

Food Labelling

A Companion to *Food Tables*

A E Bender D A Bender

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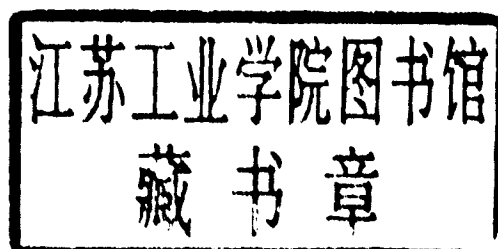
A Companion to *Food Tables*

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Preface

This book is a companion to *Food Tables*, which dealt largely with the nutrient composition of common foods.

Food Labelling provides the information needed to read nutritional labels on packaged foods : a list of permitted food additives, the basis of food labelling legislation (with examples of nutritional labelling of foods), and a glossary of nutritional and food terms likely to be found on labels and elsewhere. In addition, it gives a detailed analysis of the types of fats present in foods listed in *Food Tables*.

Food legislation

The first general food laws in the world were passed in Britain in 1860. Before that, there had been laws relating specifically to certain foods such as bread, but otherwise little control over the composition, quality and adulteration of foods.

Over the years, these laws have been expanded and modified, and currently we are operating under the Food Safety Act 1990 and European Community Directives. The regulations include three main points:

- It is an offence to sell for human consumption any food to which substances have been added or subtracted or which has been processed so as to render it injurious to health.
- It is an offence to sell food which is not of the nature, substance or quality demanded or expected by the purchaser or to label or advertise food with a false or misleading description – hence the shopkeeper shares with the manufacturer responsibility for ensuring that the food is as might be expected from the description.
- It is an offence to sell food which is unfit for human consumption.

The Laws are passed by Parliament, and enforced by Local Authorities, through the Trading Standards Officers and Environmental Health Officers. In addition, there are specific regulations covering particular foods, processes and additives, and foods are also subject to Acts of Parliament dealing with Fair Trading, Weights and Measures and other Consumer Protection Legislation.

Food labelling

The regulations concerning labelling of foods apply to all foods ready for delivery to the ultimate consumer, and also to foods for catering establishments, but not to food intended for immediate consumption on the premises where it is sold.

The label must bear the *name* of the food, a *quantity statement*, a *date mark*, an *ingredient list* and any special storage conditions or conditions of use, together with the *name and address* of the manufacturer, packager or importer.

Increasingly, packages of foods (and most other commodities) also have *bar codes*. This is a computer-readable label which identifies the product, the manufacturer and the package size in a numerical code. Such bar codes have allowed the automation of stock-keeping and checkouts in shops, and avoid the possibility of mistakes in entering prices into cash registers, as well as providing a detailed bill with every item named.

The *ingredients* must be listed in descending order by weight (i.e. the major ingredient must come first). Water added to a product must be declared if it constitutes more than 5% by weight of the finished product. Additives must be declared in the list. Certain foods, however, do *not* need to bear a list of ingredients; these include fresh fruit and vegetables, fortified flour, foods consisting of a single ingredient, and certain fermented foods with no added ingredients other than enzymes and cultures used to ferment them.

Nearly all pre-packaged foods are required to carry *date-marking* - a date up to and including which the food can reasonably be expected to retain its essential qualities if stored properly. If special storage conditions are required, these must be stated close to the date mark.

For foods with a shelf life of up to 12 weeks, the date-marking reads 'best before day, month, year'. Perishable foods with a shelf life of less than a month may have a 'sell by' date instead, together with advice on how soon after purchase they should be consumed, or a simple 'eat by' or 'use by' date showing the date after which they may be subject to spoilage or not be fit for consumption. It is illegal to sell a product after its 'use by' date. For foods with a longer shelf life date marking reads 'best before end of month, year'.

Frozen foods and ice cream carry star markings, which correspond to the star markings on freezers and frozen food compartments of refrigerators.

Table 1 Storage times for frozen foods and ice cream

	Temperature		Storage time	
	°C	°F	Frozen food	Ice cream
*	-4	25	1 week	1 day
**	-11	12	1 month	1 week
***	-18	0	3 months	1 month

(Longer storage of ice cream does not render it unfit to eat, but changes its texture.)

