

5' cap

a methylated guanine nucleotide added to the 5' end of eukaryotic mRNA. The cap is necessary to initiate translation of mRNA

A band

The band of the sarcomere that extends the full length of the thick filament. The A band includes regions of thick and thin filament overlap, as well as a region of thick filament only. A bands alternate with I bands to give skeletal and cardiac muscle a striated appearance. The A band does not shorten during muscle contraction.

Absolute refractory period

A period of time following an action potential during which no additional action potential can be evoked regardless of the level of stimulation. (usually because Na⁺ channel closed while K⁺ efflux)

Accessory glands

The three glands in the male reproductive system that reproduce semen: the seminal vesicles, the prostate, and the

Accessory organs

(1) In the GI tract, organs that play a role in digestion but not directly part of the alimentary canal. These include the liver, the gallbladder, the pancreas, and the salivary glands.

Acetylcholine (Ach)

The neurotransmitter used throughout the parasympathetic nervous system as well as the neuromuscular junction.

Acetylcholinesterase (AChE)

The enzyme that breaks down acetylcholine in the synaptic cleft.

Acetyl-CoA

The first substrate in the Krebs cycle, produced primarily from the oxidation of pyruvate by the pyruvate dehydrogenase complex, however acetyl-CoA is also produced during fatty acid oxidation and protein catabolism.

Acid hydrolases

Enzymes that degrade various macromolecules and that require an acidic pH to function properly. Acid hydrolases are found within the lysosomes of cells.

Acinar cells

Cells that make up exocrine glands, and that secrete their products into ducts. For example, in the pancreas, acinar cells secrete digestive enzymes; in the salivary glands, acinar cells secrete saliva.

Acrosome

A region at the head of a sperm cell that contains digestive enzymes which, when released during the acrosome reaction, can facilitate penetration of the corona radiata of the egg, and subsequently, fertilization

Actin

A contractile protein. In skeletal and cardiac muscle, actin polymerizes (along with other proteins) to form the thin filaments. Actin is involved in many contractile activities, such as cytokinesis, pseudopod formation, and muscle contraction.

Action potential

A localized change in a neuron's or muscle cell's membrane potential that can propagate itself away from its point of origin. Action potentials are an all-or-none process mediated by the opening of voltage-gated Na^+ and K^+ channels when the membrane is brought to the threshold potential; opening of the Na^+ channels causes a characteristic depolarization, while opening of the K^+ channels repolarizes the membrane.

Activation energy (E_a)

The amount of energy required to produce the transition state of a chemical reaction. If the activation energy for a reaction is very high, the reaction occurs very slowly. Enzymes (and other catalysts) increase reaction rates by reducing activation energy.

Active site

The 3D site of an enzyme where substrates (reactants) bind and a chemical reaction is facilitated.

Active transport

The movement of molecules through the plasma membrane against their concentration gradients. Active transport requires input of cellular energy, often in the form of ATP. An example is the Na⁺/K⁺ ATPase in the plasma membrane of all cells.

Adenine

One of the four aromatic bases found in DNA and RNA; also a component of ATP, NADH, and FADH₂. Adenine is apurine; it pairs with thymine (in DNA) and with uracil (in RNA)

Adenohypophis

anterior pituitary gland

Adipocyte

fat cell

Adrenal medulla

The inner region of the adrenal gland. The adrenal medulla is part of the sympathetic nervous system, and releases epinephrine (adrenaline) and norepinephrine into the blood when stimulated. These hormones augment and prolong the effects of sympathetic stimulation in the body.

Adrenergic tone

A constant input to the arteries that keeps them somewhat constricted to maintain a basal level of blood pressure.

Adrenocorticotropic hormone (ACTH)

A trop hormone produced by the anterior pituitary gland that targets the adrenal cortex, stimulating it to release cortisol and aldosterone.

Afferent arteriole

The small artery that carries blood toward the capillaries of the glomerulus.

Afferent neuron

A neuron that carries information (action potentials) to the central nervous system; a sensory neuron.

Albumin

A blood protein produced by the liver. Albumin helps to maintain blood osmotic pressure (oncotic pressure)

Aldosterone

The principal mineralocorticoid secreted by the adrenal cortex. This steroid hormone targets the kidney tubules and increases renal reabsorption of sodium [and excretion of potassium]. (this causes ADH to be secreted & increased water comes out, increasing blood pressure indirectly).

Alimentary canal

Also known as the gastrointestinal (GI) tract of the digestive tract, the alimentary canal is the long muscular "tube" that includes the mouth esophagus, stomach, small intestine, and large intestine.

