Appendix C: Glossary

A

**Absorption**: The taking in of substances, as when nutrients are taken from the digestive tract into the bloodstream.

**Adipose cell**: “Fat cell” that stores excess calories as body fat.

**Aerobic metabolism**: The oxygen-requiring reactions occurring in mitochondria that produce energy from the breakdown of acetyl CoA into carbon dioxide and water.

**Aflatoxin**: Highly toxic substance(s) formed by the growth of fungi (especially Aspergillus flavus), and thought to be a cause of liver cancer. The fungi can contaminate certain crops (e.g., peanuts, corn) and flourish in warm and humid conditions.

**AIDS**: Acquired Immunodeficiency Syndrome caused by infection with HIV, characterized by infections stemming from a loss of crucial white blood cells necessary for the proper function of the immune system.

**Albumin**: A protein found in the plasma portion of blood which helps transport substances, regulates acidity of blood, and regulates the amount of fluid held in blood. Low level of albumin in plasma can lead to edema.

**Alcohol**: A fermentation product of carbohydrate that is high in calories (7 calories per gram), is essentially devoid of nutrients, and acts as a drug.

**Amino acid**: The structural unit (“building block”) of protein; contains an amino group and an acid group.

**Anemia**: Lower-than-normal amount of red blood cells or hemoglobin. Dietary deficiencies of iron and folate, and lack of intrinsic factor (for vitamin B12 absorption) are common causes.
Anaerobic: Able to function in the absence of oxygen.

Anaerobic metabolism: Energy-producing reactions that break glucose into pyruvate without the need for oxygen. Also known as glycolysis.

Aneurysm: An outpouching of a weakened portion of the arterial wall. Usually caused by a defect in the affected artery and/or high blood pressure. Rupture of an aneurysm in an artery in the brain causes a hemorrhagic stroke.

Angina [pectoris]: Chest pain caused by inadequate oxygen delivery by coronary arteries to the heart muscle.

Anorexia: A loss of appetite.

Anorexia nervosa: Eating disorder characterized by a dramatic reduction of food intake for fear of becoming fat, resulting in extreme weight loss and sometimes death.

Antibody: A blood protein made in response to a foreign substance (e.g., measles virus), creating a defense and immunity against it.

Antioxidant: A substance that prevents or retards oxidation. BHA (butylated hydroxyanisole) and BHT (butylated hydroxytoluene) are common antioxidants used in foods. Vitamins C and E can also function as antioxidants in food and in the body.

Appetite: A learned response which causes the desire for food.

Artery: A thick, muscular blood vessel that carries blood away from the heart. Blood carried in arteries is oxygenated (except for the pulmonary artery, which carries blood from the heart to the lungs to be oxygenated).

-ase: A suffix used in forming the name of an enzyme, such as lipase, sucrase, and lactase.

Atherosclerosis: An accumulation of fatty material in the lining of the arterial wall, resulting in the thickening, hardening, and loss of elasticity of the arteries.

Atom: The smallest particle that can no longer be subdivided without losing its characteristic properties. Atoms contain protons, neutrons, and electrons.

ATP (adenosine triphosphate): The high-energy molecule a cell makes by breaking down the energy-providing nutrients.

Autoimmune disease: A disease that occurs when a part of the body is mistakenly seen as foreign and is destroyed by the immune system, e.g., insulin-producing pancreatic cells destroyed by the immune system resulting in type-1 diabetes.

Axon: An extension of a nerve cell that conducts a nerve impulse away from the body of a nerve cell to other cells.

B

Basal metabolic rate (BMR): The rate at which energy (calories) is used for a person’s involuntary functions. It’s
measured under standard conditions, directly by the heat produced, or indirectly by the amount of oxygen consumed.

**Bile**: A substance made by the liver and stored and concentrated in the gallbladder. Released into the upper part of the small intestine (the duodenum) and serves to emulsify fats, aiding fat digestion.