Claims and misleading descriptions

There are no restrictions on the sale of any food so long as it does not transgress any of the regulations listed above. What is controlled by law is any *claim*. Claims may be made on advertisements of various kinds, as well as

leaflets and labels. In addition to the legislation there are voluntary Codes of Practice.

It is an offence to label or advertise a food so as to describe it falsely, or in such a way as to mislead as to its nature, substance or quality - quality here includes nutritional value. There are also specific controls dealing with claims for energy, calories, proteins, vitamins and minerals, slimming claims, tonic and restorative claims and any claims relating to the medicinal value of a food.

The basic principle of control for all these specific types of claims is that they must be justified and accompanied by adequate information.

Foods for particular nutritional uses

A food that has been manufactured to fulfil the requirements of a particular group of people (e.g. those with diabetes, babies, etc.) must carry on its label an indication of its special nutritional characteristics and the particular aspect of its composition, or of the manufacturing process, which makes it suitable for the intended consumer.

It is illegal to claim on the label or in an advertisement that a food is capable of preventing, treating or curing a disease unless it has a specific Product Licence under the Medicines Act for use for the claimed purpose. It is illegal to mislead the consumer, even if, strictly speaking, the statement is true.

Nutritional labelling

For foods intended for particular nutritional purposes or for which claims or even statements of nutrient contents are made, the Regulations require the nutritional information to be given in a prescribed form. Many manufacturers of other foods provide information in various styles with differing details. To make it easier to understand the Government has issued Guidelines, updated in January 1988, so that all packages list the information in a standard format.

The terms used are defined in the Guidelines:

Carbohydrate means any carbohydrate that is metabolised in the body (i.e. excluding dietary fibre), and includes sugars, starches and sugar alcohols such as sorbitol and xylitol.

Sugars includes all monosaccharides and disaccharides, but excludes sugar alcohols.

Poly-unsaturates means poly-unsaturated fatty acids only of the *cis*-form (see page 17).

Table 2 Some examples of nutritional labelling

1 Minimum information on the label

Energy	1978 kJ / 471 kcal
Protein	6.3 g
Carbohydrate	68.6 g
Fat	21 g

2 More detail on fat content

Energy	1978 kJ / 471 kcal
Protein	6.3 g
Carbohydrate	68.6 g
Fat	21 g (of which saturates 8.3 g)

3 Full detail

Energy	1978 kJ / 471 kcal
Protein	6.3 g
Carbohydrate	68.6 g (of which sugars 13 g)
Fat	21 g (of which saturates 8.3 g)
Sodium	0.6 g
Fibre	2.9 g

4 Optional additional information

Carbohydrates	68.6 g (of which sugars 13 g, starch 50 g)
Fat	21 g (of which saturates 8.3 g, <i>trans</i> 3.2 g, poly-unsaturates 1.8 g, mono-unsaturates 6.0 g)
Vitamins	
Mineral salts	

Table 3 Some examples of labelling from food packets (with explanatory notes)

1 Baked beans with tomato sauce

Ingredients	beans, water, tomatoes, sugar, salt, modified starch ^(a) , spirit vinegar, spices
Quantity	g / oz
Name and address of manufacturer	
[Notes :	^(a) Modified starch is added to thicken the tomato sauce - see Glossary.]

2 Grissini, bread sticks

Ingredients	wheat flour, vegetable fats ^(a) , yeast, malt, salt
'Best before' date printed on bottom of box	
Nett weight	125 g
Name and address of manufacturer or importer	
[Notes :	^(a) The particular kind of fat is not specified, since it may be changed according to price and availability of different fats at different times.]

3 Orange marmalade suitable for diabetics

Ingredients sorbitol syrup ^(a), oranges, gelling agent (pectin), citric acid, acidity regulator E-331 ^(b), colour (malt extract)

Nutritional information per 100 g

protein 0.1 g, fat 0 g, sorbitol 62 g, other carbohydrate 1.7 g, total 63.7 g (added note: 'it is the 'other carbohydrate' that a diabetic must take into account') energy value 1020 kJ / 239 kcal.

