate. Also called serum or lactoserum.

Whey beverages Drinks, sometimes sports drinks or nutritional beverages for specific population groups, based on whey. Can be alcoholic or non-alcoholic.

Whey cheese Cheese prepared by concentrating whey and coagulating the proteins with heat and acids. The resulting curd is strained and possibly pressed. Milk or cream may be added to increase fat content or improve cheese flavour. Ricotta cheese is a well-known whey cheese.

Whey concentrates Concentrates prepared from whey. Used in a variety of foods to supplement nutritional values. Uses include preparation of sports drinks and sports drinks, and dietic foods.

Whey protein concentrates Products prepared from whey by separation of whey proteins using precipitation or ultrafiltration. Precipitation at a high temperature and low pH followed by centrifugation produces a concentrate of denatured, insoluble whey proteins. Ultrafiltration followed by vacuum evaporation and spray drying produces a concentrate of non-denatured, soluble proteins. Concentrates varying in composition can be made by controlling manufacturing conditions. Uses include adjustment of protein contents of various products, including infant formulas, dietic products and protein-enriched foods for specific groups of people, e.g. athletes. Foaming properties of whey protein concentrates make them suitable for use in aerated foods and as replacements for egg whites.

Whey proteins Milk proteins that remain in whey after manufacture of cheese. Sometimes called serum proteins. Consist of albumins (α-lactalbumin and serum albumin) and globulins (mainly β-lactoglobulin).

Whipped cream Cream in which the volume has been increased (overrun) by 90-100% by whipping in air. Available commercially in aerosol cans, the product containing sugar in addition to cream.

Whipping Beating of ingredients, particularly cream and egg whites, during which air is incorporated into them, increasing their volume and creating a froth.

Whipping capacity The extent to which a food can be whipped, usually measured by the percentage increase in volume.

Whipping cream Cream with a fat content of approximately 34% that can be whipped to approximately double its volume.

Whipping properties Functional properties relating to the ability of a food to be whipped, increasing the volume by incorporation of air.

Whiskey Alternative spelling of whisky. This spelling is generally used for Irish and American whiskies. Spirits made by distillation of fermented mash made from saccharified cereals, using raw materials, distillation conditions and ageing periods as specified by national regulations for the specific whiskey type.

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White amur Alternative term for grass carp.

Whitebait General name used for young marine fish of various herring-like species, including Clupea harengus (Atlantic herring) and Sprattus sprattus (European sprat). Often consumed as a fried product, sometimes in batters (whitebait fritters).

White beans Type of common beans (Phaseolus vulgaris).

White cabbages Variety of Brassica oleracea. Cabbages with white heads that mature in winter.

White cheese Fresh cheese that is either uncured or only slightly cured. High moisture content and perishable.

White chocolate Confectionery containing sugar, cocoa butter and milk solids, together with emulsifiers such as lecithin, and vanilla flavouring. Does not contain any cocoa solids, and cannot be marketed as chocolate in many countries. Both US and EU regulations require foods marketed as white chocolate to contain a minimum of 20 weight% cocoa butter.

Whitecurrants White berries produced by Ribes sativum. Rich in vitamin C. Eaten out of hand or as components of preserves, jellies and sauces.

White fish General name referring to white-fleshed marine fish in which the main fat reserves are in the livers, particularly gadoid species such as cod, haddock, whiting and coalfish.

Whitefish Any of several marine and freshwater fish within the genera Coregonus and Prosopium; distributed in the North Atlantic or in lakes across northern Europe and North America. Commercially impor-
White lupins

Common name for the white-flowered plant *Lupinus albus* or *L. termis*. Pods contain large, off-white seeds that are rich in proteins and oils. Seeds are sometimes used as coffee substitutes and their flour as a replacement for soy meal. Potentially toxic alkaloids in lupin seeds are removed by washing in water.

**White mustard**

Common name for *Sinapis alba*, seeds of which are ground to produce spices. When reconstituted with water, the spice develops a pungent aroma due to formation of allyl isothiocyanate. Turmeric is often added to the mustard powders to produce a bright yellow coloration, leading to the alternative name, yellow mustard.

**Whiteners**

Substances used to whiten or bleach foods such as flour or fish. May be used as substitutes for fresh milk in beverages including coffee (coffee whiteners), tea or cocoa, or in sauces. Available as liquids or powders. These are prepared from milk proteins or non-dairy proteins (e.g. soy proteins) and fats, blended with other ingredients such as sugar, emulsifiers, stabilizers, buffers, flavourings and colorants.

**Whiteness**

One of the optical properties; relating to the extent to which an item is white, i.e. snowy and milky in appearance.

**White pepper**

Common name for *Piper nigrum*, fruit of which are ground to produce spices. Compared with black pepper, which is produced from fully grown, but unripe, fruit of *P. nigrum*, white pepper has a more delicate flavour. The major flavour compound of white pepper is piperine.

**White pickled cheese**

White cheese pickled in brines. Alternative term for brine ripened cheese.

**White sugar**

Purified crystalline sugar containing approximately 1% moisture. Dried to produce granulated sugar.

**White tuna**

Generally refers to flesh from the albacore (*Thunnus alalunga*), which is lighter-coloured than flesh from other tuna.

**White whales**

Alternative term for beluga whales.

**White wines**

Wines with a white to golden yellow colour. May be made from white winemaking grapes or alternatively from red winemaking grapes by a technique which avoids extraction of anthocyanins from the grape skins.

**Whiting**

Name given to a variety of marine fish species, the majority being in the cod and hake families (Gadidae and Merlucciidae). Particularly refers to *Merlangius merlangus*, a commercially important species found in the north Atlantic Ocean. Marketed fresh and frozen (whole, or single and block fillets) and as smoked or canned products.

**WHO**

Abbreviation for World Health Organization.

**Wholegrain foods**

Foods made from whole, unrefined grains or wholegrain ingredients. Wholegrains contain the entire edible parts of a grain kernel, i.e. the germ, endosperm and bran, and are rich in many nutrients which are generally lost during refining. In addition, wholegrains are low in fat and cholesterol. Wholegrain foods include wholemeal bakery products and pasta, some breakfast cereals and brown rice. Consumption of wholegrain foods has been associated with a number of health benefits including reduced risks of developing certain cancers and heart disease.

