

- [Acronyms](#)
- [Glossary](#)

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## Acronyms

ADI – Acceptable Daily Intake, a measure of the maximum amount of a pesticide a person can be exposed to without exceeding a regulatory agency’s “level of concern.” ADI’s are expressed in milligrams of pesticide per kilogram of bodyweight per day (mg/kg/day).

ALA- Alpha-Linolenic Acid, the major, heart-healthy omega-3 fatty acid in food.

APHIS – Animal and Plant Health Inspection Service.

ARS – Agricultural Research Service.

*Bt- Bacillus thuringiensis* is a Gram-positive, soil-dwelling bacterium, commonly used as a biological pesticide. *Bt* also occurs naturally in the gut of caterpillars of various types of moths and butterflies, as well on leaf surfaces, aquatic environments, animal feces, insect-rich environments, and flour mills and grain-storage facilities. Genes conferring to plants the ability to produce *Bt* endotoxins in plant tissues have been moved into corn, cotton, soybeans, and help manage certain mostly Lepidopteran insects.

CDC (CDCP) – Centers for Disease Control and Prevention, a federal agency within the Department of Health and Human Services that is focused on advancing public health.

cPAD – Chronic Population Adjusted Dose, the maximum allowed level of exposure to pesticide active ingredients set by the EPA in the case of pesticides triggering the need for an additional 3-X or 10-X safety factor under the Food Quality Protection Act. Like ADI’s, cPADs are expressed in milligrams of pesticide per kilogram of bodyweight per day.

cRFC – Chronic Reference Concentration, a measure of the maximum level of a pollutant like a pesticide that can be in a single serving of food without exposing a person of known size to a dose exceeding the EPA’s “level of concern” (i.e., the pesticide’s ADI or cPAD).

cRFD – Chronic Reference Dose is the terminology EPA uses in describing a pesticides Acceptable Daily Intake (ADI), except for pesticide’s for which a FQPA-driven, added safety factor has been imposed, creating what the EPA calls a cPAD. All cRFDs are expressed in mg/kg/day, and are typically calculated by dividing the lowest No Observable Adverse Effect Level (NOAEL) from a pesticide’s toxicology database by a standard 100-fold safety factor. When pesticide exposures from all routes in any given day exceed a person’s cRFD, such exposures trigger EPA’s “level of concern” and may lead to steps to reduce exposures.

DHA- Docosahexaenoic Acid, a long-chain omega-3 fatty acid.

DPA- Docosapentaenoic Acid, a long-chain omega-3 fatty acid.

DRI – Dietary Risk Index, a system that quantifies relative pesticide dietary risk from ingestion of a known quantity of food (usually a typical serving as set by USDA) during a given day.

EPA – Environmental Protection Agency.

ERS – Economic Research Service, the USDA agency responsible for studying the economic performance, costs and benefits, and policy issues impacting U.S. agriculture and the food system.

FDA – Food and Drug Administration, the federal agency responsible for review and approval of drugs and medical devices, and administering major food safety laws.

FQPA- Food Quality Protection Act, legislation passed in 1996 that dramatically changed the basis for setting and evaluating pesticide tolerance levels (legally sanctioned levels in food). The FQPA shifted federal law from a risk-benefit balancing standard to a health-based one focused on pesticide risks to the most vulnerable population groups (pregnant women, infants, and children).

GE - Genetic Engineering (Genetically Engineered) is a process through which scientists can alter the genetic makeup of crops and animals. Genetically engineered organisms have had their genome altered through insertion and expression of a genetic trait or traits that do not exist within the organism's genome.

GMO- Genetically Modified Organism are created through biotechnology (i.e., genetic engineering).

HDL -- High density lipoproteins. HDL transport cholesterol from the tissues to the liver where it can be eliminated in bile. HDL-cholesterol is considered good cholesterol, because higher blood levels of HDL-cholesterol are associated with lower risk of heart disease.

HNU- Human Nutrition Unit(s) are a measure of the nutritional value of a given amount of a food, based on the nutrient content of the edible portion of the crop. Nutrient dense and/or high-yielding crops produce relatively more HNUs per acre than less nutrient dense or lower yielding crops. By calculating the HNUs from a given farm enterprise taking into account all crops, animals, and other foodstuffs produced, the relative contribution of different farming systems and technology in advancing food security can be quantified.

IARC – International Agency for Research on Cancer, the global authority on the potential of chemicals and lifestyle factors to cause cancer.

