Dictionary of Nutrition and Food Technology

Arnold E. Bender

SIXTH EDITION

Butterworths

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Should this book become sufficiently familiar through usage to earn the title 'Bender's Dictionary', it would probably be more correct to call it 'Benders' Dictionary', in view of the invaluable assistance of D., D.A. and B.G., guided, if not driven, by A.E.

Preface

The study of food and nutrition starts with genetic selection then proceeds to food production (farming, animal production, fishing, etc.) via food science to the technology of food processing, packaging and distribution, its preparation and consumption and then, logically, to its fate in the body and medical aspects of good or poor diets. Along the way are the complex sociological and physiological aspects of food choice.

All this involves many disciplines and basic sciences – chemistry, physics, biochemistry, biophysics, microbiology, physiology, and the social sciences, along with legal and medical aspects. It is clearly difficult for any one person to be familiar with all the technical terms used. So many readers and practitioners involved in food and nutrition may need to seek the meaning of, at least, some of them.

At the same time individuals – laymen, journalists, managers in the food industry and policy makers in nutrition and public health areas – are reading literature dealing with food and nutrition; they may need to look up explanations which might be commonplace to the specialists.

Changes are continuous in this area with 'new' foods, new processes, new safety hazards (or old ones that have become more important), rapid developments in methods of food analysis and quality control, and particularly in our understanding of the relations between diet and health. All this gives rise to a need for a dictionary.

At the same time some terms become obsolete and disappear from current textbooks so that readers of the earlier literature may be at a loss.

All these items, so far as the author is aware, are included so that the reader of food literature need not be left wondering.

If it is true to say that it is difficult for any one person to be familiar with all the terms used, then this must apply equally to the author, who apologises for errors of omission and commission in the hope of assistance from readers and reviewers.

Arnold E. Bender

Note on food composition

Any specified food will differ in composition from sample to sample, quite apart from variations due to experimental error and methods of analysis, which partly explains why foods of the same type show compositional differences between data published in different countries. For this reason all compositional data presented here must be regarded as an approximation to the average for that type of food and not with precision – as, indeed, must all composition tables.

Since vitamin A can be present in foods as preformed retinol and as its precursor carotene, it is usual to quote figures in terms of 'retinol equivalents'. Vitamin E is present in foods in several forms of different biological potencies and figures are quoted as alpha-tocopherol equivalents.

Niacin is present in foods as the preformed vitamin and can also be formed in the body from the amino acid, tryptophan. Tables of food composition usually state niacin figures in terms of niacin equivalents (preformed niacin plus 1/60 of the tryptophan): the figures of niacin content of foods shown here are for the preformed vitamin only.

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A

a_w Available water. See ***water activity***.

abalone A snail-like shellfish (gastropod mollusc) of the genus *Haliotis*, found particularly in waters around Australia, and also Japan, California, Channel Islands and France. The meat is canned and frozen. Also called ormer. Analysis per 100 g: 19 g protein, 3 g carbohydrate, 100 kcal (400 kJ).

Abbé refractometer See ***refractometer***.

Abernethy biscuit Scottish biscuit made from flour, sugar, butter, eggs, milk and caraway seeds; named after Dr John Abernethy (1764–1831) of St Bartholomew's Hospital, London.

abomasum See ***rumen***.

absinthe Green liqueur prepared from oils of wormwood, angelica, anise and marjoram. It is toxic and the manufacture has been banned in many countries. The toxic principle is oil of thujol, which is a cerebral convulsant and is cumulative.

absorptiometer Instrument used to measure the absorption of light, and therefore used as a quantitative measure of coloured solutions. Frequently (incorrectly) called colorimeter. Many substances, minerals, vitamins, amino acids, will react with a particular reagent to form a coloured complex. The colour developed is proportional to the amount present and is measured in an absorptiometer or a true colorimeter.

acarbose Generic name for a group of complex oligosaccharides isolated from culture broth of *Actinomycetes*, which inhibit the enzymes glucoamylase, sucrase, maltase and dextrinase; used experimentally to restrict digestive hydrolysis of dietary carbohydrates and so reduce postprandial hyperglycaemia and hyperinsulinaemia.

The core structure, acarviosine, is made up of a substituted cyclohexene ring and 4,6-dideoxy-4-amino-D-glucose.

acaridicides Chemicals used to kill mites and ticks.

acarviosine See ***acarbose***.

accelase Mixture of proteolytic enzymes including an exopeptidase from the dairy starter bacterium, *Streptococcus lactis*; used to shorten maturation time of cheese and intensify the flavour of processed cheese.