**Wholemeal**

Flour or bread made from the entire cereal grain with none of the bran or germ removed.

**Whole milk**

Milk from which none of the fat has been removed. Fat content of milk varies according to species, being approximately 4% in cow milk. Milk is also available in other forms from which some (semi skimmed milk) or almost all (skim milk) of the fat has been removed. These other forms are preferred by some consumers wishing to limit their intake of fats.

**Wieners**

Cooked, smoked frankfurters, which take their name from the city of Vienna (Wien), Austria. Some wieners are prepared in edible natural casings; these sausages are often considered more traditional, and tend to cost more than skinless varieties. Traditionally, wieners are braided in groups of links.

**Wild boar meat**

Meat from wild boars. It is similar to pork, but has a redder colour, a lower content of fat and a stronger flavour. It may be infested with larvae of *Trichinella spiralis* and therefore must be cooked thoroughly before eating to prevent trichinosis.

**Wild boars**

Wild swine (*Sus scrofa*) of the family Suidae from which most domestic swine have been bred. They are hunted for wild boar meat.

**Wild cabbage**

Type of *Brassica oleracea* that grows wild on coastal cliffs. Evolved into many varieties grown for their edible stem, leaves, buds or flowers.

**Wildebeests**

Large African antelopes belonging to the genus *Connochaetes*; they are also known as gnus. There are two species, namely the white-tailed gnu (*C. taurinus*), which is now a protected species, and the blue wildebeest or brindled gnu (*C. albida*). They are hunted for their meat, particularly in East Africa where controlled culling is carried out to harvest wildebeest meat.
Wild garlic  Wild plants of the genus Allium used in 
flavourings or as a vegetable, and having beneficial 
effects on health. Commonly consumed species in-
clude A. ursinum and A. victorialis.

Wild mushrooms  Mushrooms that grow in the 
wild and are prized for their exotic flavour. Since 
many wild species are poisonous, great care must be 
taken to identify the edible species when picking them.

Wild rice  Long grain aquatic grass with a nutty fla-
avour. Chinese wild rice is Oryza latifolia, while North 
American wild rice is produced by plants of the genus 
Zizania. Due to the high costs of this cereal, it is often 
eaten mixed with other rice varieties or bulgur wheat.

Wild vegetables  Plants that are harvested from the 
wild rather than being cultivated and are eaten as 
vegetables.

Wild yeasts  Naturally-occurring strains of yeasts.

Wine coolers  Beverages made by blending wines 
with other ingredients, including water, fruit juices, 
sugar, flavourings and ice.

Wine distillates  Intermediate products or finished 
spirits made by distillation of wines.

Wine gums  Sugar confectionery products with a 
chewy texture made with sucrose, glucose and ei-
ther gum arabic or gelatin. Often fruit-flavoured. 
Similar to fruit gums and to fruit jellies, although 
the latter are softer due to a higher moisture content.

Winemaking  Process of manufacture of wines. The 
basic process comprises crushing grapes, alcoholic 
fermentation of the grape juices and ageing of the 
wines. Many additional processes may be applied, in-
cluding maceration, clarification, chaptalization, 
filtration, fining and, in the case of sparkling 
winemaking, secondary fermentation.

Winemaking grapes  Grape cultivars used primarily 
for winemaking, and having characteristics making 
them especially suitable for this application. Mainly 
Vitis vinifera, but other Vitis spp. or their hybrids with 
V. vinifera are also used for winemaking.

Wineries  Industrial establishments where wines are 
manufactured.

Wines  Alcoholic beverages manufactured by al-
coholic fermentation of fruit musts or fruit 
juices. Generally refers to beverages produced from 
grapes (Vitis spp., mainly V. vinifera). Fruit wines 
are made from other fruit musts or juices. The term 
wines may also be used to refer to rice wines (made 
from saccharified rice mashes), and palm wines 
(made from palm sap).

Wines manufacture  Alternative term for winemak-
ing.

Wine vinegar  Vinegar produced by acetic fer-
mentation of wines, e.g. red wines, white wines or 
sherry. Wine vinegar has a wine-like flavour and is 
used more as a flavouring than as a condiment, e.g. as 
an ingredient of salad dressings.

Wine yeasts  Yeasts used for fermentation of 
grape musts to produce wines. May be spontaneous-
ously occurring yeasts, or pure yeasts cultures. Mainly 
Saccharomyces spp., although other genera of 
yeast may play a role in the early stages of fermenta-
tion.

Winged beans  Beans produced by Psophocarpus 
tetragonolobus. Rich in protein. As well as the seeds, 
immature green pods, leaves and root tubers of the plant are eaten. Also known as goa beans and as-
aparagus peas.

Winnowers  Devices for blowing air through grain in 
order to remove the chaff. Winnowing is also used to 
separate the shell and some of the germ from cocoa 
beans during manufacture of chocolate.

Winterization  Removal of traces of waxes and 
higher melting glycerides, or stearin, from fats. 
Waxes are generally removed by rapid chilling and 
filtration. Separation of stearin usually requires very 
slow cooling in order to form crystals that are large 
enough to be removed by filtration or centrifugation.

Cottonseed oils and groundnut oils are winter-
ized to produce salad oils that remain liquid at low 
temperatures. Tallow and other animal fats are win-
terized for simultaneous production of hard fats and 
oleo oil. Also known as destearination.

Withering  Process whereby plant material or foods 
become dry and shrivelled. Controlled withering can 
be undertaken either chemically or physically (includ-
ing techniques such as freeze withering, solar wither-
ing and warm air withering). Withering is commonly 
the first stage in the processing of teas. In some re-

gions, wines are made from grapes which have been 
partially dried by withering in the sun before pressing.

Witloof  Type of chicory.

Wolfberries  Berries of Lycium barbarum, of the 
family Solanaceae. Usually marketed in dried form, 
and can be eaten raw as health foods or used in 
functional foods and functional beverages. Also 
known as goji berries.

Wood  Hard fibrous material which forms the main 
substance of the branches and trunk of trees. Used as 
a packaging material, particularly for making wooden 
barrels, baskets, crates and some fibreboard. 
Physicochemical properties of wood have major ef-
ects on the aroma and flavour of alcoholic bev-
erages stored and/or aged in wooden barrels, or foods 
exposed to wood smoke during processing.