Allosteric regulation

The modification of enzyme activity through interaction of molecules with specific sites on the enzyme other than the active site (called allosteric sites)

Alveoli

(singular alveolus.) Tiny sacs, with walls only a single cell layer thick found at the end of the respiratory bronchiole tree. Alveoli are the site of gas exchange in the respiratory system.

Allele

A version of a gene. For example, the gene may be for eye color, and the alleles include those for brown eyes, those for blue eyes, those green eyes, etc. At most, diploid organisms can possess only two alleles for a given gene, one on each of the two homologous chromosomes.

Amino Acid

The monomer of a protein; amino acids have an amino group on one end of the molecule and a carboxylic acid group on the other, and one of the two different side chains.

Amino acid acceptor site

The 3' end of a tRNA molecule that binds an amino acid. The nucleotide sequence at this end is CCA

Aminoacyl tRNA

A tRNA with an amino acid attached. This is made by an aminoacyl-tRNA synthetase specific to the amino acid being attached.

Aminion

A sac filled with fluid (amniotic fluid) that surrounds and protects a developing embryo.

Amphipathic

The characteristics of a molecule that has both polar (hydrophilic) and non-polar hydrophobic regions, e.g. phospholipids, bile, etc.

Amylase

An enzyme that digests starch into disaccharides. Amylase is secreted by salivary glands and by the pancreas.

Anabolism

The process of building complex structures out of simpler precursors, e.g. synthesizing proteins from amino acids.

Analogous structures

Physical structures in two different organisms that have functional similarity due to their evolution in a common environment, but have different underlying structure. Analogous structures arise from convergent evolution.

Anal sphincter

The valve that controls the release of feces from the rectum. It has an internal part made of smooth muscle (thus involuntary) and an external part made of skeletal muscle (thus voluntary).

Anaphase

The third phase of mitosis. During anaphase, replicated chromosomes are split apart at their centromeres (the sister chromatids are separated from each other) and moved to opposite sides of the cell.

Anaphase I

The third phase of meiosis I. During anaphase I the replicated homologous chromosomes are separated (the tetrad is split) and pulled to opposite sides of the cell.

Anaphase II

The third phase of meiosis II. During anaphase II the sister chromatids are finally separated at their centromeres and pulled to opposite sides of the cell. Note that anaphase II is identical to mitotic anaphase, except the number of chromosomes was reduced by half during meiosis I.

Androgens

Male sex hormones. Testosterone is the primary androgen.

Angiotensin

A normal blood protein produced by the liver, angiotensin is converted to angiotensin I by renin (secreted by kidney when blood pressure falls). Angiotensin I is further converted to angiotensin II by ACE (angiotensin converting enzyme). Angiotensin II is a powerful systemic vasoconstrictor and stimulator of aldosterone release, both of which result in an increase in blood pressure.

Antagonist

Something that acts to oppose the action of something else. For example, muscles that move a joint in opposite directions are said to be antagonists.

Anterior pituitary gland

Also known as the adenohypophysis, the anterior pituitary is made of gland tissue and makes and secretes six different hormones: FSH, LH, ACTH, prolactin, TSH, and growth hormone. The anterior pituitary is controlled by releasing and inhibiting factors from the hypothalamus.

Antibody (Ab)

Also called immunoglobins, the antibodies are proteins secreted by B-cells upon activation that bind in a highly specific manner to foreign proteins (such as those found on the surface of pathogens or transplanted tissues). The foreign proteins are called antigens. Antibodies generally do not directly destroy antigens, rather they mark them for destruction through other methods, and can inactivate antigens by clumping them together or by covering necessary active sites.

Anticodon

A sequence of three nucleotides (found in the anticodon loop of tRNA) that is complementary to a specific codon in mRNA. The codon to which the anticodon is complementary specifies the amino acid that is carried by that tRNA.

Antidiuretic hormone (ADH)

Also called vasopressin, this hormone is produced in the hypothalamus and secreted by the posterior pituitary gland. It targets the kidney tubules, increasing their permeability to water, and thus increasing water retention by the body. Also raises blood pressure by inducing moderate vasoconstriction.

Antigen (Ag)

A molecule (usually a protein) capable of initiating an immune response (antibody production).

Antigen presenting cell

Cells that possess MHC II (B cells and macrophages) and are able to display bits of ingested antigen on their surface in order to activate T cells. See also "MHC"

Antiparallel orientation

The normal configuration of double-stranded DNA in which the 5' end of one strand is paired with the 3' end of the other

Antiporter

A carrier protein that transports two molecules across the plasma membrane in opposite directions.