Additional information

best to eat less than 25 g of sorbitol a day ^(c)
not suitable for overweight diabetics ^(d)
do not refrigerate, store at room temperature

Quantity g / oz

Name and address of manufacturer

- [Notes :
- ^(a) Sorbitol is tolerated by diabetics because it is only slowly absorbed into the bloodstream.
 - ^(b) E-331 is sodium citrate - citric acid is E-330. The manufacturer could have listed both as names, or both as E- numbers, but has listed one by name and the other by number. The mixture of citric acid and sodium citrate forms a buffer to control acidity.
 - ^(c) In large amounts, sorbitol is a laxative, hence a warning not to eat too much.
 - ^(d) Sorbitol is metabolized like any other carbohydrate, yielding 16 kJ (4 kcal)/g

4 Chicken stock cubes

Ingredients salt ^(a), vegetable fat, monosodium glutamate ^(b), dehydrated chicken meat^(c), beef extract, hydrolysed vegetable protein^(d), chicken fat ^(e), dried parsley, natural flavourings, ascorbyl palmitate ^(f)

Quantity g / oz

Name and address of manufacturer

- [Notes :
- ^(a) Note that salt is the main ingredient.
 - ^(b) A flavour enhancer.
 - ^(c) This can be listed in the order of quantity when rehydrated.
 - ^(d) A general meaty savoury flavour.
 - ^(e) Low in the list – a small amount.
 - ^(f) A derivative of vitamin C, used as an anti-oxidant.]

5 Caramel Dessert Mix

Ingredients sugar ^(a), dextrose ^(b), gelling agent E-407 ^(c), caseinate, modified starch ^(d), sodium bicarbonate ^(e), flavouring ^(f), E- 102, E-110, brown HT ^(g)

Quantity g/oz

Name and address of manufacturer

- [Notes :
- ^(a) Note that sugar is the first ingredient.
 - ^(b) An alternative name for glucose – the second ingredient.
 - ^(c) Carageenan (see *Glossary*).
 - ^(d) See *Glossary*.
 - ^(e) An acidity regulator.
 - ^(f) Unspecified.
 - ^(g) E-102 is tartrazine; E-110 is sunset yellow; brown HT is E-155. It is not clear why some colours are quoted by number, but brown HT by name.]

Food additives

An additive is defined as any substance not commonly regarded or used as a food, which is added to a food to affect its keeping properties, texture, consistency, appearance, taste, alkalinity, acidity, or to perform any other function. Legally the term 'additive' does not include nutrients added to enrich the food, or herbs and spices used as seasonings, salt or yeast.

Additives may be extracted from natural sources, synthesized in the laboratory to be chemically the same as natural materials (and hence known as 'nature-identical' compounds), or they may be synthetic compounds which do not occur in nature.

Additives can be grouped according to their uses and functions, as colours, preservatives, anti-oxidants (fat preservatives), emulsifiers, acidifying agents, humectants (to keep food moist), and for other specific purposes.

The use of additives is controlled by law. In some cases, the amounts that may be used are limited, or their use is restricted to specified foods,

while other additives may be used more widely. In all cases, their use is only permitted when a need has been shown, and if they are regarded as being safe - hence the term 'permitted additives'.

When laboratory testing has revealed that a high dose or intake of a substance causes some change in experimental animals, then the total amount that is permitted from all foods in the daily diet is limited (with a large safety factor). This safe amount is termed the Acceptable Daily Intake (ADI), agreed by international bodies such as the World Health Organisation, as well as by various national government regulatory bodies. The Acceptable Daily Intake is usually one hundredth of the *highest dose that shows no effect* when tested. When no harm can be demonstrated even at very high levels of intake (very much higher than would be used in foods), then the substance may be used without any limitation, although the intensity of colour and flavour usually limit the amounts that are used in foods.

Permitted food additives have been classified according to their uses, and have been assigned serial numbers which may legally be used on food labels instead of, or as well as, their (sometimes complex) chemical names. Numbers with the prefix 'E-' are those permitted throughout the European Community and

covered by specific European Community legislation. Additionally, some compounds are permitted in the United Kingdom, and some other countries, but are not covered by European Community legislation; these have numbers without the 'E-' prefix.

Table 4 Permitted food additives – the 'E-' numbers

Colouring materials : Used to make food more colourful or to replace colour lost in processing.