Woodcock  Long-billed game birds of the sandpiper 
family. Valued highly as a food. Includes the Ameri-
Wood pigeons  Eurasian pigeons that may be hunted as game birds for their meat. Synonymous with the ring dove (Columba palumbus).

Wood smoke  Smoke produced from the burning of wood. The type of wood used (e.g. oak, hickory, mesquite) influences the properties of the smoke and governs its application. Used in flavourings and/or preservatives. Foods which are commonly processed using smoke include fish and meat. Smoke flavourings may be added to barbecue sauces or marinades.

Woolliness  Extent to which products, usually fruits, have a woolly texture, i.e. are dry and spongy. Woolliness is an adverse sensory property and physiological disorder, involving lack of juiciness, internal browning and inability to ripen, without variation in tissue moisture. It is associated with an imbalance in activity of pectic enzymes during storage. Onset of woolliness can be quantified instrumentally and is characterized as a lack of crispness, low hardness values and low juiciness.

Worcestershire sauces  Condiments produced by fermentation with yeasts of a mixture of fruit juices, vegetable juices, syrups and amino acids.

World Health Organization  The World Health Organization (WHO) is a specialized agency of the United Nations (UN) that helps countries to improve their health services and coordinates international action against diseases.

World Trade Organization  The World Trade Organization (WTO) is an international body, which began life on 1 January 1995, that promotes and enforces the provisions of trade laws and regulations at a global level. The WTO is an organization primarily for liberalization of trade, but its rules also support the maintenance of trade barriers when it is needed. It is a forum for governments to negotiate trade agreements and to settle trade disputes. The WTO agreements provide legal ground rules for international commerce. The bulk of the WTO's current work comes from the 1986-1994 Uruguay Round of negotiations and earlier negotiations under the General Agreement on Trade and Tariffs (GATT). The WTO is currently hosting new negotiations under the Doha Development Agenda launched in 2001.

Wormwood  Common name for Artemesia absinthium, leaves and flowering tops of which are used to produce spices. Wormwood has a bitter flavour. It is used in natural flavourings for vermouths. A. absinthium extracts and essential oils are also used as flavourings. The plant also contains α-thujone, which is a convulsant at high concentrations; hence, in some countries such as the USA, foods and beverages containing wormwood are permitted only if thujone is not present.

Worts  Clarified extracts prepared from mash based on malt, sometimes with addition of brewing adjuncts, and subsequently fermented to form beer. Worts are generally boiled with hops to extract hop bitter compounds.

Wrapping  Packaging, e.g. paper or soft material, used to cover or protect a food, particularly during retail and after selection by the consumer.

Wreckfish  Marine fish species (Polyprion americanus) belonging to the family Polyprionidae and of minor commercial importance. Distributed in the Atlantic Ocean, western Indian Ocean and southwest Pacific Ocean. Marketed fresh, frozen or cooked in a variety of ways.

Wuerstel  Small sized, frankfurter style sausages, traditionally made in Italy. They have high fats content.
Xanthan Extracellular heteropolysaccharide produced by Xanthomonas campestris. Uses in the food industry include in gelling agents, gel stabilizers, thickeners and crystallization inhibitors.

Xanthan gums Gums produced by the bacterium Xanthomonas campestris. These gums are exopolysaccharides composed of repeating pentasaccharide units comprising a cellulose backbone and trisaccharide side chains of D-mannose and D-glucuronic acid residues. The gums also contain variable quantities of pyruvic acid. Used widely in the food industry as thickeners due to their ability to produce highly viscous, highly stable aqueous solutions. Other uses include as emulsifiers, stabilizers and binding agents, and to provide body, e.g. in low fat foods.

Xanthene dyes Pigments derived from xanthene. Examples of those used as food colorants include rose bengal, erythrosine and phloxine.

Xanthine dehydrogenases EC 1.17.1.4, formerly 1.1.1.204. Enzymes that catalyse the conversion of hypoxanthine to xanthine and the further oxidation of xanthine to uric acid. Also act on a variety of purines and aldehydes. Major proteins of bovine milk fat globule membranes. Xanthine dehydrogenases from animals can be converted to xanthine oxidases by thiols such as 1,4-dithioerythritol. In most tissues, the enzyme exists mainly as the oxidase but in animal livers it is found almost entirely in the form of xanthine dehydrogenase.

Xanthohumol Prenylated chalcone present in hops and beer. Possesses a range of properties beneficial for health, including antioxidative activity, anticarcinogenicity, antimitogenicity and protection against osteoporosis and atherosclerosis.

Xanthomegnin Hepatotoxic mycotoxin produced by certain species of Aspergillus, Penicillium and Trichophyton.

Xanthomonas Genus of Gram negative, aerobic, rod-shaped bacteria. Several species are plant pathogens (e.g. Xanthomonas campestris, X. fragariae, X. ampe-lina and X. abilicanes). X. campestris causes black rot of cabbages and cauliflowers, common blight of beans, and bacterial spot of tomatoes and peppers. X. campestris is also used in the production of xanthan gums. Several species may cause spoilage of raw chilled meat, fish and egg products.

Xanthophyllomyces dendrorhous Species of yeasts of the family Cystoflabasiaceae. Used in biotechnology for the industrial production of astaxanthin.

Xanthophylls Group of neutral yellow or brown carotenoid pigments that are oxygenated derivatives of carotenoids and distributed widely in plants. Useful as food colorants.

Xanthotoxin Furano coumarin toxin produced by celery in response to infection by certain fungi and bacteria and after various stress treatments. Consumption or contact with affected celery can cause phototoxic skin reactions or bullous dermatitis.

Xenobiotics Substances that are foreign to living organisms. Can be synthetic or naturally occurring compounds. Examples include drugs, pesticides and carcinogens.

Xerocomus Genus of edible fungi, commonly consumed species including Xerocomus badius and X. subtomentosus.

X-ray absorptiometry One of the analytical techniques employed for analysis of bone mineral
**X-ray crystallography**

Density, body composition and obesity. It is more commonly known as dual energy X-ray absorptiometry since it involves irradiation with 2 beams of X-rays having different energies. The amount of X-ray radiation absorbed by a tissue is correlated positively with its density. Used in nutritional studies for assessing impact of diet on bone health or body composition, and also for analysis of the composition of animal carcasses.