**Bile acids**: Component of bile made in the liver from cholesterol.

**Biotechnology**: Use of technology to study or solve problems of living organisms, e.g., the production of human proteins by bacteria that have had the human gene for that protein inserted into their DNA ("recombinant DNA"). Biotechnology often used interchangeably with words genetic engineering, recombinant DNA, biotech.

**BMI**: See Body Mass Index.

**BMR**: See Basal metabolic rate.

**Body Mass Index (BMI)**: Your weight in kilograms divided by the square of your height in meters. Used to assess whether you are at a healthy weight, or underweight or overweight.

**Bomb calorimeter**: An apparatus used to determine the energy value of food by measuring the amount of heat produced by complete oxidation ("burning") of a food sample.

**Bulimia**: Eating disorder characterized by a compulsion to eat huge amounts of food in a short period of time and then "purging," usually by inducing vomiting or taking a lot of laxatives.

**Caffeine**: Stimulant found in coffee, which makes the nervous system more excitable. Also refers to related substances found in tea and chocolate which act as stimulants.

**Calorie**: As used in nutrition, the amount of heat needed to raise the temperature of 1 kg of water 1 °C. Also called a kilocalorie because it is 1,000 times more than a calorie as defined in physics.

**Cancer**: The uncontrolled overgrowth of cells which can lead to death.

**Capillary**: Small, thin-walled blood vessel. Reaching every living cell in the body, capillaries provide the means for exchange of substances between the blood and each cell.

**Carbohydrate**: One of the three classes of nutrients in food that provide energy to the body. Carbohydrates (e.g., sugar, starch) have an energy value of 4 calories per gram.

**Carbohydrate loading**: A regimen used by endurance athletes to temporarily increase muscle glycogen to higher-than-normal levels by depleting glycogen in the muscle by exercise, and then, in the days immediately prior to competition, resting and replenishing muscle glycogen by eating a high-carbohydrate diet.

**Carcinogen**: A substance that causes cancer.

**Catalyst**: Substance that increases the speed of a chemical reaction. (Enzymes are biological catalysts.)
Cell: The basic structural unit of an organism. Cell membrane: The outside layer of a cell.

Cholesterol: A fat found in all cell membranes, where it helps regulate membrane fluidity. It’s found in animal fat and animal tissue, and used to make vitamin D, estrogen, etc. Excessive amounts in the blood can lead to atherosclerosis.

Chromosome: Structures in the cell nucleus that are made of protein and DNA (the cell’s genetic information).

Coenzyme: A non-protein substance that works with enzymes in chemical reactions. Coenzymes often contain B-vitamins as part of their structures.

Cofactor: A non-protein substance, often a mineral, that can be required for enzyme action.

Collagen: A protein found in bone, cartilage, and connective tissue.

Constipation: Difficult or infrequent passage of stool. Insoluble dietary fiber can help prevent constipation by absorbing water, making the stool bulkier and softer. Covalent bond: The connection of two atoms that occurs because they share one or more electrons.

CRISPR-Cas: A revolutionary DNA-editing tool that can simply and precisely edit DNA in any organism.

Cytoplasm: The fluid in a cell.

D

Delaney clause: Adopted in 1958, it prohibits the Food and Drug Administration (FDA) from approving food additives that have been shown, in any dose, to cause cancer in any animal.

Denaturation: A change in the 3-dimensional shape of a protein molecule.

Dental plaque: Soft patches, containing bacteria and debris, that cling to teeth. Involved in tooth decay and gum disease.

Deoxyribonucleic acid: See DNA.

Dextrose: See glucose.

Diarrhea: Rapid movement of fecal matter through the colon, producing a watery stool.

Diabetes: A disease characterized by high blood sugar, resulting from a deficiency or ineffectiveness of insulin.

Dietary fiber: See Fiber.

Digestion: Breakdown of foods by digestive enzymes into smaller units that can be absorbed by the body.