Organic compounds (some naturally occurring and others synthetic)

Yellow and orange colours

E-100	Curcumin (extracted from the spice turmeric)
E-101	Riboflavin (vitamin B ₂)
E-102	Tartrazine
E-104	Quinoline yellow
107	Yellow 2G
E-110	Sunset yellow FCF or orange yellow S

Red colours

E-120	Cochineal or carminic acid
E-122	Carmoisine or azorubine
E-123	Amaranth
E-124	Ponceau 4R or cochineal red A
E-127	Erythrosine BS
128	Red 2G

Blue colours

E-131	Patent blue V
E-132	Indigo carmine or indigotine
133	Brilliant blue FCF

Green colours

E-140	Chlorophyll (the natural green colour of leaves)
E-141	Copper complex of chlorophyll
E-142	Green S or acid brilliant green BS

Brown and black colours

E-150	Caramel (caramel is made from sugar in the kitchen)
E-151	Black PN or brilliant black BN
E-153	Carbon black or vegetable carbon (charcoal)
154	Brown FK
155	Brown HT (chocolate brown HT)

Derivatives of carotene, some of which are precursors of vitamin A

E-160(a)	Alpha-, beta- or gamma-carotene (the pigments of many yellow and orange plants - vitamin A active)
E-160(b)	Annatto, bixin, norbixin (extracted from the seeds of a plant, <i>Bixa orellana</i>)
E-160(c)	Capsanthin or capsorubin
E-160(d)	Lycopene (the red colour of tomatoes)
E-160(e)	Beta-apo-8'-carotenal (vitamin A active)
E-160(f)	Ethyl ester of beta-apo-8'-carotenoic acid

Other plant colours

E-161(a)	Flavoxanthin
E-161(b)	Lutein
E-161(c)	Cryptoxanthin (vitamin A active)
E-161(d)	Rubixanthin
E-161(e)	Violaxanthin
E-161(f)	Rhodoxanthin
E-161(g)	Canthaxanthin
E-162	Beetroot red or betanin (the pigment of beetroot)
E-163	Anthocyanins (the pigments of many plants)

Inorganic compounds used as colours

E-170	Calcium carbonate (chalk, white, used as a base and firming agent, also as a source of calcium in enriched flour)
E-171	Titanium dioxide (white)
E-172	Iron oxides and hydroxides (rust - may be a useful source of iron in the diet)
E-173	Aluminium
E-175	Gold
E-180	Pigment rubine or lithol rubine BK

Preservatives: Compounds that protect foods against microbes which cause spoilage and food poisoning. They increase the storage life of foods.

Sorbic acid and salts

E-200	Sorbic acid
E-201	Sodium sorbate
E-202	Potassium sorbate
E-203	Calcium sorbate

Benzoic acid and salts

E-210	Benzoic acid (benzoic acid is found naturally in many fruits)
E-211	Sodium benzoate
E-212	Potassium benzoate
E-213	Calcium benzoate
E-214	Ethyl 4-hydroxybenzoate
E-215	Ethyl 4-hydroxybenzoate sodium salt
E-216	Propyl 4-hydroxybenzoate
E-217	Propyl 4-hydroxybenzoate sodium salt
E-218	Methyl 4-hydroxybenzoate
E-219	Methyl 4-hydroxybenzoate sodium salt

Sulphur dioxide and its salts

E-220	Sulphur dioxide (sulphur dioxide and its salts are especially useful to prevent browning of raw peeled potatoes as well as having anti-microbial properties)
E-221	Sodium sulphite
E-222	Sodium hydrogen sulphite
E-223	Sodium metabisulphite
E-224	Potassium metabisulphite
E-226	Calcium sulphite
E-227	Calcium hydrogen sulphite

Biphenyl and its derivatives

E-230	Biphenyl or diphenyl (biphenyl and its derivatives are used only on the outside of citrus skins)
E-231	2-Hydroxybiphenyl
E-232	Sodium biphenyl-2-yl oxide
E-233	2-(Thiazol-4-yl) benzimidazole (used on banana skins)
234	Nisin
E-239	Hexamine