X-ray crystallography One of the analytical techniques used for modelling of molecular structure. Crystals prepared from the molecule of interest, or a powder of the crystals, are bombarded with X-rays which are scattered by the electrons of the molecule. The pattern of diffracted X-rays generated is related to electron density by the Fourier transform function, thus an electron density map is created by application of this function to the X-ray diffraction pattern. A molecular model may be produced from the electron density map and other data. Synonymous with X-ray diffraction. Widely used for the analysis of proteins, including milk proteins and enzymes, and starch.

X-ray diffraction Alternative term for X-ray crystallography.

X-ray fluorescence spectroscopy Spectroscopy technique in which the sample is irradiated with X-rays, causing emission of a characteristic X-ray photon and fluorescence, which is measured using a spectrophotometer.

X-rays Penetrating electromagnetic radiation of very short wavelength, able to pass through many materials. X-rays are produced by bombarding a target, usually made of tungsten, with high-speed electrons. The shorter the wavelength of the X-ray, the greater its energy and its penetrating power. Longer wavelengths, near the UV-ray band of the electromagnetic spectrum, are known as soft X-rays. The shorter wavelengths, closer to and overlapping the gamma-ray range, are called hard X-rays. A mixture of many different wavelengths is known as white X-rays, as opposed to monochromatic X-rays, which represent only a single wavelength. X-rays are used in the food industry for a wide range of analytical purposes, including detection of contaminants in manufactured foods.

Xylan Polysaccharide found in the cell walls of plants, where it forms the bulk of the hemicelluloses component. Consists of (1→4)-β-linked D-xylose residues with side chains of other sugars, such as (4-β-glucopyranosyluronic acid and α-L-arabinofuranosyl residues. (1→3)-linkages may also be present and the molecule may be acetylated.

Xylanases Alternative term for xylan degrading enzymes and xylan endo-1,3-β-xylosidases.

Xylan degrading enzymes General term for glycosidases that hydrolyse and degrade xylan.

Xylan endo-1,3-β-xylosidases EC 3.2.1.32. Xylan degrading enzymes that catalyse the random hydrolysis of 1,3-β-D-xylosidic linkages in 1,3-β-D-xylans. Useful as dough improvers and volume-increasing agents in bread and bakery products, and for wheat starch separation. Also known as xylanases and endo-1,3-β-xylanases.

Xylan 1,4-β-xylosidases EC 3.2.1.37. Xylan degrading enzymes that hydrolyse 1,4-β-D-xylans, removing successive D-xylose residues from the non-reducing termini. Also known as xylobiases, β-xylosidases and exo-1,4-β-xylosidases, these enzymes are useful for utilization of xylan-containing substrates. Also hydrolyse xylobiose.

Xylene Comprises 3 dimethylbenzene isomers which are potential chemical contaminants of foods and drinking water. Used as a solvent in the printing, rubber and leather industries. Human exposure is generally via inhalation, but levels of 1-100 ppb have been found in foods. Can cause headaches, lack of muscle coordination, dizziness, renal failure and death, depending on the level of exposure.

Xylitol Naturally occurring polyol comprising 5 carbon atoms which has equivalent sweetness to sucrose. Manufactured by hydrogenation of xylene. Used in sweeteners, especially for low sugar confectionery, since it is non-cariogenic.

Xylitol dehydrogenases Alternative term for d-xylulose reductases.

Xyloglucans Polysaccharides found in the hemicelluloses component of plant cell walls. Consist of (1→4)-linked glucose residues, most of which have a xylose residue side chain attached. Galactose, arabinose and fucose may also be present.

Xylooligosaccharides Oligosaccharides that contain xylose residues. Useful as sweeteners and as prebiotics. Thought to be indigestible, and animal models have suggested that they may reduce serum cholesterol levels and repress peroxidation of lipids induced by a high cholesterol diet.

Xylose Aldose monosaccharide comprising 5 carbon atoms which may be produced by hydrolysis of xylan. Substrate for manufacture of xylitol and xylobiose. Has approximately 0.7 times the sweetness of sucrose and is used as a sweetener for diabetic foods.

Xylose isomerases EC 5.3.1.5. Enzymes that catalyse the isomerization of D-xylose and D-xylulose. Also isomerize D-ribose and D-glucose, and are useful for isomerization of glucose to fructose in the pro-
Xylose reductases

Reduction of fructose high corn syrups. The name glucose isomerases is still widely used for these enzymes.

Xylose reductases  Alternative term for aldehyde reductases.

β-Xylosidases  Alternative term for xylan 1,4-β-xylosidases.

Xylulose  Ketose monosaccharide comprising 5 carbon atoms (pentose) that is an isomer of xylose. May be formed by aldose-ketose isomerization of xylose using bacterial xylose isomerases.

d-Xylulose reductases

EC 1.1.1.9. Dehydrogenases involved in the fermentation of xylose and production of xylulose from xylitol. These enzymes have been expressed in several bacteria, and the yeast Saccharomyces cerevisiae, and recombinant cells have been used for fermentation of xylose to ethanol. They have also been used in xylitol biosensors for online control of xylitol production by yeasts.
Yacon Edible tubers of Smallanthus sonchifolius that are usually eaten raw. Contain high contents of inulin. The sweetish water chestnut-like flavour develops after exposure to the sun for a few days. Used for production of alcohol and sweeteners.

Yakfu Japanese bakery product made by mixing gluten with starch or wheat flour and baking.

Yakju Alcoholic beverages of the rice wines type, produced in Korea.

Yak meat Meat from yaks. It has higher protein, thiamin, iron, potassium and sodium contents, and lower fat and riboflavin contents than beef. In sensory terms, yak meat is described as very juicy, but sweetish, with a metallic off-flavour, due to its high iron content.

Yak milk Milk obtained from yaks, and drunk predominantly in Tibet, but also in Mongolia and India. Pink in colour. In Tibet, it is processed into 3 products: crispy oil (butter oil produced by separation of milk and used in cooking and making butter tea); sour milk made from whole milk or the skim milk remaining after removal of crispy oil; and milk solids residue resulting from boiling skim milk (made into yak milk cheese).