Aorta

The largest artery in the body; the aorta carries oxygenated blood away from the left ventricle of the heart.

Appendix

A mass of lymphatic tissue at the beginning of the large intestine that helps trap ingested pathogens.

Aqueous humor

A thin, watery fluid found in the anterior segment of the eye (between the lens and the cornea). The aqueous humor is constantly produced and drained, and helps to bring nutrients to the lens and cornea, as well as to remove metabolic wastes.

Arousal

A function in the reproductive system, controlled by the parasympathetic nervous system, that includes erection (via dilation of erectile arteries) and lubrication.

Artery

A blood vessel that carries blood away from the heart chambers. Arteries have muscular walls to regulate blood flow and are typically high-pressure vessels.

A site

Amino-acyl tRNA site; the site on a ribosome where a new amino acid is added to a growing peptide.

ATP synthase

A protein complex found in the inner membrane of the mitochondria. It is essentially a channel that allows H^+ ions to flow from the intermembrane space to the matrix (down the gradient produced by the enzyme complexes of the electron transport chain); as the H^+ ions flow through the channel, ATP is synthesized from ADP and P_i .

Atrioventricular bundle (AV) bundle

Also known as the Bundle of His, this is the first portion of the cardiac conduction system, after the AV node.

Atrioventricular (AV) node

The second major node of the cardiac conduction system (after the SA node). The cardiac impulse is delayed slightly at the AV node, allowing the ventricles to contract just after the atria contract.

Atrioventricular valves

The valves in the heart that separate the atria from the ventricles. The tricuspid valve separates the right atrium from the right ventricle, and the bicuspid (mitral) valve separates the left atrium from the left ventricle. These valves close at the beginning of systole, preventing the backflow of blood from the ventricles to the atria, and producing the first heart sound (lub).

Atrium

One of the two small chambers in the heart that receive blood and pass it on to the ventricles. The right atrium receives deoxygenated blood from the body through the superior and inferior vena cavae, and the left atrium receives oxygenated blood from the lungs through the pulmonary veins.

Attachment

The first step in viral infection. Attachment of a virus to its host is very specific and is also known as adsorption.

Auditory tube

The tube that connects the middle ear cavity with the pharynx; also known as the Eustachian tube. Its function is to equalize middle ear pressure with atmospheric pressure so that pressure on both sides of the tympanic membrane is the same.

Autoimmune reaction

An immune reaction directed against normal (necessary) cells. For example, diabetes mellitus (type I) is an autoimmune reaction directed against the beta cells of the pancreas (destroying them and preventing insulin secretion) and against insulin itself.

Autonomic nervous system (ANS)

The division of the peripheral nervous system that innervates and controls the visceral organs (everything but the skeletal muscles). It is also known as the involuntary nervous system and can be subdivided into the sympathetic and parasympathetic divisions.

Autosome

A chromosome that does not determine gender (is not a sex chromosome). Humans have two sex chromosomes and 22 autosomes.

Autotroph

An organism that makes its own, typically using CO₂ as a carbon source.

Auxotroph

A bacterium that cannot survive on minimal medium (glucose alone) because it lacks the ability to synthesize a molecule it needs to live (typically an amino acid). Auxotrophs must have the needed substance (the auxiliary trophic substance) added to their medium in order to survive. They are typically denoted by the substance they require followed by a "-" sign in superscript. For example, a bacterium that cannot synthesize leucine would be a leucine auxotroph, and would be indicated as leu⁻ (w/ a superscript, though)

Avascular

Lacking a blood supply; cartilage is an example of this

Axon

A long projection off the cell body of a neuron down which an action potential can be propagated.

Bacillus

A bacterium having a rod-like shaped (plural = bacilli).

Bacteriophage

A virus that infects a bacterium.

Baroreceptor

A sensory receptor that responds to changes in pressure; for example, there are baroreceptors in the carotid arteries and the aortic arch that monitor blood pressure.

Basement membrane

A layer of collagen fibers that separates epithelial tissue from connective tissue (example of epithelial cells in digestive tract) - they are actual connective tissue.

Basilar membrane

The flexible membrane in the cochlea that supports the organ of Corti (structure which contains the hearing receptors). The fibers of the basilar membrane are short and stiff near the oval window and long and flexible near the apex of the cochlea. This difference in structure allows the basilar membrane to help transduce pitch.