Digestive tract: The series of organs (including the mouth, esophagus, stomach, small intestine, and colon) responsible for the digestion and absorption of nutrients. Also called the gastrointestinal (GI) tract.

Direct calorimetry: A method for determining the amount of calories expended by an organism by measuring the
amount of heat produced.

**Disaccharide**: A carbohydrate consisting of two monosaccharides (single sugars) linked together. Disaccharides are also called double sugars. The disaccharide sucrose (table sugar) is glucose linked to fructose.

**Diverticulosis**: Outpouching of the colon wall. Dietary fiber is believed to reduce the risk by providing bulk to contents of the colon, allowing the stool to pass with less pressure.

**DNA (deoxyribonucleic acid)**: The double-stranded molecule, located in the cell nucleus, that encodes an organism’s genetic information.

**Double-blind study**: A study in which neither the subjects nor the investigators actively involved know whether a particular subject is in the experimental group or the control group used for comparison.

**Duodenum**: Uppermost region (about the first 12 inches) of the small intestine. Site where pancreatic and liver secretions enter the small intestine through the bile duct.

**E**

**Edema**: Swelling in the body caused by excess fluids in body tissues. Seen in severe protein deficiency and some other medical conditions.

**Emulsifier**: A substance which finely divides and suspends fat in a water-based solution.

**Enrichment**: The addition of specific nutrients (thiamin, riboflavin, niacin, folic acid, iron) to refined grains such as white rice and white flour.

**Enzyme**: A biological catalyst, usually a protein, that speeds biochemical reactions.

**Epidemiology**: The study of the factors associated with diseases in populations, e.g., comparing populations worldwide, low-fiber diets are associated with higher rates of colon cancer.

**Estrogen**: Female sex hormone.

**Esophagus**: The muscular tube, serving as a passageway for food, that extends from the throat to the stomach.

**F**

**Fat**: One of the three classes of nutrients in food that provide energy (9 calories per gram) to the body. Fats dissolve in organic solvents but not in water.

**Fat-soluble vitamins**: The vitamins (A,D,E,K) that dissolve in fat.

**Fatty acid**: A chain of carbon (and hydrogen) atoms with an acid group (—COOH) on one end; the main component of triglycerides.

**Fiber**: Indigestible material found in plants. Insoluble fibers (those that don’t dissolve in water) help prevent
diverticulosis, constipation, and possibly colon cancer. Soluble fibers may help lower blood-cholesterol levels.

**Fructose**: A single sugar (monosaccharide) found in such foods as honey and fruit and a part of the double sugar sucrose.

**G**

**Galactose**: A single sugar (monosaccharide) that’s a part of the double sugar lactose.

**Gastric juice**: Acidic secretion from the stomach lining that kills bacteria ingested along with food, denatures proteins, dissolves minerals (enabling their absorption), etc.

**Genetic Engineering**: Modifying the gene of an organism.

**Genetically Modified Organism (GMO)**: An organism whose gene/genes have been modified by genetic engineering.

**Ghrelin**: A hormone made mainly by the cells lining the stomach that stimulates appetite.

**Glucose**: The most common single sugar (monosaccharide), also known as dextrose. It’s found in various foods, is the sugar found in blood, and is a part of the double sugars sucrose, maltose, and lactose.

**Glycogen**: A starch-like carbohydrate (a polysaccharide made of glucose) found in animal tissue (muscle and liver). Provides for the storage of glucose in the body.

**Glycolysis**: The production of ATP energy from the anaerobic breakdown of glucose in the cell cytoplasm.

**Goiter**: Enlarged thyroid gland caused by any of several factors. Called “simple goiter” when caused by a dietary deficiency of iodine.

**Goitrogens**: Substances found in foods and some drugs which, when ingested in large amounts of over a long time, can cause goiter.