Ac'cent Trade name (International Mineral & Chemical Corpn, USA) for monosodium glutamate. See ***glutamic acid***.

acerola West Indian cherry; see ***cherry, West Indian***.

acesulfames Also acesulphames. Class of artificial, non-nutritive sweeteners from oxathiazinone. The potassium salt, called acesulfame-K, is 200 times as sweet as sucrose; not metabolised and excreted unchanged; good shelf life.

acetate, active The form in which the acetyl radical, CH_3CO-, is transferred from one compound to another, as the acetyl–coenzyme A complex (see ***coenzyme A***). The metabolism both of glucose and of fats involves the formation of active acetate.

acetate replacement factor See ***lipoic acid***.

acetic acid One of the simplest organic acids – CH_3COOH. Formed by fermentation of ethyl alcohol (secondary fermentation) and formed in some fermented foods together with lactic acid, both of which serve to preserve such foods – i.e. the process of pickling. May also be added to foods and sauces to preserve them.

Acetobacter Genus of bacteria of family Bacteriaceae, which oxidises alcohol to acetic acid. *Acetobacter pasteurianus* (also known as *Mycoderma aceti* and *Bacterium aceti* or *pasteurianum*) is one of this type and is used in the manufacture of vinegar. Also grow in film on beer wort, pickle brine and fruit juices. See also ***vinegar***.

acetoglycerides Differ from the triglycerides in that either one or two of the long-chain fatty acids attached to the glycerol molecule are replaced by acetic acid. There are three types: diacetotriglycerides (e.g.diacetomonostearin); monoacetotriglycerides (e.g. monoacetodistearin); and monoacetodiglycerides (e.g. monoacetomonostearin), in which one hydroxyl group of the glycerol is free. Also known as partial glyceride esters.

They are non-greasy and have lower melting points than the corresponding triglycerides, and are used in shortenings and spreads, as films for coating foods, and as plasticisers for hard fats.

acetoin Acetyl methyl carbinol, $CH_3COCHOHCH_3$, precursor of diacetyl, butter flavour. Produced by bacteria during butter ripening and by yeast during fermentation.

acetone bodies See ***ketone bodies***.

acetylcholine Acetyl derivative of choline (which see) which is liberated at certain nerve endings (cholinergic nerves) to stimulate the muscle.

ACH index Arm, chest, hip index. The arm girth, chest diameter and hip width used as a method of assessing the state of nutrition.

achlorhydria Deficiency of hydrochloric acid in the gastric secretion.

achromotrichia Loss of hair pigment. See ***pantothenic acid***; ***para-amino benzoic acid***.

achroodextrin Product formed during the enzymic breakdown of starch to maltose; it is a dextrin that gives no colour with iodine (hence achro).

acid–base balance Body fluids are maintained just on the alkaline side of neutrality, pH 7.3–7.45, by buffers in the blood and tissues. Buffers include proteins, and sodium and potassium phosphate and bicarbonate.

Acidic products of the body's metabolism are excreted in the urine in combination with bases such as sodium and potassium. These bases are thereby lost to the body and the acid–base balance is maintained by replacing them from the diet.

Buffer materials in the blood and tissues are termed the alkaline reserve.

acid calcium phosphate See ***calcium acid phosphate***.

acid foods and basic foods Refers to the residue of the metabolism of the food – the minerals sodium, potassium, magnesium and calcium are base-forming, and phosphorus, sulphur and chlorine are acid-forming, and which of these predominates determines whether the food leaves an acid or basic residue. Meat, fish, eggs, cheese and cereals leave an acid residue; milk, vegetables and some fruits leave an alkaline residue; fats and sugar contain no minerals and so are neutral foods.

Fruit juices contain acids and their sodium salts and have an acid taste, but the organic portion is completely oxidised and the residual sodium leaves an alkaline residue.

See also ***acid–base balance***.

acid number With reference to fats, a measure of hydrolytic rancidity. Defined as milligrams of caustic potash required to neutralise the free fatty acids in 1 g of the fat.