LDL – Low density lipoprotein, the type of cholesterol that contributes to the risk of heart disease.

MSDS -- Material Safety Data Sheets, documents that provide information on the properties of a chemical, or formulated chemical product.

NASS – National Agricultural Statistics Service, a USDA agency responsible for field data collection, including pesticide use.

NIEHS – National Institute of Environmental Health Services, the part of the National Institutes of Health responsible for research on the impacts of environmental quality on human health.

NIH -- The National Institutes of Health is a non-regulatory U.S. Federal agency that conducts and supports research on human reproduction and health, disease etiology, and basic mammalian biology.

NIOSH -- National Institute for Occupational Safety and Health is an agency within the Centers for Disease Control, U.S. Department of Health and Human Services, that researches safety and health hazards in the workplace and makes recommendations to improve conditions. Unlike OSHA, they have no enforcement powers.

NOEL (also NOAEL) -- The No Observable (Adverse) Effect Level is the highest pesticide dose level that was not associated with an observable adverse health effect in a study involving humans or test animals. The EPA sets a pesticides ADI, cRFD, or cPAD based on the lowest NOEL observed in all toxicology studies submitted to the agency on a given pesticide active ingredient.

NOP- National Organic Program, administered by the USDA's Agricultural Marketing Service. The NOP establishes the rules and oversees the process governing the accreditation of organic certifiers and the organic certification process. The NOP also manages the National List of substances approved for use on organic farms and in organic food manufacturing.

NPS- Nutrient Profiling Systems are designed and applied to quantify the nutritional contribution of one food compared to others. Such systems are based government recommended, minimal daily intakes for various vitamins, minerals, and other nutrients, and the portion of each such nutrient delivered in a known quantity of different foods (a serving, equal amounts of calories, or the same weight across foods).

NQI – Nutrition Quality Index, a NPS that quantifies the relative nutritional quality of different foods taking into account the relative concentrations of 26 important nutrients.

NTP -- The National Toxicology Program is a federal program that coordinates toxicology research and testing activities within the US Department of Health and Human Services. The NTP provides information about potentially toxic chemicals to regulatory and research agencies and the public. It also conducts basic research in toxicology and risk assessment science.

PDP – Pesticide Data Program is administered by USDA’s Agricultural Marketing Service. It tests approximately 20,000 samples of food and beverages tests annually for pesticide residues. About one-third of annual samples are imported foods, and 2% to 4% are certified organic, allowing quantification of relative pesticide dietary risks in domestic versus imported foods, and organic versus conventionally grown foods.

PPB (ppb) -- Parts Per Billion (ppb) is a unit of concentration used when measuring levels of pollutants in air, water, body fluids, and other media. A ppb is 1 part in 1,000,000,000, and is often reported as ug/l (microgram per liter) and ug/kilogram. The difference between 1 ppm and 1 ppb is comparable to the difference between \$1 and \$1000.

PPM (ppm) -- Parts Per Million (ppm) is a unit of concentration often used when measuring levels of pollutants in air, water, body fluids, etc. One ppm is 1 part in 1,000,000. Common units include mg/l (milligram per liter) and mg/kilogram.

PUFA- Polyunsaturated Fatty Acids, key "good fats" and essential nutrients with health promoting benefits. The two major types of PUFAs are omega-3 and omega-6 fatty acids. The former promote heart health and development, and the later contribute to metabolic syndrome and diseases rooted in inflammation when ingested at the high levels in the typical Western diet. The omega-6 to omega ratio is a key measure of the balance of fatty acids in food.

RDA- Recommended Daily Allowance, the scientifically-established recommended daily average consumption of essential nutrients.

TOC- The Organic Center, a non-profit organization dedicated to conducting science on the environmental and health effects of organic food and farming, and communicate the findings to the public.

USDA – U.S. Department of Agriculture, a federal agency with a vast portfolio of programs and responsibilities from administering supplemental food programs, to food safety, soil and water conservation, rural community development, research, and managing the nation’s forests.

WHO -- The World Health Organization, a United Nations agency that coordinates international health activities and helps governments improve health services.

## Glossary

### A

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“Active ingredient” (AI) -- the chemical (or chemicals) in a pesticide that are responsible for killing or otherwise controlling target pests. Most tests required by regulatory agencies worldwide are done on pesticide active ingredients, rather than the formulated products that farmers and others actually apply.

“Acute exposure” -- a single or short-term exposure to a toxic substance over up to a 24-hour period.