**H**

**HDL (high-density lipoprotein)-cholesterol**: The blood-cholesterol carried in the protein-rich lipoprotein associated with a lower risk of cardiovascular disease. It’s dubbed “good cholesterol” for this reason.

**Heme iron**: Iron that is part of the iron-containing molecule called heme. Heme is found in the oxygen-carrying molecules hemoglobin and myoglobin found in animal tissue.

**Hemoglobin**: The iron-containing protein found in red blood cells; carries oxygen and carbon dioxide.

**HIV (Human Immunodeficiency Virus)**: The virus that cause AIDS (See AIDS).

**Hormone**: A chemical messenger, typically secreted in one location, carried in the bloodstream, and having specific effects elsewhere, e.g., the hormone glucagon is secreted by the pancreas and causes the liver to release glucose.

**Hydrogenation**: The addition of hydrogen to unsaturated fat. This changes the double bonds in fatty acids to single
bonds, resulting in a more solid (i.e., more saturated) fat.

**Hypoglycemia:** An abnormally low blood-glucose level. An excess of insulin is the usual cause.

**I**

**Indirect calorimetry:** Measurement of oxygen consumption to determine the calories expended by the organism.

**Insulin:** A hormone made in the pancreas that allows glucose to enter cells.

**Intrinsic factor:** A protein secreted by the stomach that’s needed for the absorption of vitamin B₁₂. An insufficient secretion of intrinsic factor can cause a B₁₂ deficiency and pernicious anemia.

**Ion:** A positively or negatively charged atom or molecule.

**K**

**Ketone:** A chemical formed from acetyl CoA when there’s an accumulation of acetyl CoA (from the breakdown of fatty acids) in metabolism.

**Ketosis:** An abnormal condition in which ketones are produced in large amounts because of a lack of carbohydrates for fuel. This can happen in starvation, untreated diabetes, and low-carbohydrate diets.

**L**

**Lactase:** The digestive enzyme that breaks the double sugar lactose into galactose and glucose.

**Lactic acid:** An acid formed by glycolysis when oxygen is limited (e.g., in sustained, strenuous physical activity).

**Lactose:** Double sugar (disaccharide) found in milk; made of galactose and glucose.

**Lactose intolerance:** Reduced ability to digest lactose (because of insufficient lactase enzyme in the small intestine), resulting in symptoms such as diarrhea and gas.

**LDL (low-density lipoprotein)-cholesterol:** The blood cholesterol carried in the fat-rich lipoprotein that’s associated with an increased risk of cardiovascular disease. It’s dubbed “bad cholesterol” for this reason.

**LDL receptor:** A protein in the membrane of cells that serves as a site of attachment for LDL, allowing cholesterol to enter a cell.

**Lecithin:** A phospholipid (a type of fat) found in food and body tissues. In food products, it’s commonly used as an emulsifier. In the body, it forms the basic structure of cell membranes.

**Leptin:** A hormone produced by fatty tissue that plays a key role in regulating energy intake and energy expenditure, including the regulation (decrease) of appetite and (increase) of metabolism.

**Lipoprotein:** A sphericle particle made of fat and protein used to carry fat in the plasma portion of blood.
**M**

**Malnutrition**: A condition of too much or too little of a nutrient, resulting in poor health.

**Maltase**: Digestive enzyme that breaks apart the double-sugar maltose into two molecules of glucose.

**Maltose**: A double sugar (disaccharide) made of two glucose molecules linked together.

**Menopause**: The permanent cessation of menstruation that occurs normally between about age 45 and 55.

**Messenger RNA (mRNA)**: A copy of the genetic information needed to make a particular protein.

**Metabolism**: The sum total of the chemical changes or reactions occurring in the body. Energy metabolism is the process by which cells release energy from food.

**Microvilli**: The ruffled portion of the membrane of the cells lining the small intestine.

**Mitochondria**: Cell components in which all oxygen-requiring reactions occur.

**Molecule**: Two or more atoms linked together. **Monosaccharide**: A single sugar. Glucose is the most common single sugar.

