Central Glossary

Agonist: An agent that mimics the actions or effects of another agent (e.g., a compound that mimics the effects of a neurotransmitter and activates that neurotransmitter’s receptor).

Allele: Different forms of a gene. Different alleles for a gene serve the same function (e.g., code for a protein that affects a person’s eye color) but may result in different phenotypes (e.g., blue eyes or brown eyes).

Antagonist: An agent that blocks or reverses the effects of another agent (e.g., a compound that blocks the effects of a neurotransmitter or inactivates that neurotransmitter’s receptor).

Antioxidant: A substance (e.g., glutathion or vitamin E) that inhibits oxidation.

Association study: A study that analyzes whether a certain DNA marker or allele is inherited with a particular disease or disorder (e.g., alcoholism) more frequently than would be expected in the general population; the marker or allele does not necessarily play a role in the development of the disease, however, but may just be located adjacent to a gene that contributes to the disease.

Candidate gene: A gene that has been implicated in causing or contributing to the development of a particular disease.

Cardiomyopathy: Any disease that affects the structure and function of the heart.

Catecholamine: One of a group of physiologically active substances with various roles in the functioning of the nervous system; also helps regulate heart functioning.

Cerebellum: A brain structure at the base of the brain that is involved in the control of muscle tone, balance, and sensorimotor coordination.

Cerebral cortex: The intricately folded outer layer of the brain, composed of nerve-cell bodies (gray matter); contains areas for processing sensory information and for controlling motor functions, speech, higher cognitive functions, emotions, behavior, and memory.

Chromosomes: Threadlike molecules in the cell that consist of DNA and protein and contain most of the cell’s genes. Humans have 46 chromosomes arranged in 23 pairs.

Collagen: The major protein component of fibrous connective tissue (e.g., tendons and ligaments); also found in scar tissue.

Congenic strain: A strain of animals, such as mice, in which a DNA segment from one strain has been transferred (or introgressed) into the genome of a host animal (typically an inbred animal). In a set of congenic strains, the animals are identical with respect to the vast majority of their genetic material and differ only in the introgressed DNA segment.

Cytokine: A molecule that regulates cellular interactions and cellular functions. Cytokines are produced and secreted by a variety of cells, including immune cells.

Cytosol: The portion of the cell that contains soluble materials.

Cytoskeleton: Fiber-like structures within a cell that help give the cell its shape and stability.

Dendrite: A type of thin, branched nerve cell fiber that extends from the neuron’s body to receive information from other neurons.

Diastole: The time period between two contractions of the heart during which blood enters the relaxed heart chambers from the lungs and from the systemic circulation.

DNA: The abbreviation for deoxyribonucleic acid, the molecule that encodes the genetic information in all organisms except some viruses. DNA molecules usually consist of two strings of nucleotides. DNA is a component of chromosomes.

DNA marker: A DNA region with a known sequence.

Endogenous opioids: A group of brain chemicals that bind to opiate receptors in the brain, resulting in such effects as euphoria and pain relief; also contribute to alcohol reinforcement.

Endophenotype: A phenotype that is not immediately visible but may contribute to the susceptibility to develop a particular behavior or syndrome.

Endothelium: A layer of cells lining the inner wall of a blood vessel.

Endotoxin: A molecule in the cell wall of many bacteria, including many bacteria in the intestine. Endotoxins are released and may enter the bloodstream when the bacteria die; they can cause fever, chills, shock, and other symptoms of infection.

Epithelium: The tissue layer lining the internal and external organs of the body as well as the blood vessels, body cavities, and glands.

Excitation-contraction (E-C) coupling: The process through which the electrical excitation of a muscle cell membrane that occurs in response to a nerve signal leads to the contraction of the muscle cell.

Extinction: The “un-learning” of a previously learned behavior (e.g., pressing a lever in order to receive alcohol); can be achieved by withholding the reward (i.e., alcohol) that was associated with the learned behavior.

Fatty acids: Molecules that constitute components of fat molecules (i.e., lipids)

Fibrosis: Formation of scar tissue.