Pickling salts

E-249	Potassium nitrite (a mixture of nitrates and nitrites is a traditional pickling agent for corned beef, ham and other cured meats)
E-250	Sodium nitrite
E-251	Sodium nitrate
E-252	Potassium nitrate (saltpetre)

Acids and their salts: Used as flavourings and as buffers to control the acidity of foods, in addition to their anti-microbial properties

E-260	Acetic acid (vinegar is a 5% solution of acetic acid)
E-261	Potassium acetate
E-262	Potassium hydrogen diacetate
262	Sodium acetate
E-263	Calcium acetate (used as a firming agent and as a source of calcium in quick-setting jelly)
E-270	Lactic acid (formed in the body, also the acid of soured milk)
E-280	Propionic acid (a fatty acid)
E-281	Sodium propionate
E-282	Calcium propionate
E-283	Potassium propionate
E-290	Carbon dioxide
296	Malic acid (a natural fruit acid)
297	Fumaric acid (a natural fruit acid)

Anti-oxidants: Compounds used to prevent fatty foods going rancid, and to protect the fat soluble vitamins (A, D, E and K) against the damaging effects of oxidation.

Vitamin C and derivatives

E-300	L-Ascorbic acid (vitamin C)
E-301	Sodium-L-ascorbate
E-302	Calcium-L-ascorbate
E-304	Ascorbyl palmitate

Vitamin E

E-306	Natural extracts rich in tocopherols (vitamin E)
E-307	Synthetic alpha-tocopherol
E-308	Synthetic gamma-tocopherol
E-309	Synthetic delta-tocopherol
E-310	Propyl gallate
E-311	Octyl gallate
E-312	Dodecyl gallate
E-320	Butylated hydroxyanisole (BHA)
E-321	Butylated hydroxytoluene (BHT)
E-322	Lecithins (lecithins occur naturally; their emulsifying properties are used when you add an egg to make mayonnaise)

More acids and their salts: Used as flavourings and as buffers to control the acidity of foods, in addition to other special uses.

Salts of lactic acid (E-270)

E-325	Sodium lactate
E-326	Potassium lactate
E-327	Calcium lactate

Citric acid and its salts

E-330 Citric acid (formed in the body, a natural fruit acid; as well as their properties as acids, citrates are often used as sequestrants (see *Glossary*) and emulsifying agents)

E-331	Sodium citrates
E-332	Potassium citrates
E-333	Calcium citrates

Tartaric acid and its salts

E-334	Tartaric acid (tartaric acid occurs naturally; as well as their properties as acids, tartrates are often used as sequestrants and emulsifying agents)
E-335	Sodium tartrate
E-336	Potassium tartrate (cream of tartar)

Phosphoric acid and its salts

E-338 Orthophosphoric acid

E-339 Sodium phosphates

E-340 Potassium phosphates

E-341 Calcium phosphates

Salts of malic acid (E-296)

350 Sodium malate

351 Potassium malate

352 Calcium malate

353 Metatartaric acid (used as a sequestrant in wine. Tartaric acid is E-334)

355 Adipic acid (naturally occurring)

363 Succinic acid (naturally occurring)

370 1,4-Heptonolactone

375 Nicotinic acid (a vitamin, also used to preserve the colour of some foods)

380 Triammonium citrate (an emulsifying salt; citric acid is E-330)

381 Ammonium ferric citrate (used to enrich bread with iron)

385 Calcium disodium EDTA (a sequestrant)

Emulsifiers and stabilizers: Used to enable oils and fats to mix with water, to give a smooth and creamy texture to food and slow the staling of baked goods. Many of these compounds are also used to form jellies.

Compounds E-400–416 are naturally occurring plant gums.