**Monounsaturated fatty acid**: A fatty acid with one double bond in its carbon chain. Olive oil is a rich source.

**Mutation**: A change in the sequence of bases in DNA.

**N**

**Non-heme iron**: Iron that is not part of the molecule called heme (an oxygen-carrying molecule found in blood and muscle). Plant iron is non-heme iron.

**Nucleus, cell**: The cell component that holds genetic information.

**O**

**Obesity**: Excess accumulation of body fat. Generally defined as exceeding ideal body weight by 20% or more, or a Body Mass Index (BMI) of 30 or more.

**Obestatin**: A hormone produced by the cells lining the stomach that affects appetite.

**Oil**: Generally speaking, a fat (triglyceride) that’s liquid at room temperature, e.g., corn oil, fish oil. Exceptions include palm oil.

**Organism**: Any living plant or animal.

**-ose**: A suffix used in naming of carbohydrates such as glucose, maltose, and lactose.

**Osteomalacia**: Vitamin D deficiency in adults, resulting in bone demineralization and easily fractured bones.
**Osteoporosis**: A loss of bone calcium such that the bone is easily fractured. Occurs most commonly in postmenopausal women.

**Oxidation**: The addition of oxygen atoms to (or the removal of hydrogen atoms from) a substance.

**P**

**Pectin**: A dietary fiber which can help lower blood-cholesterol levels. It’s also used to "gel" jams and jellies.

**Peptide**: Two or more amino acids joined together. The bond that joins them together is called a peptide bond.

**Periodontal tissue**: The gums, periodontal ligament, and other tissue surrounding the teeth.

**Peristalsis**: The wave-like contractions of the digestive tract muscles that move the digestive material downward.

**Phenylalanine**: One of the 9 amino acids required in the diet. The inherited inability to break down phenylalanine causes the disease phenylketonuria (PKU).

**Phospholipid**: A phosphorus-containing fat (lipid) made of glycerol, two fatty acids, and one phosphorus-containing substance. Phospholipids are the basic unit in cell membranes and are used as emulsifiers in foods. Lecithin is a common phospholipid.

**Photosynthesis**: The process whereby plants use the energy in sunlight to make carbohydrates and oxygen from carbon dioxide and water.

**Placebo**: An inert substance which seems identical to the real substance to be tested in an experiment; used to control for nonspecific effects.

**Placebo effect**: An effect that results from, but is not caused by, the test substance or procedure (e.g., feeling better simply because you expect to).

**Plasma**: The fluid portion of blood in which blood cells are suspended.

**Platelets**: Small blood cells which cluster at the site of injury to a blood vessel, acting immediately to stop the bleeding until a clot forms.

**Polysaccharide**: A carbohydrate of 3 or more monosaccharides (single sugars) linked together. Digestible polysaccharides are commonly called complex carbohydrates.

**Polyunsaturated fatty acid**: A fatty acid with two or more double bonds in its carbon chain. When these fatty acids predominate in a fat, the fat is liquid at room temperature.

**Protein**: A chain of amino acids having many structural and metabolic functions in the body. It’s also an energy-providing nutrient (4 calories per gram).

**Protein complementation**: Combining plant proteins to increase the quality of protein in the diet. A protein low in one essential amino acids is complemented by another protein that is low in another amino acid.
**Protein-energy malnutrition**: A severe deficiency of both protein and calories. Young children are particularly vulnerable because of their heightened need for calories and high-quality protein.

**Pyruvate**: The end-product of anaerobic metabolism (glycolysis) that can be made into acetyl CoA, to proceed onto aerobic metabolism. When oxygen is limited, pyruvate is made into lactic acid instead.

**R**

**Rancid**: Having the disagreeable taste and/or smell of decomposed fat, caused by oxidation of double bonds in unsaturated fat.