Forward genetics: Strategy in genetic research by which investigators first introduce mutations into the DNA and then assess the result of those mutations on the function of a cell or an
organism (e.g., whether the cell or organism loses certain functions or characteristics).

**Free iron:** Iron molecules with a low molecular weight that can form bonds with other molecules (e.g., proteins).

**Gene:** A string of **nucleotides** that directs the synthesis of a **protein**.

**Gene expression:** The process of converting the genetic information encoded in the **DNA** into the final **gene product** (i.e., a **protein**).

**Genetic marker:** A segment of **DNA** with an identifiable physical location on a **chromosome** whose inheritance can be followed.

**Genome:** The sum of all **genes** in an individual organism.

**Genotype:** The genetic makeup of an individual organism.

**Germ cell:** A cell responsible for reproduction (i.e., the sperm cells in males and the eggs in females) or its precursors. Germ cells contain only half the number of chromosomes as **somatic cells**.

**Germ-line transformation:** A technique for introducing genetic changes into the germ cells (i.e., eggs or sperm cells) of an organism so that these changes are passed on to the offspring.

**Hepatitis:** Inflammation of the liver.

**Hepatocyte:** The principal cell type found in the liver; its many functions include bile production, **protein synthesis**, detoxification, and nutrient storage.

**Hippocampus:** A curved ridge found within the cerebral hemisphere that functions in consolidating new memories.

**Inbred strain:** A virtually genetically identical group of organisms derived by inbreeding among a limited number of ancestors. An inbred strain of mice is like a population of identical twins.

**In vitro:** Latin for “in glass,” as in a test tube. An in vitro test is done in the laboratory using preparations of isolated cells, tissues, or organs.

**Knockout/knock-in mice:** Mice in which a gene has been deleted (knockedout) or mutated (knocked-in) in both the somatic and the germ cells so that the animals produce no functional gene product.

**Kupffer cell:** A phagocytic cell in the liver that removes bacteria and other foreign organic substances from the blood by ingesting them.

**Linkage study:** A study that looks for **genes** or **alleles** that are necessary or sufficient for the development of a particular disorder.

**Locus, loci:** A specific location(s) on a **chromosome**.

**Microsome:** Small vesicles derived from one of the cell’s **organelles** (i.e., the endoplasmatic reticulum) when cells are forcibly broken up.

**Mitochondria:** Organelles that generate the energy (e.g., adenosine triphosphate [ATP]) required for many cell functions.

**Mitogen:** A molecule that stimulates cell division.

**Mutagen:** Any substance that can induce a **mutation**.

**Mutation:** A change, deletion, or rearrangement in the **DNA** sequence that may lead to the synthesis of an altered **protein** or to a totally inactive **gene** incapable of producing a protein.

**Myocardium:** A thick layer of uniquely constructed and arranged muscle cells that forms the bulk of the heart wall.

**Myocyte:** A muscle cell.

**Necrosis:** Death of one or more cells or of portions of tissue resulting from adverse conditions or changes in the cell’s environment.

**Neuron:** A nerve cell.

**Neurotransmitter:** A chemical messenger released by an excited or stimulated neuron. After release, neurotransmitters travel across a **synapse** and bind to docking molecules (i.e., **receptors**) on an adjacent neuron or muscle cell, usually triggering a series of chemical and electrical changes in the second cell.

**Neuroadaptive changes:** Changes in nerve cell **gene expression** and in the connections among nerve cells that occur in response to environmental changes (e.g., chronic exposure to alcohol or other drugs).

**Neuropeptide:** A small molecule that can regulate nerve cell function and is made up of amino acids.

**Neurotransmitter:** A chemical messenger released by a nerve cell that transmits a nerve signal from that cell to a neighboring nerve cell.

**Organelle:** A functional component of a cell (e.g., a **mitochondrion** or the endoplasmic reticulum); each organelle has its own membrane and specialized function.

**Oxidation:** A chemical reaction that removes a hydrogen atom from a substance or adds oxygen to it (or both).

**Oxidative stress:** An imbalance between oxidants and antioxidants, leading to excessive oxidation and cell damage.

**Oxygen radical:** Highly reactive, oxygen-containing molecules that cannot exist in a free state for a prolonged period; also called reactive oxygen species.