Alginates

E-400 Alginic acid (derived from seaweed)

E-401 Sodium alginate

E-402 Potassium alginate

E-403 Ammonium alginate

E-404 Calcium alginate

E-405 Propane-1,2-diol alginate

Other plant gums

E-406 Agar (derived from seaweed)

E-407 Carrageenan (derived from the seaweed Irish moss)

E-410 Locust bean gum (carob gum)

E-412 Guar gum

E-413 Tragacanth

E-414 Gum acacia or gum Arabic

E-415 Xanthan gum

416 Karaya gum

E-420 Sorbitol (a sweetener)

E-421 Mannitol (a sweetener)

E-422 Glycerol (a sweetener and humectant)

Fatty acid derivatives

430 Polyoxyethylene (8) stearate

431 Polyoxyethylene (40) stearate

432 Polyoxyethylene (20) sorbitan monolaurate (Polysorbate 20)

433 Polyoxyethylene (20) sorbitan mono-oleate (Polysorbate 80)

434 Polyoxyethylene (20) sorbitan monopalmitate (Polysorbate 40)

435 Polyoxyethylene (20) sorbitan monostearate (Polysorbate 60)

436 Polyoxyethylene (20) sorbitan tristearate (Polysorbate 65)

Pectin and derivatives

E-440(a) Pectin (pectin occurs in many fruits, and is often added to jam, to help it to set)

E-440(b) Amidated pectin

442 Ammonium phosphatides

E-450(a),(b),(c) Sodium and potassium phosphates and polyphosphates (Phosphoric acid is E-338)

Cellulose and derivatives

E-460	Microcrystalline or powdered cellulose
E-461	Methylcellulose
E-463	Hydroxypropylcellulose
E-464	Hydroxypropyl-methylcellulose
E-465	Ethylmethylcellulose
E-466	Carboxymethylcellulose, sodium salt

Salts or esters of naturally occurring fatty acids

E-470	Sodium, potassium and calcium salts of fatty acids
E-471	Mono- and diglycerides of fatty acids
E-472	Various esters of mono- and diglycerides of fatty acids
E-473	Sucrose esters of fatty acids
E-474	Sucroglycerides
E-475	Polyglycerol esters of fatty acids
476	Polyglycerol esters of polycondensed esters of castor oil (polyglycerol polyricinoleate)
E-477	Propane-1,2-diol esters of fatty acids
478	Lactylated fatty acid esters of glycerol and propane-1,2- diol
E-481	Sodium stearyl-2-lactylate
E-482	Calcium stearyl-2-lactylate
E-483	Stearyl tartrate
491	Sorbitan monostearate
492	Sorbitan tristearate
493	Sorbitan monolaurate
494	Sorbitan mono-oleate
495	Sorbitan monopalmitate

Acids and salts used for special purposes: Buffers, emulsifying salts, sequestrants, stabilizers, raising agents, anti-caking agents.

Carbonates

500	Sodium carbonate, sodium bicarbonate (sodium bicarbonate is used as a raising agent in the kitchen)
501	Potassium carbonate, potassium bicarbonate
503	Ammonium carbonate
504	Magnesium carbonate (a very small amount of magnesium carbonate added to salt helps it to flow freely - it acts as an anti-caking agent. Magnesium is an essential dietary mineral)

Hydrochloric acid and its salts (ordinary salt is sodium chloride)

507	Hydrochloric acid
508	Potassium chloride (sometimes used as a replacement for ordinary salt)
509	Calcium chloride
510	Ammonium chloride

Sulphuric acid and its salts

513	Sulphuric acid
514	Sodium sulphate
515	Potassium sulphate (sometimes used as a replacement for ordinary salt)
516	Calcium sulphate
518	Magnesium sulphate

Alkalis: Used as bases to neutralize acids in foods.

524	Sodium hydroxide
525	Potassium hydroxide
526	Calcium hydroxide
527	Ammonium hydroxide
528	Magnesium hydroxide
529	Calcium oxide
530	Magnesium oxide (used as anti-caking agent)
535	Sodium ferrocyanide
536	Potassium ferrocyanide
540	Dicalcium diphosphate
541	Sodium aluminium phosphate

Compounds used as anti-caking agents, and for other uses

542	Edible bone phosphate (bone meal, used as a source of calcium in food enrichment)
544	Calcium polyphosphates (used as emulsifying agents)
545	Ammonium polyphosphates (used as emulsifying and texturizing agents in frozen chicken)

Silicon salts

551	Silicon dioxide (silica - sand; silicon may be an essential dietary mineral)
552	Calcium silicate
553	Magnesium silicate or trisilicate (talc)
554	Aluminium sodium silicate
556	Aluminium calcium silicate
558	Bentonite
559	Kaolin (fine white clay - aluminium silicate)
570	Stearic acid (a naturally occurring fatty acid)
572	Magnesium stearate