**Rhodopsin**: The vitamin-A containing molecule that plays a crucial role in vision.

**Ribosome**: A cell component that is the site of protein synthesis.

**Rickets**: Bone deformities caused by vitamin D or calcium deficiency in children.

**Risk factor**: A condition or circumstance thought to increase the chance of developing a disease or injury, e.g., smoking is a risk factor for lung cancer; high LDL-cholesterol is a risk factor for cardiovascular disease.

**RNA (ribonucleic acid)**: See messenger RNA and transfer RNA.

**S**

**Satiety**: Feeling of fullness or of being satisfied. Fat provides a longer satiety than carbohydrate or protein.

**Saturated fatty acid**: A fatty acid that does not contain any double bonds in its carbon chain because it is saturated with hydrogen atoms.

**Scientific Method**: The standard procedure used to acquire scientific knowledge, involving a hypothesis, experimentation, evaluation, discussion of results and conclusions, all subject to peer review.

**Serotonin**: The brain chemical (neurotransmitter) made from the amino acid tryptophan; has a calming effect.

**Sickle cell anemia**: A severe and painful inherited anemia caused by defective hemoglobin in red blood cells.

**Skinfold thickness**: A measure of fatness, based on the fact that body fat is mostly stored under the skin and adheres to the skin when the skin is pinched (skinfold).

**Stroke**: Brain damage stemming from an interruption of oxygen delivery to the brain, because of a blockage or bleeding (hemorrhage) in an artery that supplies the brain.

**Sucrase**: The digestive enzyme that breaks sucrose into fructose and glucose.

**Sucrose**: A double sugar (disaccharide) made of fructose and glucose. Commonly known as “table sugar.”

**Sugar**: The general name that includes single sugars (e.g., glucose, fructose, and galactose) and double sugars (e.g., sucrose, lactose, maltose). “Table sugar” is sucrose.
**T**

**Thyroxine**: An iodine-containing hormone made by the thyroid gland that’s important in maintaining normal rates of metabolism.

**Trans fat**: Unsaturated fat that has an unusual configuration around the double bond. Most commonly found in partially hydrogenated fat. Like saturated fat, it can raise LDL-cholesterol.

**Transfer RNA (tRNA)**: Carries the amino acids used to make protein in the cell.

**Triglyceride**: A fat made of three fatty acids attached to glycerol; makes up most of the fat in food and in our body.

**Tryptophan**: One of the nine diet-essential amino acids; can be made into the B-vitamin niacin and the neurotransmitter serotonin.

**U**

**Umami**: One of the five basic tastes sensed by the tongue. It describes the flavor common to savory foods such as meats and cheeses.

**Unsaturated fatty acid**: A fatty acid which contains one or more double bonds in its carbon chain.

**Urea**: A waste product made up of discarded amino groups from amino acids (as when amino acids are used for energy or made into body fat). Urea is excreted in the urine.

**V**

**Vegan**: A person who eats only plant foods.

**Vegetarianism**: Consuming a diet of only plant foods and plant products. Some vegetarians, however, eat some animal foods, e.g., a lacto-ovo-vegetarian diet includes milk (lacto-) and eggs (ovo-).

**Vein**: Blood vessel that transports blood throughout the body to the heart. Veins have valves that direct the blood back to the heart and help prevent pooling of the blood in veins.

**Villus**: Finger-like projection in the inner lining of the small intestine that’s covered with a single layer of intestinal cells. The projections (villi) markedly increase the surface area of the small intestine.

**Vitamin**: An essential molecule required in the diet. Of the 13 vitamins required for human health, 9 are water-soluble, and 4 are fat-soluble.

**W**

**Warfarin**: An anticoagulant that works by interfering with vitamin K’s role in the formation of blood clots.

**Water-soluble vitamins**: Vitamins that dissolve in water; vitamin C and the 8 B-vitamins.
Xerophthalmia: A dryness of the eyeball caused by vitamin A deficiency, which can progress to blindness.