The acid number, also known as the acid value, is an index of the efficiency of refining, during which process the free fatty acids are removed and the acid number falls to very low values; it is also an index of the deterioration in storage.

acidophilus therapy Consumption of milk containing a high concentration of viable *Lactobacillus acidophilus* (the milk itself being unfermented) as a treatment for constipation. The effect is said to be due to the implantation of these organisms in the intestine.

acidosis Increase in the ratio between acid and base in the blood plasma, or a reduction in its buffering power. Causes may be alteration in carbon dioxide excretion, metabolic overproduc-

tion of acid or excessive loss of base. See also ***acid–base balance***.

acid rebound Term used in reference to the secretion of gastric acid to signify the increase in acidity of the stomach that results from the administration of alkalies. There is conflicting evidence as to whether this really occurs.

acid value See ***acid number***.

ackee Fruit of *Blighia sapida* common in West Indies. Unripe fruits contain hypoglycin (α-amino-β-methylene cyclopropanyl-propionic acid – hypoglycin A, and its peptide – hypoglycin B) in quantities sufficient to reduce blood glucose levels and cause 'vomiting sickness', coma and death.

aconitine Toxic alkaloid of monkshood (*Aconitum*); slows the pulse and reduces blood pressure; fatal in small doses.

acorn sugar Quercitol, extracted from acorns; pentahydroxy-cyclohexane.

ACP Acid calcium phosphate. See ***calcium acid phosphate***.

acraldehyde See ***acrolein***.

acrodynia Specific type of dermatitis seen in animals fed on diet deficient in vitamin B_6.

acrolein Acraldehyde, $CH_2{=}CHCHO$. Formed when glycerol is heated to a high temperature, and responsible for the acrid odour and lachrymatory vapour produced when fats are over-heated.

Acronize Trade name (Cyanamide Co., USA) for the antibiotic chlortetracycline (used, for example, as 'acronized ice').

ACTH Abbreviation for adrenocorticotropic hormone, which see.

actin See ***actomysin***.

activators With reference to enzymes, substances that increase the activity of the enzyme in a non-specific manner. Those substances that are part of the activating system, and are required before the enzyme can activate its substrate, are activators. Substances that are part of the reaction system but play no part in the activation of the substrate are coenzymes. Many inorganic radicals are activators; thus, salivary amylase requires the presence of chloride; others are potassium, calcium, magnesium, phosphate.

active oxygen method A method of measuring the stability of fats and oils by bubbling air through the heated material and following the formation of peroxides. Also known as the Swift stability test.

actomyosin The two principal proteins of muscle, actin (about 13% of muscle protein) and myosin (about two-fifths of muscle protein), form actomyosin during muscle contraction with the simultaneous hydrolysis of ATP to ADP.

Addison's disease Destruction of the cortex of the suprarenal glands; symptoms are low blood pressure, anaemia, muscular weakness, fall in metabolic rate. Treatment partly successful by taking sodium chloride, or by implantation of pellets of deoxycorticosterone acetate.

additives Include all materials deliberately added to food to help manufacture and preserve food, improve palatability and eye-appeal; for example, emulsifiers, flavours, thickeners, curing agents, humectants, colours, vitamins, minerals, and mould, yeast and bacterial inhibitors. Most of these are controlled by law in all countries.

additives, baking See ***baking additives***.

adenine See ***nucleic acids***; ***purines***.

adenosine Combination of the base adenine with the sugar ribose. See ***adenosine nucleotides***.

adenosine diphosphate (ADP) See ***adenosine nucleotides***.

adenosine monophosphate See ***adenylic acid***.

adenosine nucleotides Adenosine triphosphate (ATP) has three phosphate moieties esterified to adenosine. Two of these are associated with a high free energy of hydrolysis, and are often called 'high-energy' phosphates; they are readily available for transfer to other compounds, and are a common method of energy transfer in reactions. In general, oxidative (energy-yielding) metabolism leads to the synthesis of ATP from ADP, while synthetic reactions, which require energy, involve the use of phosphate from ATP to yield ADP (adenosine diphosphate).

Cyclic AMP (cAMP) is formed from ATP by the action of adenyl cyclase; this enzyme is frequently activated in cell membranes by hormones and neurotransmitters, and acts as a second messenger for the hormone; it is a common allosteric effector of regulatory enzymes.

adenosine triphosphate See ***adenosine nucleotides***.

adenylic acid Combination of the base adenine with the sugar ribose, and phosphoric acid. Also known as adenosine monophosphate, or AMP; of importance in muscle metabolism.

adenyl pyrophosphate See ***adenosine nucleotides***.

adermin See ***vitamin B_6***.

adipose tissue Groups of cells that store and mobilise fat; constitutes one-fifth to one-quarter of the total body mass – more in fat people. Composed of 82–88% fat, 2–2.6% protein and 10–14% water and contains 8–9 kcal (34–38 kJ) per gram or 3600–4000 (15.1–16.8 MJ) per pound.