“Acute toxicity” -- the ability of a substance to cause adverse effects resulting in biological harm following a single exposure or dose.

"Adjuvant" -- compounds added to formulated pesticide products that serve a purpose other than actively killing pests. Adjuvants are used to alter some property of the solution that enhances function, such as how it penetrates and spreads, the ease of mixing, or the size and nature of the solution droplets. Surfactants, emulsifiers, oils and salts are all common adjuvants.

“Alpha-lipoic acid” (lipoic acid) -- a powerful antioxidant that is readily absorbed and utilized within the cell where it is capable of regenerating glutathione. As such, lipoic acid supplementation results in increased glutathione levels. Lipoic acid is also involved in energy production. Lipoic acid works together with vitamin E and vitamin C to protect cells from oxidative stress.

“Amino acids” -- the building blocks of proteins. Non-essential amino acids are those that we can make in our bodies; essential amino acids are those we cannot make and must get from our diet. Amino acids are not only important in the synthesis of protein, but also function in transmission of neural pulses.

“Anemia” -- too few red blood cells in the bloodstream, resulting in not enough oxygen to tissues and organs.

“Antibody” -- a protein substance produced in the blood or tissues in response to a specific antigen, such as a bacterium or a toxin. Antibodies destroy or weaken bacteria and neutralize organic poisons, thus forming the basis of immunity.

“Antigen” -- a substance that when introduced into the body stimulates the production of an antibody. Antigens include toxins, bacteria, foreign blood cells, and the cells of transplanted organs.

“Antioxidant” -- an enzyme or other organic molecule that can counteract the damaging effects of oxygen in tissues. Although the term technically applies to molecules reacting with oxygen, it is often applied to molecules that protect from any free radical (a molecule with an unpaired electron). The term antioxidant is used to describe a dietary component that can function to decrease the tissue content of reactive oxygen. Common antioxidants include vitamins C and E, beta-carotene, N-acetylcysteine, selenium, zinc and alpha-lipoic acid.

“Autoimmune disease” -- autoimmune diseases occur when tissues in the body are mistakenly attacked by its own immune system. The immune system is a complex organization of cells and antibodies designed normally to destroy pathogens, particularly viruses and bacteria that cause infections. Individuals with autoimmune diseases have antibodies in their blood which target their own body tissues.

## **B**

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“Beta-carotene” -- a major carotenoid found in foods, and a pre-cursor of Vitamin A.

“Bioavailable” -- the portion of a nutrient (or other chemical) that can be absorbed, transported, and utilized physiologically.

## **C**

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“Calorie” -- a unit of thermal energy equal to 4.184 joules, used to quantify the energy content of food.

“Carcinogen” -- a substance that can cause or contribute to cancer.

“Carotenoids” -- chemicals produced by higher plants that function to protect the plant from oxygen-based free radicals produced during the absorption of light. Carotenoids also act as pigments to aid in light absorption. In our bodies, carotenoids function to protect our cells from free-radical damage. Several carotenoids enhance immune response, help prevent cancer and heart disease, inhibit mutagenesis, and reduce damage to DNA.

“Case-control study” -- a study in which levels of risk factors thought or known to be associated with a given disease are measured and compared in groups of people with and without a given disease or health problem (like spontaneous abortion). Because risk factors (e.g., nutrient intake, chemical exposure) are generally measured at the time of diagnosis, it is often difficult to determine whether the risk factor was present prior to the development of the disease. Another potential limitation in case-control studies is identifying and enrolling in studies well-matched control subjects.

“Catalyst” -- a substance that increases the rate of a chemical reaction by reducing the activation energy required, but which is left unchanged by the reaction.

“Cation” -- an ionic species (molecule) with a positive charge.

“Central nervous system” (CNS) -- the brain, spinal cord, and spinal nerves.

“Chelate” -- the combination of a metal with an organic molecule to form a ring-like structure known as a chelate. Chelation of a metal may inhibit or enhance its bioavailability, alter metabolism, and lead to bioaccumulation in parts of the body.

“Cholesterol” -- a lipid used in the construction of cell membranes and as a precursor in the synthesis of steroid hormones. Dietary cholesterol is obtained from animal sources, but cholesterol is also synthesized by the liver. Cholesterol is carried in the blood by lipoproteins (e.g., LDL and HDL). In atherosclerosis, cholesterol accumulates in plaques on the walls of some arteries, triggering heart disease.