Yaks Large stocky ruminants belonging to the Bovidae family. Wild yaks are a protected species, but domesticated yaks (Bos grunniens) are reared to provide yak meat, yak milk, hair and hides. The domesticated yak is the dominant dairy animal in the pastoral areas of the Qinghai-Tibet plateau in China.

Yakult Starchy underground tubers of the genus Dioscorea. Good source of potassium and zinc, but contain only small amounts of vitamin C; yellow-fleshed varieties contain carotenes. Eaten cooked in the same way as potatoes, and sometimes processed into fufu. Flavour resembles that of potatoes. In the USA the name is used for sweet potatoes with orange flesh.

Yam starch Starch isolated from yams. Used as thickeners and gelling agents in some foods, and also in edible films.

Yard-long beans Alternative term for asparagus beans.

Yarrow Pungent, aromatic herb of the genus Achillea, especially A. millefolium. Used sparingly in salads and soups, and to make herb tea.

Yarrowia Genus of fungi of the class Saccharomycetes. Yarrowia lipolytica is responsible for spoilage of certain foods, e.g. yoghurt, butter, margarines, meat mince and cheese.

Yeast biomass Quantitative estimate of the total population of yeasts present in a given habitat, in terms of mass, volume or energy.

Yeast extracts Water-soluble fraction of autolysed yeasts. During autolysis, yeast enzymes hydrolyse cytoplasmic proteins and carbohydrates. Insoluble cell wall material (cellulose) is removed, e.g. by centrifugation, to leave a clear extract of water soluble cellular material that is rich in amino acids and other nutrients. Yeast extracts are used as flavourings, as a source of nutrients for microbial fermentation, and as a source of B group vitamins for fortification of foods.

Yeast proteins Proteins produced by yeasts.

Yeasts Unicellular fungi of the phylum Ascomycota that reproduce by fission or budding, and are capable of fermenting carbohydrates into alcohol and carbon dioxide. Some are responsible for food spoilage, while others are economically important as agents in breadmaking, brewing and winemaking, and in the production of single cell proteins, B vitamins and other fermentation products.

Yellowfin Alternative term for yellowfin tuna.

Yellowfin tuna Marine fish (Thunnus albacares), which forms the second largest part of the world tuna catch after skipjack tuna; widely distributed across the Atlantic and Pacific Oceans. Mar-
Yellow fish  General name used for salted, cold-smoked, white fish fillets, which usually develop a yellow colour after smoking; particularly refers to smoked haddock.

Yellow mustard  Synonym for white mustard (produced from seeds of *Sinapis alba*), to which turmeric has been added to produce a bright yellow coloration.

Yellow perch  Freshwater fish species (*Perca flavescens*) of commercial importance belonging to the family Percidae. Widely distributed in rivers and lakes of America and Canada. Marketed fresh or frozen and cooked by pan frying, broiling or baking.

Yellowtail  Any of several marine fish species of the genus *Seriola* (family Carangidae); distributed across warmer regions of the Atlantic and Pacific Oceans. The most important food fish species in commercial terms is *S. quinqueradiata*, which is cultured on a large scale in Japan. Marketed fresh, salted and dried; also canned (smoked flesh packed in oils). Also known as amberjack.

Yerba mate  Tree (*Ilex paraguariensis*) which grows in South America, the leaves and twigs of which are dried, seasoned and made into a popular local infusion or tea, called mate or sometimes yerba mate.

Yersinia  Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Enterobacteriaceae. Occur in soil and water, and in the gastrointestinal tract of animals (e.g. swine and rodents). Some species are able to survive and proliferate at low temperatures, which can pose a risk for refrigerated foods; some also possess relatively high heat resistance and can withstand pasteurization. *Yersinia enterocolitica* and *Y. pseudotuberculosis* are the causative agents of yersiniosis. Pork and pork products are substantial sources.

Yersiniosis  Disease of humans or animals caused by *Yersinia enterocolitica* and *Y. pseudotuberculosis*. Frequently characterized by gastroenteritis with diarrhoea and/or vomiting, and accompanying fever and abdominal pain. Transmission in humans is usually via ingestion of contaminated water and foods (e.g. meat, fish, shellfish, milk, dairy products, fruits and vegetables).

Yessotoxins  Class of shellfish toxins produced by dinoflagellates. Can produce enterotoxic effects in humans following ingestion of mollusc shellfish (e.g. clams, mussels, oysters and scallops) which filter feed on these dinoflagellates.

Yield stress  Stress at which the yield strength of a material is exceeded and elastic behaviour gives way to viscous behaviour. If continued, the stress may lead to failure stress, beyond which failure occurs. Measured in Newtons.

Ymer  Danish fermented milk.

Yoghurt  Fermented milk of creamy texture that can be prepared from milk of many species, but most often is made from cow milk. Can be made from whole milk, semi skimmed milk or skim milk, in a range of thicknesses, stirred or set, and in plain or flavoured varieties. Flavoured yoghurt is mixed with sugar and flavourings or fruits. Also made into frozen yoghurt, a product resembling soft serve ice cream. Commercially, yoghurt is made using yoghurt starters (generally *Lactobacillus bulgaricus* and *Streptococcus thermophilus*). Other bacteria beneficial to gastrointestinal health, e.g. *L. acidophilus* and *Bifidobacterium bifidum*, may also be added. Pasteurization destroys the bacteria in yoghurt; unpasteurized product is known as live yoghurt. Yoghurt is rich in calcium and iodine and a source of protein and B vitamins. Many spelling variants for yoghurt are used in various parts of the world, including yogurt, yoghurt and yogourt.

Yoghurt beverages  Drinks based on yoghurt. Include many health beverages as well as fruit containing beverages such as smoothies.

Yoghurt starters  Microbial cultures inoculated into milk to produce acidity by fermentation during manufacture of yoghurt. Commercial starter preparations generally contain *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.

Yukan  Japanese confectionery products made with agar (gelling agent), sugar and azuki beans paste, together with persimmons and chestnuts, which are used as flavourings.

Youngberries  Dark red berries produced by *Rubus arsimus*, a hybrid between dewberries and blackberries.

Yuba  Product made from the skin that forms on the surface of soymilk during heating. The skin is hung up to dry in sheets or sticks. Used in meat substitutes, wrapped round other foods or eaten alone after deep frying.