B cell

A type of lymphocyte that can recognize (bind to) an antigen and secrete an antibody specific for that antigen. When activated by binding an antigen, B cells mature into plasma cells (that secrete antibody) and memory cells (that patrol the body for future encounters with that antigen). - must be activated by Helper T cell also, though.

Bicarbonate

HCO_3^- . This ion results from the dissociation of carbonic acid, together with carbonic acid forms the major blood buffer system. Bicarbonate is also secreted by the pancreas to neutralize stomach acid in the intestines.

Bile

A green fluid made from cholesterol and secreted by the liver. It is stored and concentrated in the gallbladder. Bile is an amphipathic molecule that is secreted into the small intestine when fats are present, and serves to emulsify the fats for better digestion by lipases.

Binary fission

An asexual method of bacterial reproduction that serves only to increase the size of the population; there is no introduction of genetic diversity. The bacterium simply grows in size until it has doubled its cellular components, then it replicates its genome and splits into two.

Bipolar neuron

A neuron with a single axon and a single dendrite, often projecting from opposite sides of the cell body. Bipolar neurons are typically associated with sensory organs; an example is the bipolar neuron in the retina of the eye. - note that one axon may innervate many different muscles, or other things.

Blastocyst

A fluid-filled sphere formed about 5 days after fertilization of an ovum that is made up of an outer ring of cells and inner cell mass. This is the structure that implants in the endometrium of the uterus.

Bohr effect

The tendency of certain factors to stabilize the hemoglobin in the tense conformation, thus reducing its affinity for oxygen and enhancing the release of oxygen to the tissues. The factors include increased PCO_2 , increased temperature, increased bisphosphoglycerate (BPG), and decreased pH. Note that the Bohr effect shifts the oxy-hemoglobin saturation curve to the right.

Bone marrow

A non-bony material that fills the hollow spaces inside bones. Red bone marrow is found in regions of spongy bone and is the site of blood cell (red and white) production. Yellow bone marrow is found in the diaphysis (shaft) of long bones, is mostly fat, and is inactive.

Bowman's capsule

The region of the nephron that surrounds the glomerulus. The capsule collects the plasma that is filtered from the capillaries in the glomerulus.

Bronchioles

Very small air tubes in the respiratory system (diameter 0.5 - 1.0 mm). The walls of the bronchioles are made of smooth muscle (thus involuntary) to help regulate air flow.

Brush border enzymes

Enzymes secreted by the mucosal cells lining the intestine. The brush border enzymes are disaccharidases and dipeptidases that digest the smallest peptides and carbohydrates into their respective monomers.

Bulbourethral glands

Small paired gland found inferior to the prostate in males and at the posterior end of the penile urethra. They secrete an alkaline mucus on sexual arousal that helps to neutralize any traces of acidic urine in the urethra that might be harmful to sperm.

Calcitonin

A hormone produced by the C-cells of the thyroid gland that decreases serum calcium levels. It targets the bones (stimulates osteoblasts), the kidneys (reduces calcium reabsorption), and the small intestine (decreases calcium absorption).

Calcitriol

A hormone produced from vitamin D that acts in essentially the same manner as parathyroid hormone.

Calmodulin

A cytoplasmic Ca^{2+} -binding protein. Calmodulin is particularly important in smooth muscle cells, where binding of Ca^{2+} allows calmodulin to activate myosin light-chain kinase, the first step in smooth muscle cell contraction.

Canaliculus

Very small tube or channel, such as is found between lacunae (connecting them together) in compact bone.

Capacitation

An increase in the fragility of the membranes of sperm cells when exposed to the female reproductive tract. Capacitation is required so that the acrosomal enzymes can be released to facilitate fertilization.

Capillary

The smallest of all blood vessels, typically having a diameter just large enough for blood cells to pass through in single file. Capillaries have extremely thin walls to facilitate the exchange of material between the blood and the tissues.

Capsid

The outer protein coat of a virus (the whole coat)

Carbohydrates

Molecules made from monosaccharides that serve as the primary source of cellular energy. Carbohydrates can also act as cell surface markers (good thing to remember).

Carbonic anhydrase

An enzyme present in erythrocytes (as well as in other places) that catalyzes the conversion of CO_2 and H_2O into carbonic acid (H_2CO_3).

Cardiac conduction system

The specialized cells of the heart that spontaneously initiate action potentials and transmit them to the cardiac muscle cells. The cells of the conduction system are essentially cardiac muscle cells, but lack the contractile fibers of the muscle cells, thus they are able to transmit impulses (action potentials) more quickly and efficiently than cardiac muscle tissue. The cardiac conduction system includes the SA node, the internodal tract, the AV node, the AV bundle, the right and left bundle branches, and the Purkinje fibers.