“Clinical trial” -- a research study generally designed to evaluate the effectiveness of a new treatment in human participants. Clinical trials are designed to answer specific scientific questions, and to determine the efficacy and side-effects of new treatments for specific diseases or health conditions.

“Coenzyme” -- a molecule that binds to an enzyme and is essential for its activity, but is not permanently altered by the reaction. Many coenzymes are derived from vitamins.

“Cohort study” -- a study that follows a large group of people over a long period of time, often 10 years or more. In cohort studies, dietary information is gathered before disease occurs, rather than relying on recall after disease develops.

“Cross-over trial” -- a clinical trial in which at least two interventions or treatments are applied to the same individuals after an appropriate wash-out period. One of the treatments is often a placebo. In a randomized cross-over design, interventions are applied in a randomized order to ensure that the order of treatments did not contribute to the outcome.

“Cross-sectional study” -- a study of different groups of people at one point in time to determine whether a risk factor or a level of a risk factor is associated with the occurrence of a disease. Because the disease outcome and the risk factor (e.g., nutrient intake) are measured at the same time, a cross-sectional study provides a "snapshot" view of their relationship. Cross-sectional studies cannot provide information about causality.

## D

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“Daily Value” (DV) -- a term used in food and supplement labeling in the U.S. The amount of a vitamin or other nutrient in a serving of a food or supplement. DVs are expressed as the percentage of the total Daily Value, or recommended intake, of that nutrient, based on a daily 2,000 or 2,500 calorie diet.

“Density” -- mass per unit volume (i.e., milligrams of a vitamin per gram of food).

“Diabetes” (diabetes mellitus) -- a chronic condition associated with abnormally high levels of glucose (sugar) in the blood. The two types of diabetes are referred to as insulin-dependent (type 1) and non-insulin dependent (type 2).

“Diabetic ketoacidosis” -- a potentially life-threatening condition characterized by ketosis (elevated levels of ketone in the blood) and acidosis (increased acidity of the blood). Ketoacidosis occurs when diabetes is not adequately controlled.

“Dietary Supplement” -- a product intended to supplement the diet that bears or contains one or more of the following dietary ingredients: a vitamin; mineral; herb or botanical; amino acid; any other dietary substance for use by man to supplement the diet by increasing the total dietary intake.

“Double blind” -- a study in which neither the investigators administering the treatment nor the participants know which participants are receiving the experimental treatment and which are receiving the placebo.

## E

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“Electrolyte” -- a substance which forms ions in an aqueous (water) solution. Major electrolytes in the body include sodium, potassium, magnesium, calcium, chloride, bicarbonate, phosphate.

"Emulsifiers" -- are compounds that bond to oil and water and are used to help chemical solutions form a stable emulsion, or mixture. Emulsifiers are often added to pesticide solutions.

"Endocrine system" -- the glands and parts of glands that secrete hormones that integrate and control the body's metabolic activity. Endocrine glands include the pituitary, thyroid, parathyroids, adrenals, pancreas, ovaries, and testes.

"Endogenous" -- arising from within the body. Endogenous synthesis refers to the synthesis of a compound by the body. Secondary plant metabolites are also endogenous within plants.

"Endotoxin" -- a heat-stable toxin associated with the outer membranes of certain gram-negative bacteria, including *Brucella*, *Neisseria*, and *Vibrio* species. Endotoxins are not secreted, but are released only when the cells are disrupted or break down.

"Enzyme" -- a protein that catalyzes a chemical reaction. A substance that increases the speed of a chemical reaction without being changed in the overall process. Enzymes are vitally important to the regulation of the chemistry of cells and organisms.

"Epigenetic" -- changes in the way an organism expresses its DNA. While epigenetic changes in an organism's DNA can happen naturally, they can also be triggered by environmental exposures, including pesticides. Epigenetic changes often occur following fetal exposure and can have serious health implications later in life.

"Epigenetics" -- the study of potentially heritable changes in gene expression (active versus inactive genes) that does not involve changes to the underlying DNA sequence — a change in phenotype without a change in genotype — which in turn affects how cells read the genes. (Definition credit: <http://www.whatisepigenetics.com/fundamentals/>)

"Epidemiologic study" -- a study examining disease occurrence in a human population.

"Etiology" -- the causes or origin of a disease.

"Eukaryote" -- an organism consisting of a cell or cells in which the genetic material is DNA in the form of chromosomes contained within a distinct nucleus. Eukaryotes include all living organisms other than the eubacteria and archaeobacteria.