Adirondack bread Baked product made from ground maize, butter, wheat flour, eggs and sugar (USA speciality).

adlay A tall grass, *Coix lachryma-jobi*, Job's tears, which grows wild in parts of Africa and Asia and is used as a cereal to eke out rice supplies in countries in S.E. Pacific area. Same tribe as maize – Tripsaceae.

Analysis per 100g: 14g protein, 4g fat, 4mg Fe, 0.3mg vitamin B_1, 0.2mg vitamin B_2, 3mg niacin, 360kcal (1.5MJ).

ADI Acceptable daily intake: refers to chemical additives used in food processing.

ADP See ***adenosine nucleotides***.

adrenal glands Also called suprarenal glands; situated just above each kidney. Comprise the inner part, or medulla, which secretes adrenaline and noradrenaline (which see), and the outer cortex, which secretes steroid hormones.

Steroid hormones include steroid sex hormones, corticosterone (affects carbohydrate metabolism and is anti-inflammatory) and aldosterone (controls excretion of salt and water through the kidneys).

adrenaline Hormone secreted by the medulla of the adrenal glands; the first hormone to be discovered. It is secreted under conditions of emotional stress, and causes an increase in blood pressure, blood sugar levels and metabolic rate, thus mobilising the body's reserves of energy.

Also known as epinephrine, chemically hydroxy, dihydroxyphenyl-ethylmethylamine.

adrenocorticotropic hormone Hormone extracted from the anterior part of the pituitary gland of animals and used in the treatment of rheumatoid arthritis. Acts by stimulating the adrenal gland to secrete corticosteroids.

adverse reactions (to food) (1) Food aversion – an unpleasant reaction caused by emotions associated with the food rather than the food itself; it does not occur in a blind trial.

(2) Food intolerance – a reproducible unpleasant reaction to food which is not psychologically based, subdivided into: (a) allergy – the body's immune system reacts to traces of a substance (to which the individual has been previously exposed); (b) irritants (e.g. highly spiced foods); (c) pharmacological effects caused by substances in the food, e.g. natural toxicants, caffeine; (d) inability to metabolise the substance because of enzyme defects.

aequum Amount of food necessary to maintain body weight under normal or specified conditions of activity (rarely used).

aerobes Micro-organisms that need oxygen for growth. Obligate aerobes cannot survive in the absence of oxygen.

aesculin (esculin) Dihydroxycoumarin glucoside found in the

leaves and the bark of the horse chestnut tree, *Aesculus hippocastanum*. Has effect on capillary fragility, which see.

AFD Accelerated freeze-drying. See ***freeze-drying***.

aflatoxins Group of complex difurano-coumarins (about 15 are known) formed by some strains of the mould, *Aspergillus flavus*, which can grow on groundnuts and cereals when stored under damp and warm conditions. Originally identified as turkey X disease in UK in 1960.

Aflatoxin B1 is a most potent liver carcinogen in experimental animals and thought to be the cause of primary carcinoma of the liver of human beings in parts of Africa.

If cows consume feed infected with *A. flavus* the aflatoxin B1 is secreted in the milk as aflatoxin M1, so the aflatoxin content of animal feed is strictly limited.

agar Dried, purified stems of a seaweed, *Gelidium algae*, *Gracilaria* and other genera. Partly soluble, and swells with water to form a gel. It has a wide temperature range between gelling and melting points.

Used in soups, jellies, ice-cream, meat and fish pastes, in bacteriological media, for sizing silk, as adhesive and as a stabiliser for emulsions. Also called agar-agar, Macassar gum and vegetable gelatine.

Agar is a galactan, i.e. a complex of galactose units, but it is not digested by man.

agene Nitrogen trichloride, once used as bleaching and 'improving' agent for wheat flour in bread making but found to combine with methionine to form methionine sulphoximine, which caused 'canine hysteria' and so was abandoned.

ageusia Lack or impairment of sensitivity to taste stimuli.

agglomeration Production of a free-flowing, dust-free powder from substances such as dried milk powder and wheat flour. The process consists of moistening with droplets of water and drying in a stream of air; the agglomerates are readily wettable.

agglutinins See ***lectins***.

aging (1) Term applied to chemicals used to oxidise (age) wheat flour for bread making. Freshly milled flour produces a weaker and less resilient dough and less 'bold' loaf than flour which has been stored for some weeks or 'aged' chemically. Substances such as ammonium persulphate, ascorbic acid, chlorine, sulphur dioxide, potassium bromate and cysteine are used as oxidising agents; nitrogen peroxide and benzoyl peroxide, to bleach the flour; chlorine dioxide (and at one time nitrogen trichloride – agene), to bleach the flour and 'improve' the dough. Regulations in many countries control which of these may be used and the amounts.