**Paradigm:** A specific experimental design or approach.

**Parietal cortex:** A subdivision of the cerebral cortex involved in controlling higher cognitive functioning and the integration of sensory information.

**Perfused organ:** An isolated organ that is kept functional by passing a fluid (i.e., medium) through it.

**Phagocytic cell:** Any type of cell that eliminates foreign substances, microorganisms, or damaged cells by ingesting them.

**Phenotype:** The observable properties, traits, or physical appearance of an organism resulting from the interaction of the **genotype** with environmental factors.

**Polymorphic marker:** A DNA marker that exists in different forms (i.e., **alleles**) within a test population.
**Polymorphism:** Occurrence of two or more alleles at a high frequency in the population.

**Primary cell culture:** In vitro cultivation of cells that have been newly isolated from an organism.

**Promoters:** Stretches of DNA associated with a specific gene that guide the expression of the gene to specific areas in the brain and "turn on" the expression of the gene.

**Prostaglandins:** A group of hormone-like, unsaturated fatty acids that act in exceedingly low concentrations on a variety of organs, regulating, for example, heart function, smooth muscle tone, and nervous system function.

**Protein:** The product of the genetic information encoded in a gene. Proteins are made up of amino acids whose order is dictated by the gene’s nucleotide sequence.

**Purkinje cells:** Specialized neurons in the cerebellum that send signals from the cerebellum to other neurons after the cerebellar cortex has processed sensory and motor information from the rest of the nervous system.

**Quantitative trait:** A trait, or characteristic, that is determined by more than one gene and which exists in many different degrees (i.e., is distributed continuously) within a population. Body height is an example of a quantitative trait.

**Receptor:** A protein that serves as a “docking molecule” for signaling molecules, such as neurotransmitters and hormones, and which mediates the actions of those signaling molecules.

**Recombinant inbred (RI) strain:** An animal strain generated by mating two inbred strains and then inbreeding the F1 ("grandchild") generation; in an RI strain, the genetic material from the original inbred strains has been recombined as a result of the DNA rearrangement that occurs during the specialized cell division (i.e., meiosis) that results in the production of egg and sperm cells.

**Redox state:** The ratio of oxidized to reduced reactants in a cell.

**Reinforcement:** A process in which a response or behavior (e.g., alcohol consumption) is strengthened by the anticipation of a reward (e.g., a feeling of euphoria).

**Reverse genetics:** Strategy in genetic research by which investigators begin by selecting a specific gene and then try to generate a mutant organism that lacks the function of that gene.

**Somatic cells:** All cells of an organism other than the germ cells.

**Stellate cell:** A star-shaped, droplet-containing cell that serves as the primary storage site for vitamin A compounds and fat molecules; plays a key role in the development of fibrosis after being activated.

**Synapse:** A microscopic gap separating adjacent neurons or neurons and myocytes.

**Thymus:** A lymphoid organ near the base of the neck in which T-lymphocytes mature.

**T-lymphocyte:** A type of immune cell that originates in the bone marrow and matures in the thymus and which plays a central role in regulating the immune response (e.g., by secreting important cytokines).

**Transcription factor:** A protein that binds to the DNA, regulating the conversion of genetic information into proteins.

**Transformed cell line:** A cell line, frequently derived from a tumor and grown in vitro, that no longer responds to normal growth control mechanisms and can divide indefinitely.

**Transposable element:** A small piece of DNA that can change its position in an organism’s genetic material; if such a DNA piece by chance integrates into a gene, that gene (and the protein it encodes) may be altered or even inactivated.

**Transposon tagging:** The process by which the known DNA sequence of a transposable element (i.e., P element) is used as a tag to isolate the genomic DNA located adjacent to the site of transposon integration. This procedure allows the cloning of the gene whose function is disrupted by the P element.

**Tumor necrosis factor alpha (TNF-α):** A cytokine produced by a type of immune cell (i.e., macrophages) and which, among other functions, has anticancer effects.

**Vesicle:** A small, bubble-like component of the cytosol that serves to store various types of molecules (e.g., neurotransmitters).
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