## **F**

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"Fat soluble vitamins" -- nutrients that dissolve in fats or oils but not in water. These vitamins are often found in foods that contain fat, and fat may be necessary for their absorption from the digestive tract into the bloodstream. People who eat very little fat may have difficulty getting enough of the fat-soluble vitamins A, D, E, and K.

"Fatty acid" -- an organic acid molecule consisting of a chain of carbon molecules and a carboxylic acid (COOH) group. Fatty acids are found in fats, oils, and as components of several essential lipids, such as phospholipids and triglycerides. Fatty acids can be burned by the body for energy.

"Folic Acid" -- water-soluble B complex vitamin. Plays an important role in cell division, and thus is important to the development of the nervous system of the fetus. Folic acid can also reduce levels of homocysteine, preventing damage to the artery walls, and ultimately, atherosclerosis. Folic acid is easily absorbed directly from the digestive tract into the bloodstream. Foliates, however, must be processed by enzymes in the intestinal lining before they can be absorbed.

"Fortification" -- the addition of nutrients to foods to prevent or correct a nutritional deficiency, to balance the total nutrient profile of food, or to restore nutrients lost in processing.

"Free radical" -- an atom or a molecule with an unpaired electron. Because they have a free electron, such molecules are highly reactive with nearby molecules. By interacting with cellular components, free radicals may cause cellular and genetic damage. Free-radical damage has been implicated in several diseases. Free radicals are generated by smoking, environmental pollutants, and exposure to UV radiation. In addition, they also occur naturally in the body as a result of metabolic processes. Free-radical damage can be countered with antioxidants.

“Fructose” -- a very sweet 6-carbon sugar abundant in plants. Fructose is increasingly common in sweeteners such as high-fructose corn syrup.

## G

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"Genotype" -- is the genetic code, or DNA, of an individual organism.

“Glucose” -- a 6-carbon sugar which plays a major role in the generation of energy for living organisms.

“Glutamate” -- an excitatory neurotransmitter. Under certain circumstances glutamate may become toxic to neurons. Glutamate excitotoxicity appears to play a role in nerve cell death in some neurodegenerative disorders.

“Glutathione” -- protects cells against various free radicals. Glutathione levels have been shown to decrease with age. Glutathione cannot be absorbed in the stomach, and therefore levels of this cellular protector cannot be increased with dietary supplementation. Instead, alternate antioxidants (i.e. alpha-lipoic acid) and precursors to glutathione (i.e. N-acetyl cysteine) must be taken to increase glutathione levels.

"Guttation (droplets)" -- Droplets of fluid that are released by vascular plants. Guttation droplets come from xylem sap and form on the tips or edges of leaves, often at night when transpiration (evaporation of water from plants) is reduced. Guttation droplets are an important dietary source of nutrients for pollinators and other insects, and can also carry pesticide residues from the inside to the outside of plants, creating an important route of exposure for certain insects.

## H

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"Herbicide" -- chemical used to manipulate or control undesirable vegetation, also known as weed killers.

“Herbicide-resistant” (HR) – crops genetically engineered to survive direct application of one or more herbicides during the growing season, chemicals that would otherwise kill or severely stunt the crop. “Herbicide resistant” is the terminology preferred by the Weed Science Society of America to describe genetically engineered.

“Herbicide-tolerant” (HT) – crops genetically engineered to survive direct application of one or more herbicides during the growing season, chemicals that would otherwise kill or severely stunt the crop. The terminology preferred by the Weed Science Society of America to describe genetically engineered, herbicide-tolerant crops is “herbicide-resistant” (HR).

“High density lipoproteins” (HDL) – proteins that transport cholesterol from tissues to the liver, where it can be eliminated in bile. HDL-cholesterol is considered good cholesterol, because higher blood levels of HDL-cholesterol are associated with lower risk of heart disease.

“Hypoxia” -- deficiency in the amount of oxygen reaching body tissues.

## I

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“In vitro” -- refers to studies and/or phenomena that take place outside the body (e.g., in test tubes).

“In vivo” -- refers to studies and/or phenomena that take place in live animals or humans.

"Insecticide" – the type of pesticide formulated to kill, harm, repel or mitigate one or more species of insect.

“Intervention trial” -- an experimental study (usually a clinical trial) used to test the effect of a treatment or intervention on a health- or disease-related outcome.

“Ion” -- an atom or group of atoms that carries a positive or negative electric charge, because it lost or gained one or more electrons.

“Ionic bond” -- a chemical link between two atoms caused by the electrostatic force between oppositely-charged ions in an ionic compound.