(2) In reference to wine aging, refers to the development of a 'bouquet' and smooth, mellow flavour and the disappearance of harsh yeasty flavours by slow oxidation and the formation of esters.

(3)With reference to meat, see ***rigor mortis***.

aginomoto See ***glutamic acid***.

aglycone The non-sugar part of a glycoside.

agnelloto Envelope of pasta stuffed with minced meat or vegetables; cut in half-moon shape, so differing from ravioli, which is cut in squares.

A/G ratio See ***albumin/globulin ratio***.

air classification Separation of fractions of powdered material in a current of air by size and composition of the particles on the basis of weight and density. Particularly applied to fractionation of the endosperm of milled wheat flour; the smaller particles are richer on protein – fractions range from 3% to 25% protein.

aitchbone Cut of meat (UK) = rumpbone (USA) = loin or haunch.

Ajinomoto Trade name (Hercules Powder Co.) for range of flavour enhancers – Ajinomoto IMP, disodium inosinate; Ajinomoto GMP, disodium guanylate; Ajinomoto, monosodium glutamate.

akutok Dried strips of caribou meat prepared by Eskimos; outer crust, inside only partly dry.

alactasia Reduction or absence of the digestive enzyme, lactase, resulting in impaired tolerance to milk products.

alanine A non-essential amino acid, amino propionic acid. The alpha amino acid is found in all proteins; there is also beta-alanine (the amino group attached to the second carbon atom), which is part of the molecule of pantothenic acid, of carnosine and of anserine.

albacore Long-finned species of tunny fish, *Thynnus germo*, usually canned as tuna fish.

albedo White pith of the inner peel of citrus fruits, also known as the mesocarp; 20–60% of the whole fruit. Consists of sugars, cellulose and pectins; used as a source of pectin for commercial manufacture.

albumen Variant spelling of albumin (which see), used generally to mean white of egg. See also ***egg-white***.

albumin Often used as a non-specific term for protein (e.g. albuminuria means protein present in urine), but strictly refers to simple proteins soluble in water and coagulated by heat, such as ovalbumin in egg, serum albumin in blood, lactalbumin in milk.

albumin/globulin ratio Ratio between the blood albumin and the globulins; in normal human serum, 1.82. Change in the A/G ratio is of diagnostic value.

albumin index A measure of the quality of an egg; the ratio between the height of the albumin and the width when broken on to a flat surface. As the egg deteriorates, the albumin index decreases, i.e. the egg white spreads.

albumin milk See ***protein milk***.

albuminoids (scleroproteins) Fibrous proteins that have supporting or protective function in animals (in plants cellulose fulfils this function). Three types: (1) collagens in skin, tendons and bones, resistant to pepsin and trypsin, converted to water-soluble gelatin by boiling with water; (2) elastins in tendons and arteries, not converted to gelatin; (3) keratins, proteins insoluble in dilute acids and alkalies, not attacked by any animal digestive enzymes, comprise horns, hoofs, feathers, scales, nails.

albumoses Old name for proteoses, which see.

alcaptonuria A rare inborn error of metabolism of the two amino acids phenylalanine and tyrosine. Their metabolism ceases at homogentisic acid, which is excreted in the urine. Homogentisic acid oxidises to black melanoid pigments; hence, the urine of alcaptonurics slowly turns black. The defect appears to be harmless.

alcohol Generally refers to ethyl alcohol or ethanol, C_2H_5OH, although it is the second member of the series of alcohols of the general formula $C_nH_{2n+1}OH$. Produced by yeast fermentation of sugars, and the basis of a large number of alcoholic beverages ranging from low alcohol beers containing 2% ethanol to spirits with 40%. See also ***alcoholic beverages***.

alcohol, denatured Alcohol to which unpleasant materials have been added to prevent it being drunk – e.g. methylated spirits contains 10% methyl alcohol, a blue dye and unpleasant-smelling pyridine. Denatured alcohol is used for industrial purposes and not subject to Excise Duty.

alcoholic beverages Yeast can convert sugar into ethanol until the concentration reaches about 12–14% w/v, at which the yeast dies off. Consequently, this is the maximum alcohol content of wines, depending on the amount of sugar in the grapes. If fermentation is stopped before all the sugar has been fermented, the wine will be relatively sweet.

In some countries wines are labelled 'dry' when they contain less than 8 g carbohydrate per litre; less than 4 g/l is labelled 'suitable for diabetics'; 25–45 g/l is medium; and sweet wines contain more than 45 g/l.