Yucca  Trees belonging to the genus *Yucca* which grow mainly in the USA and Mexico. Extracts of some species, especially *Y. brevifolia* and *Y. schidigera*, are used as foaming agents in foods and beverages, including root beer, cocktail mixes and whipped drinks. Yucca extracts are also used as feed additives.

Yukwa  Traditional Korean snack food made by deep frying gelatinized waxy rice dough, which has previously been steamed, punched and moulded.

Yusho  Disease caused by ingestion of edible oils which became contaminated with polychlorinated...
biphenyls (PCB) on the Japanese island of Kyushu in 1968.

Yuzu Citrus fruits (Citrus junos) cultivated mainly for the rind which has a characteristic aroma and is used as a garnish or flavour enhancer in a variety of dishes. Source of essential oils.
Zabadi  Fermented milk resembling yoghurt that is popular in the Middle East. Sometimes served as a dessert with thick syrups. Alternative term for zabady.

Zabady  Alternative term for zabadi.

Zearalenol  Alcohol derivative of zearalenone with oestrogenic activity, which may be used as an anabolic growth promoter in food-producing animals. Use is banned in some countries. Animals may carry out in vivo metabolic conversion of zearalenone to zearalenol.

Zearalenone  Synonym for F2 toxin. A mycotoxin produced by Fusarium graminearum, F. culmorum and other Fusarium spp.. May be formed when the fungus grows on damp cereal grain (e.g. wheat, barley and corn) used as animal feeds. Has oestrogenic activity and can cause hyperoestrogenism in swine, cattle and poultry.

Zeatin  Naturally occurring cytokinin derived from adenine which plays a role in the growth and development of plants.

Zeaxanthin  Member the xanthophylls group of carotenoid pigments and an isomer of lutein. May contribute to visual health. Found in many plants, certain algae and egg yolks, and used in food colourants.

Zedoary  Common name for Curcuma zedoaria, a plant related to turmeric. Young rhizomes are eaten as a vegetable. The dried rhizome is pulverized and used as a spice. Used as a condiment and in manufacture of flavourings and bitters. Also known as shoti.

Zefir  Traditional Russian foamed confectionery products, similar to meringues.

Zein  Prolamin which accounts for approximately half of the total storage proteins in corn. Contains minimal concentrations of lysine and tryptophan, but is rich in leucine.

Zeleny values  Indicators of wheat protein quality for breadmaking, providing estimates based on sedimentation of swollen gluten and starch suspended in a solution of lactic acid.

Zeolites  Crystalline, hydrated alkali-aluminium silicates. Useful as catalysts for production of invert sugar from sucrose, downstream processing of flavour compounds, detoxification of contaminated foods and feeds, and as molecular sieves.

Zeranol  Anabolic growth promoter with oestrogenic activity which may be used in food-producing animals. Use has been banned in the EU since 1988. May be formed in animals by in vivo metabolism of Fusarium spp. mycotoxins (e.g. zearalenone) present in feeds.

Zinc  Essential trace element, chemical symbol Zn. Important for growth and is part of the active site of many enzymes, where it is usually required for activity.

Zineb  Foliar dithiocarbamate fungicide used for control of downy mildew, blights and other fungal diseases in leafy vegetables, potatoes, tomatoes, berries, stone fruits and pome fruits. Classified by WHO as unlikely to present acute hazard in normal use.

Zingerone  One of the primary pungent principles of ginger, displaying antioxidative activity.

Ziram  Foliar dithiocarbamate fungicide used for control of fungal diseases in a wide range of fruits and vegetables. Also applied to plants as an animal repellent. Classified by WHO as slightly hazardous (WHO III).

Zireh  Name used in some parts of the world for black cumin (Nigella sativa). The dark brown crescent-shaped fruits or seeds are used as a spice and as the source of essential oils rich in monoterpene aldehydes and terpene hydrocarbons such as cuminaldehyde and γ-terpinene.

Zn  Chemical symbol for zinc.

Zolone  Alternative term for the insecticide phosalone.

Zoonoses  A group of infectious and parasitic diseases which are transmissible from animals to man, e.g. brucellosis, salmonellosis and trichinosis. Many disease organisms affect only humans or particular animals; however, zoonotic organisms can adapt themselves to many different species.

Z-Trim  Trade name for non-caloric, thermally stable food ingredients derived from insoluble fibre from plants (usually cereals and legumes). Used as fat substitutes, stabilizers and emulsifiers in a range
of food applications, including bakery products, meat products, dressings and dairy products. Developed by the USDA. Z Trim Holdings, Inc. licenses the rights to manufacture and sell Z Trim.

**Zucchini** Alternative (US) name for courgettes.

**Zucchini squashes** Alternative term for courgettes.

**Zwieback** Sweetened bread originating from Germany. The dough contains eggs and butter and is baked, sliced and baked a second time to form a type of rusk.

**Zygosaccharomyces** Genus of ascomycetous fungi of the family Saccharomycetaceae. *Zygosaccharomyces rouxii* is responsible for spoilage of certain foods (e.g. musts, fruit juice concentrates, confectionery and honeys), and is important in the manufacture of miso, soy sauces, ogi and balsamic vinegar. *Z. bailii* causes spoilage of mayonnaise, salad dressings, pickles, mustard, ketchups, carbonated beverages and some wines.

**Zymomonas** Genus of facultatively anaerobic, rod-shaped Gram negative bacteria of the family Sphingomonadaceae. Occur in fermenting beverages and plants. Some species cause spoilage of alcoholic beverages (e.g. cider and beer). *Z. mobilis* is a widely used industrial bacterium, producing fermentation products such as ethanol, levans, fructose, oligosaccharides and sorbitol. Also used in the production of pulque and palm wines. Levansucrases produced by *Z. mobilis* are used in hydrolysis of sucrose to levans and ethanol.
## APPENDIX A: THE GREEK ALPHABET

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APPENDIX B: SCIENTIFIC SOCIETIES AND ORGANISATIONS IN THE FOOD SCIENCES

International Union of Food Science and Technology (IUFoST)

The International Union of Food Science and Technology is the world organization of food science and technology and is full scientific member of the International Council for Sciences (ICSU). The chief aims of IUFoST are to promote international cooperation, support international progress, advance technology, stimulate education and teaching, and to foster professionalism and professional organization.