“Isomers” -- compounds that have the same numbers and kinds of atoms, but that differ in the way the atoms are arranged.

## K

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“Kinetics” -- the study of the rates of chemical reactions.

## L

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“Low density lipoprotein” (LDL) -- particles composed of lipids and protein. The form in which fats are transported throughout the body, in the bloodstream. LDLs transport cholesterol from the liver to the tissues of the body. A high proportion of cholesterol carried in LDL (LDL-cholesterol) is associated with an increased likelihood of developing cardiovascular diseases (heart disease and stroke). Oxidized LDL appear to play an important role in the development of atherosclerosis.

## M

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“Macronutrients” -- nutrients that the body needs in relatively large amounts. The major macronutrients are protein, carbohydrate, fat, and water.

“Material Safety Data Sheets” (MSDS) --document providing necessary, helpful, and useful information on the properties of a chemical or chemical product.

“Meta-analysis” -- a mathematical or statistical analysis used to pool the results of multiple studies investigating a particular phenomenon (e.g., the effect of folic acid supplementation on homocysteine levels). Meta-analysis can enhance the statistical reliability of linkages between risk factors and observed effects.

“Metabolism” -- a general term for the complex biochemical processes by which the body generates energy from food, manufactures substances that it needs, and breaks down substances in food into simpler components for incorporation into the body or detoxification and excretion from the body.

“Metabolite” -- a compound derived from the metabolism of another compound is said to be a metabolite of that compound.

“Methylation” -- a biochemical reaction resulting in the addition of a methyl group (-CH<sub>3</sub>) to another molecule.

“Microgram” (μg) -- one microgram is equal to one thousandth (1/1,000) of a milligram or one millionth (1/1,000,000) of a gram.

“Micrometer” (μm) -- one micrometer is equal to one thousandth (1/1,000) of a millimeter or one millionth (1/1,000,000) of a meter.



“Micronutrients” -- nutrients that the body needs in small amounts. Vitamins and minerals are micronutrients.

“Microorganism” -- a microscopic organism, e.g. a bacterium or fungus.

“Minerals” -- nutritionally significant elements composed of only one kind of atom. Minerals are inorganic, i.e., they do not contain carbon, as do vitamins and other organic compounds.

“Minimum Data Set” (MDS) – a set of measures of some phenomenon that collectively are required to provide a reliable, quantitative assessment of levels, performance, and trends.

“Mycotoxin (mycotoxins)” -- toxins produced by certain molds, such as aflatoxin. Exposures to these toxins are poisonous to man and animals, and even t relatively low doses, can disrupt reproduction and cause cancer.

## N

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“Neurodegenerative diseases” -- progressive diseases of nervous system, such as Alzheimer's disease and Parkinson's disease, that are characterized by the loss or degeneration of neurons.

“Neurotoxic (neurotoxin)” -- chemicals that cause central nervous system (CNS) problems such as dizziness, headaches and ability to think clearly, and/or disrupt the normal development of the neurological system.

“Nutraceutical” -- a product isolated or purified from foods, and generally sold in medicinal forms not usually associated with food. Many nutraceuticals have been demonstrated to deliver physiological benefits or provide protection against chronic disease.

## O

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“Organophosphate (OP)” -- the general name for esters of phosphoric acid, and a major class of neurotoxic insecticides. Many important biochemicals are organophosphates, including DNA and RNA.

“Oxidation” -- a chemical reaction that removes electrons from an atom or molecule.

“Oxidative stress” -- an organism is said to experience oxidative stress when the effects of prooxidants (e.g. free radicals, reactive oxygen and reactive nitrogen species) exceed the ability of antioxidant systems to neutralize them.

“Oxyradical” (reactive oxygen) -- a free radical derived from molecular oxygen.

## P

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“Pathogen” -- a disease causing agent, such as a virus or a bacterium.

“Peptide” -- a chain of amino acids. All proteins are made up of one or more peptides.

“Peptide hormones” -- hormones that are proteins, as opposed to steroid hormones. Insulin is an example of a peptide hormone.

“Pesticide” -- a chemical that controls pests. The term encompasses herbicides applied to control weeds, insecticides used to manage insects, and fungicides sprayed to manage plant diseases, as well as several other types of chemicals (e.g. rodenticides, nematicides, acaricides, plant growth regulators, desiccants).

“Pesticide use” -- the most common metric of use is the pounds of pesticide “active ingredient” applied per acre, or on a given crop over some period of time.