Gluconates

575	Glucono delta-lactone (gluconates are naturally occurring compounds)
576	Sodium gluconate
577	Potassium gluconate
578	Calcium gluconate

Compounds used as flavour enhancers

Glutamic acid and its salts

620	L-Glutamic acid (a natural amino acid)
621	Monosodium glutamate (MSG)
622	Monopotassium glutamate
623	Calcium glutamate

Nucleic acid derivatives

627	Sodium guanylate (naturally occurring)
631	Sodium inosinate (naturally occurring)
635	Sodium 5-ribonucleotide (naturally occurring)
636	Maltol (a sugar derivative)
637	Ethyl maltol
900	Dimethylpolysiloxane (used as an anti-foaming agent)

Compounds used as glazing agents

901	Beeswax
903	Carnauba wax
904	Shellac (used to wax apples)
907	Refined microcrystalline wax

Compounds used to treat flour and improve the texture of bread, cakes and dough

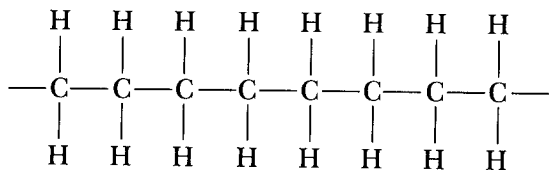
920	L-Cysteine hydrochloride (a natural amino acid)
924	Potassium bromate
925	Chlorine
926	Chlorine dioxide
927	Azodicarbonamide

Fats and oils

The fat in our diet is present in various forms: oils and fats added during food preparation or spread on bread, obvious fat that we can see in meat, and hidden fat such as that in the lean part of meat. There are even small amounts of oils in cereals. All these are chemically the same, by far the greatest part being neutral fats or triglycerides, with small amounts of other fats (phospholipids and cholesterol). They are all known collectively as *lipids*.

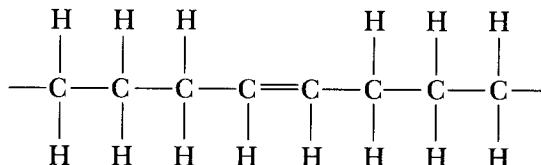
Triglycerides are nutritionally the most important, since the body can make as much phospholipid and cholesterol as it needs from the triglycerides and other components in the diet. Triglycerides consist of glycerol attached to three molecules of fatty acid. The fatty acids are chains of carbon atoms from 2 to 22 carbons in length, with an acidic group at one end. This end is attached to the glycerol. The shorter chains are liquid at room temperature, and the longer ones are solid. Chain length is one factor that determines whether the lipid is an oil or a solid fat. The other factor is how 'saturated' the fatty acid is.

Saturation means that all the carbon atoms in the chain carry their full quota of two hydrogen atoms and the carbons are linked by a single bond:

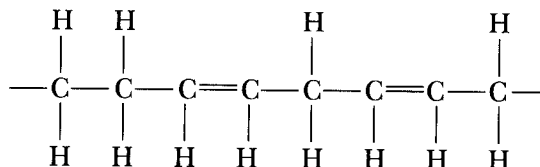


When one hydrogen is missing from two adjacent carbon atoms then they are linked

by a double bond instead of a single bond, the fatty acid is called *mono-unsaturated*:



If two or more pairs of hydrogen atoms are missing there will be two or more double bonds, and the fatty acid is *poly-unsaturated*:



The less saturated the fatty acid, the lower its melting point.

Liquid oils can be hardened by hydrogenation, a process by which some of the double bonds become saturated with hydrogen. This is used to harden vegetable oils and fish oils in the manufacture of margarine.

Fats and oils are mixtures of different triglycerides, each of which can contain the same three or three different fatty acids of different chain length and different degrees of saturation. Usually one type of fatty acid tends to predominate, so the resultant mixture may be hard (e.g. lard and coconut fat) or soft (e.g. butter) or liquid (e.g. olive oil and sunflower oil). Cooking fats are specially blended to provide the right degree of softness, and other qualities. Fish oils consist of very long chain fatty acids (20 carbons and more), with four or five double bonds.