Contact information

IUFoST Secretariat
PO Box 61021
No. 19, 511 Maplegrove Road
Oakville, Ontario
Canada L6J 6X0
Phone: +1 905 815 1926
Email: secretariat@iufost.org
Web site: www.iufost.org

IUFoST has four Regional Groupings:

Asociación Latinoamericano y del Caribe de Ciencia y Tecnología de Alimentos (ALACCTA)

ALACCTA unites Latin-American and Caribbean Associations of Food Science and Technology. A regional seminar is organized every other year as well as international courses with experts from all over the world. Sixteen countries have joined the Association and ongoing efforts are being made to pool research efforts and find scholarship funds. Details of member organizations can be found on the ALACCTA website, www.publitec.com/alaccta.htm.

European Federation of Food Science and Technology (EFFoST)

The European Federation of Food Science and Technology is a regional grouping of IUFoST, with 80 societies in 21 countries affiliated to it. Its primary aims are to develop closer contact between food producers and distributors, universities and research institutes; enhance rapid technology transfer from ideas/research into industrial applications to improve European competitiveness; promote continuing professional development and educational excellence within food science and technology; harmonize food legislation and enforcement programmes throughout Europe; and maintain a collaborative network of (research) organizations within the European food industry aimed at cooperation and ‘knowledge sharing’.

Contact information

EFFoST
c/o Wageningen University
Bomenweg 2
PO Box 8129
6703 HD Wageningen
Federation of Institutes of Food Science and Technology in ASEAN (FIFSTA)

Activities of this body include joint efforts between the seven member countries of the Association of Southeast Asian Nations (ASEAN) to develop a vital interest in and help set standards for the food industry, through conferences, committees addressing specific regional issues, and workshops.

FIFSTA aims to promote cooperation and exchange of scientific and technical information among scientists, food technologists and specialists; support progress in both theoretical and applied areas of food science; advance technology in the processing, manufacturing, preservation, storage and distribution of food products; stimulate appropriate education and training in food science and technology; and foster professionalism and professional organization among food scientists and technologists.

Western African Association of Food Science and Technology (WAAFoST)

The Western African Association of Food Science and Technology was inaugurated in 2007 and is a regional, non-governmental and non-profit professional body of organizations/institutions, one or more from each country or sub-region, representative of food scientists and technologists, food industry management and other related professional bodies in West Africa.

Selected national scientific societies for food science and technology

Argentina
Asociación Argentina de Tecnólogos Alimentarios
Alsina 943, 4º 406 (1088), Ciudad Autónoma de Buenos Aires, Argentina
Phone: +54 11 4334 0155
Email: tecnologos@alimentos.org.ar
Web site: www.alimentos.org.ar

Australia
Australian Institute of Food Science and Technology Inc.
PO Box 6436
Alexandria
NSW 2015 Australia
Phone: +61 2 8399 3996
Email: aifst@aifst.asn.au
Web site: www.aifst.asn.au

Brazil
Sociedade Brasileira de Ciência e Tecnologia de Alimentos
Caixa Postal: 271, Av. Brasil, 2880
CEP: 13001-970 – Campinas SP Brazil
Phone: +55 19 3241 5793
Email: glaupast@fea.unicamp.br
Web site: www.sbcta.org.br

Canada
Canadian Institute of Food Science and Technology
3-1750 The Queensway
Suite 1311
Toronto, Ontario M9C 5H5, Canada  
Phone: +1 905 271 8338  
Email: cifst@cifst.ca  
Web site: www.cifst.ca

China  
Chinese Institute of Food Science and Technology  
Room 201 Zhongke Mansion, No.75 Deng shikou Street  
Dongcheng District, Beijing, P. R. China 100006  
Phone: +86 10 652 65375/6  
Email: cifst@126.com or cifst.China@gmail.com  
Web site: www.cifst.org.cn

Germany  
Gesellschaft Deutscher Lebensmitteltechnologen e.V.  
Eschborner Landstr.122  
60489 Frankfurt, Germany  
Phone: +49 69 90 745187  
Email: gdl@gdl-ev.org  
Web site: www.gdl-ev.org

India  
Association of Food Scientists & Technologists (India)  
CFTRI Campus  
Mysore 570 020, Karnataka, India  
Phone: +91 821 251 5557  
Email: afstimys@yahoo.com  
Web site: www.afsti.org

Italy  
Associazone Italiana di Technologia Alimentare  
Strada Farini, 31  
43100 Parma, Italy  
Phone: +39 521 230 507  
Email: aitaer@tin.it  
Web site: www.aitaer.com

Japan  
Japanese Society for Food Science and Technology  
Shokuhin Sogo Kenkyujo  
2-1-12 Kannondai  
Tsukuba-shi  
Ibaraki 305-8642, Japan  
Phone: +81 29 838 8116  
Email: info@jsfst.or.jp  
Web site: www.jsfst.or.jp

Korea  
Korean Society for Food Science and Technology  
Room 605, Science Center Building  
Yeoksam-dong, Kangnam-gu, Seoul 135-703, Korea  
Phone: +82 2 566 9937  
Email: kosfost@kosfost.or.kr  
Web site: www.kosfost.or.kr
Appendix B

Mexico
Asociación Nacional de Tecnólogos en Alimentos de México
Mar del Norte No. 5, Col. San Alvaro, 02090 México, D.F.
Phone: +52 55 5386 4225
Email: info@atam.com.mx
Web site: www.atam.com.mx

Nigeria
Nigerian Institute of Food Science and Technology
Olajide Koleoso Laboratory Complex, FIRO, PO Box 2,
NITEL Training Centre, Oshodi Lagos, Nigeria
Phone: +234 1 877 5253
Email: via www.nifst.org/?nifst:contact_nifst
Web site: www.nifst.org

Singapore
Singapore Institute of Food Science and Technology
Singapore Professional Centre (SPC)
93 Toa Payoh Central #05-01 Toa Payoh Community Building
Singapore 319194
Phone: +65 62 568 890
Email: info@sifst.org.sg
Web site: www.sifst.org.sg

South Africa
The South African Association for Food Science and Technology
PO Box 4507
Durban 4000, South Africa
Phone: +27 31 368 8000
Email: info@saafost.org.za
Web site: www.saafost.org.za

UK
Institute of Food Science & Technology
5 Cambridge Court, 210 Shepherds Bush Road
London W6 7NJ, UK
Phone: +44 207 603 6316
Email: info@ifst.org
Web site: www.ifst.org

USA
Institute of Food Technologists
525 W. Van Bureen, Ste.1000
Chicago, IL 60607, USA
Phone: +1 312 782 8424
Email: info@ift.org
Web site: www.ift.org
APPENDIX C: WEB RESOURCES IN THE FOOD SCIENCES

Shown below is a collection of web resources of relevance to the food science, food technology and nutrition communities. For details of food-related societies, please see Appendix B.