“PH” -- a measure of acidity or alkalinity.

“Pharmacologic dose” -- the dose or intake level of a nutrient many times the level associated with the prevention of deficiency, or the maintenance of health. A pharmacologic dose is generally associated with the treatment of a disease state and considered to be a dose at least 10-times greater than that needed to prevent deficiency.

“Phenotype” -- is the set of genetic characteristics expressed in an individual organism that arise from the interaction of their genotype (i.e. DNA) with the environment.

“Phospholipids” -- lipids (fat molecules) in which phosphoric acid, as well as fatty acids, are attached to a glycerol backbone. Phospholipids are found in all living cells and in the bilayers of cell membranes.

“Phosphorylation” -- the creation of a phosphate derivative of an organic molecule. This is usually achieved by transferring a phosphate group (-PO<sub>4</sub>) from ATP to another molecule.

“Physiologic dose” -- the dose or intake level of a nutrient associated with the prevention of deficiency, or the maintenance of health. A physiologic dose of a nutrient is not generally greater than that which could be achieved through a conscientious diet, as opposed to the use of supplements.

“Phytochemical” -- substance produced by plants in response to biotic (pest attacks, nutrient imbalances or inadequacies) and abiotic (drought, damage from wind, intense sunlight) stresses. The term is generally reserved for molecules with biological activity. Antioxidants in plant-based foods are all phytochemicals.

“Polyphenol” -- an antioxidant phytochemical (e.g. chlorogenic acid) that tends to prevent or neutralize the damaging effects of free radicals.

“Prokaryote” -- a microscopic single-celled organism that has neither a distinct nucleus with a membrane, nor other specialized organelles. Prokaryotes include bacteria and cyanobacteria.

“Prooxidant” -- an atom or molecule that promotes oxidation of another atom or molecule by accepting electrons. Examples of prooxidants include free radicals, reactive oxygen species (ROS), and reactive nitrogen species (RNS).

“Prospective cohort study” -- an observational study in which a group of people—known as a cohort—are interviewed or tested for risk factors (e.g. nutrient intake), and then followed up at subsequent times to determine their status with respect to a disease or condition of interest.

“Protein” -- a polypeptide or molecule made up of polypeptides. A complex, nitrogen-containing substance that is found in food and is essential for the functioning of the human body. Protein molecules consist of long chains of building blocks called amino acids. Some of these amino acids can be manufactured in the human body. Others must be supplied by the diet. The body breaks down food proteins into their amino acid constituents, and then reassembles the amino acids into the proteins needed for normal functioning.

“Provitamin” -- a compound that the human body can convert into a vitamin. For example, beta-carotene is a provitamin because the body can convert it into vitamin A, as needed.

## R

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“Randomized controlled trial” (RCT) -- a clinical trial that involves at least one test treatment and one control treatment, in which the treatments administered are selected by a random process (e.g. coin flips, or a random-numbers table).

“Randomized design” -- an experiment in which participants are chosen for the experimental and control groups at random, in order to reduce bias caused by self-selection into experimental and control groups. This type of study design can provide evidence of causality.

“Reactive nitrogen species” (RNS) -- highly reactive chemicals, containing nitrogen, that react easily with other molecules, resulting in potentially damaging modifications.

“Reactive oxygen species” (ROS) -- highly reactive chemicals, containing oxygen, that react easily with other molecules, resulting in potentially damaging modifications.

“Receptor” -- a protein on, or protruding from the cell surface to which certain chemicals can bind. Binding of a specific molecule (ligand) may result in a cellular signal, or the internalization of the receptor and the ligand.

“Recommended Dietary Allowance” (RDA) – intake levels set by the Food and Nutrition Board of the Institute of Medicine. The RDA is the average daily, dietary intake level sufficient to meet the nutrient requirements of nearly all (97-98%) healthy individuals in a specific life stage and gender group (e.g., women 19-50 years of age). It is intended as a goal for the daily intake of specific nutrients by individuals.

“Redox reaction” -- another term for an oxidation-reduction reaction. A redox reaction is any reaction in which electrons are removed from one molecule or atom and transferred to another molecule or atom. In such a reaction, one substance is oxidized (loses electrons) while the other is reduced (gains electrons).

"Resveratrol" -- a polyphenol phytochemical found in certain plants and in red wine that has potent antioxidant properties. Studies have suggested that resveratrol has possible anticarcinogenic effects and also can slow down the aging process.

“Retinol” -- the chemical name for vitamin A.

## S

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“Scavenge” (free radicals) -- to combine readily with free radicals, preventing them from reacting with other molecules.

“Selenium” -- a component of the antioxidant enzyme, glutathione peroxidase. Glutathione peroxidase works with vitamin E in preventing free radical damage to cell membranes. In addition, selenium appears to have antioxidant properties on its own and plays a role in cancer, cardiovascular disease, enhancing immune function, inflammatory conditions, and cataracts.

“Signal transduction” -- the movement of information through the cell.

“Spore” -- a small, usually single-celled reproductive body that is highly resistant to dehydration and heat and capable of growing into a new organism, produced especially by certain bacteria, fungi, algae, and nonflowering plants.

“Stacked trait” – seeds that express two or more distinct, novel traits following the introduction and expression of a transgene via the genetic engineering process (e.g. herbicide tolerance and *Bt*-insect protected, or a crop variety resistant to two or more herbicides or expressing two or more *Bt* endotoxins).

"Surfactants" -- are compounds that are added to chemical solutions, including pesticides, to lower the surface tension between two liquids, or a liquid and a solid. They can help a mixture blend together, foam up, or support better dispersion across a surface.

## T

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“Tannins” -- any of a large group of plant-derived compounds. Tannins tend to be bitter tasting and may function in pigment formation and plant protection.

“Trait” -- the unique characteristic or attribute added to the genetic makeup of a crop using biotechnology. The capacity of a plant to withstand applications of an herbicide is an example of a GE crop trait.

“Trait acres”-- the number of crop acres that contain a particular trait. One acre planted to a single-trait GE crop represents one trait acre, an acre planted to a “stacked” crop with two traits is equivalent to two trait acres. GE trait acres planted often exceeds total GE crop acres planted.

## V

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“Vascular (vascular system)” -- Vascular plants are the higher plants that have evolved vascular tissue to transport and distribute resources throughout the plant. This allows plants to grow to a larger size. Examples of vascular plants are trees, grasses, and agricultural crops.

“Vitamin” -- the name that is given to 13 organic substances that are essential in the diet because they cannot be manufactured by the body. Vitamins are needed in very small amounts, but are essential to life.

“Vitamin A” -- a fat soluble vitamin involved in the maintenance of healthy skin, eyes, bones, hair and teeth and is essential to proper immune function. Vitamin A can be synthesized from the antioxidant beta-carotene.

“Vitamin B2” -- riboflavin.

“Vitamin B6” -- important vitamin in the formation of proteins, structural compounds, messengers in the nervous system, red blood cells, prostaglandins, proper functioning of a large number of enzymes, and in maintaining proper immune function. Low levels of Vitamin B6 result in high levels of homocysteine. Homocysteine damages the cells that line the arteries, which can eventually result in atherosclerosis. Vitamin B6 can inhibit platelet aggregation, lower blood pressure, can protect against the development of diabetic neuropathy and enhances the immune system.

“Vitamin C” -- important as an antioxidant, but also in its ability to regenerate the antioxidant form of Vitamin E. With acute viral infections (flues, colds), vitamin C can reduce symptom severity and shorten illness time at high levels. Important in the maintenance of bones, teeth, blood vessels and connective tissue as well as enhancing the immune system, and in decreasing the risk of death from heart attacks, strokes, and cancer.

“Vitamin E” -- a fat soluble antioxidant playing an important role in protecting cell membranes, fats, the immune system and vitamin A from oxidative stress. Studies suggest that vitamin E supplementation may improve immune function and reduce the risk of chronic diseases such as heart disease, cancer, strokes.

“Volatile Organic Compounds” (VOCs) -- chemicals containing carbon are called organic. Volatile means that they evaporate or get into the air easily, which enhances inhalation exposures. Examples of common VOCs include benzene and trichloroethylene.

## W

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“Water-soluble vitamins” -- nutrients that dissolve in water. These include vitamin C and the B vitamins. Water-soluble vitamins can easily be lost when fruits or vegetables are cooking in water. This problem can be avoided by serving foods raw, cooking foods in as little water as possible, or including the cooking water in the finished dish (e.g., in a soup or stew).

## Y

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“Yeast” -- Eukaryotic, single-celled microorganisms classified as members of the fungus kingdom. The yeast lineage originated hundreds of millions of years ago, and 1,500 species are currently identified. They are estimated to

constitute 1% of all described fungal species. Some yeasts are reported to be allergenic and may cause problems if a person has had previous exposure and developed hypersensitivity.