**Food Science Central**
www.foodsciencecentral.com
A gateway to free and subscription based information relating to the world of food science, food technology and nutrition. The site includes feature articles, reports on important papers published in leading food science journals, and details of products and services offered by IFIS Publishing.

**FSTA Direct**
www.fstadirect.com
Offers web access to *Food Science and Technology Abstracts*, a database composed of an extensive collection of abstracts prepared from the world’s food science, food technology and nutrition literature.

**FoodInfo Quest**
www.foodinfoquest.com
A guide from IFIS to help students, researchers, and professionals find and use food science information.

**British Nutrition Foundation (BNF)**
www.nutrition.org.uk
The British Nutrition Foundation promotes the nutritional wellbeing of society through the impartial interpretation and effective dissemination of scientifically based knowledge and advice on the relationship between diet, physical activity and health. It works in partnership with academic and research institutes, the food industry, educators and government. The Foundation influences all in the food chain, government, the professions and the media.

**CABI**
www.cabi.org
CABI is a not-for-profit organization specializing in scientific publishing, research and communication. CABI improves people’s lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment.

**Campden BRI**
www.campden.co.uk
Campden BRI is the UK’s largest independent membership-based organization carrying out research and development for the food and drinks industry worldwide. Its website includes details of current research, member services, legislation information and training timetables.

**Codex Alimentarius**
www.codexalimentarius.net
Website of the Codex Alimentarius Commission which aims to develop food standards, guidelines and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme.

**Deutsche Landwirtschafts Gesellschaft e.V. (DLG)**
www.dlg.org
DLG is one of the key organizations in the German agricultural and food sector and aims to translate scientific findings into practice. The website details current research programmes and events.
European Food Information Council (EUFIC)
www.eufic.org
The European Food Information Council (EUFIC) is a non-profit organization which provides science-based information on food safety & quality and health & nutrition to the media, health and nutrition professionals, educators and opinion leaders, in a way that consumers can understand.

European Food Safety Authority (EFSA)
www.efsa.europa.eu
The European Food Safety Authority (EFSA) is the keystone of European Union risk assessment regarding food and feed safety. In close collaboration with national authorities and in open consultation with its stakeholders, EFSA provides independent scientific advice and clear communication on existing and emerging risks.

Food and Agriculture Organization (FAO)
www.fao.org
This site acts to further the FAO’s goals of leading international efforts to defeat hunger, with particular reference to: putting information within reach; sharing policy expertise; providing a meeting place for nations; and bringing knowledge to the field.

Food Law
www.rdg.ac.uk/foodlaw/
Provides resources on UK, European and international legislation including food additives, labelling and hygiene.

Food and Nutrition Information Center (FNIC)
www.nal.usda.gov/fnic/
The FNIC web site provides a directory to credible, accurate, and practical resources for a wide audience. Visitors can find material such as printable format educational materials, government reports and research papers.

Food Navigator
www.foodnavigator.com
A specialized news service, broadcast as a free access website, as well as e-newsletters to registered subscribers, which is built around a proactive news agenda that adds value to product announcements.

Institute of Food Research (IFR)
www.ifr.ac.uk
The Institute of Food Research’s vision is to be a world-leading contributor to harnessing food for health and controlling food-related disease. Its website provides resources on food science topics, information sheets, IFR publications and news releases.

International Food Information Council (IFIC)
www.ific.org
This site aims to provide a resource on food safety and nutrition and communicate science-based information to health and nutrition professionals, educators, journalists, government officials and consumers.

International Portal on Food Safety, Animal and Plant Health
www.ipfsaph.org
Developed by FAO, this portal provides a single access point for authorized official international and national information across the sectors of food safety, animal and plant health.

Just Food
www.just-food.com
A rapidly growing food trade website providing instant access to over 1500 reports, books and research products from leading market information providers, as well as news, industry announcements, feature articles and discussion forums.
Leatherhead Food International
www.leatherheadfood.com
Leatherhead Food International is a global and independent provider of food information, market intelligence and technical and food research services. Its website details the different products and services on offer.

National Agricultural Library
www.nal.usda.gov
The National Agricultural Library is one of the world’s largest and most accessible agricultural research libraries and plays a vital role in supporting research, education, and applied agriculture. The website provides online access to its library catalogue, AGRICOLA, as well as to details of publications and services.

UK Department for Environmental, Food and Rural Affairs (DEFRA)
www.defra.gov.uk
DEFRA’s remit is the pursuit of sustainable development, weaving together economic, social and environmental concerns. Information on the DEFRA website aims to further this outlook.

UK Food Standards Agency (FSA)
www.food.gov.uk
The FSA provides advice and information to the public and Government on food safety, nutrition and diet. Its website includes information on a variety of topics including food labelling, genetically modified foods and BSE.

US Department of Agriculture (USDA)
www.usda.gov
The USDA aims to provide leadership on food, agriculture, natural resources and related issues based on sound public policy, the best available science and efficient management. This website offers information about the USDA’s agencies and offices and allows users to browse the site either by type of audience or subject.

US Food and Drug Administration (FDA)
www.fda.gov
The FDA is responsible for protecting the public health by assuring the safety, efficacy and security of human and veterinary drugs, biological products, medical devices, food, cosmetics, and products that emit radiation. The website includes information on hot topics, reference materials and FDA-regulated products.

World Health Organization (WHO)
www.who.int
Published by the WHO, the United Nations specialized agency for health, this website provides health-related details on member countries, together with information on specific health topics, WHO publications and research tools.