Cardiac muscle

The muscle tissue of the heart Cardiac muscle is striated, uninucleate, and under involuntary control (controlled by the autonomic nervous system). Note also that cardiac muscle is self-stimulatory, and autonomic control serves only to modify the intrinsic rate of contraction.

Cardiac output

The volume of blood pumped out of the heart in one minute (vol/min); the product of the stroke volume (vol/beat) and the heart rate (beat/min). Cardiac output is directly proportional to blood pressure**.

Carrier protein

An integral membrane protein that undergoes a conformational change to move a molecule from one side of the membrane to another. See also 'uniporter', 'antiporter', and 'symporter'.

Cartilage

A strong connective tissue with varying degrees of flexibility. (1) Elastic cartilage is the most flexible, forming structures that require support but also need to bend, such as the epiglottis and outer ear. (2) Hyaline cartilage is more rigid than elastic cartilage, and forms the cartilages of the ribs, the respiratory tract, and all joints. (3) Fibrocartilage is the least flexible of them all, and forms very strong connections, such as the pubic symphysis and the intervertebral disks.

Catabolism

The process of breaking down large molecules into smaller precursors, e.g. digestion of starch into glucose.

Catalase

The primary enzyme in peroxisomes; catalase catalyzes the hydrolysis of hydrogen peroxide (H_2O_2) into water and oxygen.

Catalyst

Something that increases the rate of a chemical reaction by reducing the activation energy for that reaction. The free energy of reaction remains unchanged.

cDNA

Complementary DNA. DNA produced synthetically by reverse transcribing mRNA. Because of eukaryotic mRNA splicing, cDNA contains no introns.

Cecum

The first part of the large intestine.

Cell surface receptor

An integral membrane protein that binds extracellular signaling molecules, such as hormones and peptides.

Central canal

The hollow center of an osteon, also known as a Haversian canal. The central canal contains blood vessels, lymphatic vessels, lymphatic vessels, and nerves. Bone is laid down around the central canal in concentric rings called lamellae.

Central chemoreceptors

Receptors in the central nervous system that monitor the pH of cerebrospinal fluid to help regulate ventilation rate.

Central Nervous System

The subdivision of the nervous system consisting of the brain and spinal cord.

Centriole

A structure composed of a ring of nine microtubule triplets, found in pairs in the MTOC (microtubule organizing center) of a cell. The centrioles duplicate during the cell division, and serve as the organizing center for the mitotic spindle.

Centromere

A structure near the middle of eukaryotic chromosomes to which the fibers of the mitotic spindle attach during cell division.

Cerebellum

The region of the brain that coordinates and smooth skeletal muscle activity.

Cerebral cortex

A thin (4 mm) layer of gray matter on the surface of the cerebral hemispheres. The cerebral cortex is the conscious mind, and is functionally divided into four pairs of lobes: the frontal lobes, the parietal lobes, the temporal lobes, and the occipital lobes.

Cerebrospinal fluid

A clear fluid that circulates around through the brain and spinal cord that helps to physically support the brain and act as a shock absorber, and that also exchanges nutrients and wastes with the brain and spinal cord.

Ceruminous gland

A gland that secretes a waxy product, found in the external ear canal.

Cervix

The opening to the uterus The cervix is typically plugged with a sticky acidic mucus during non-fertile times (to form a barrier against the entry of pathogens), however during ovulation the mucus becomes more watery and alkaline to facilitate sperm entry.

Channel protein

An integral protein that selectively allows molecules across the plasma membrane. See also entries under 'ion channel', 'voltage-gated channel', and 'ligand-gated channel'.

Chemical synapse

A type of synapse at which a chemical (a neurotransmitter) is released from the axon of a neuron into the synaptic cleft where it binds to receptors on the next structure in sequence, either another neuron or an organ.

Chemoreceptor

A sensory receptor that responds to specific chemicals. Some examples are gustatory (taste) receptors, olfactory (smell) receptors, and central chemoreceptors (responds to pH changes in the cerebrospinal fluid).

Chemotaxis

Movement that is directed by chemical gradients, such as nutrients or toxins. (seen in some bacteria)

Chemotroph

An organism that relies on a chemical source of energy (such as ATP) instead of light (which phototrophs).

Chief cells

Pepsinogen-secreting cells found at the bottom of the gastric glands

Chitin

A polysaccharide found in the cell walls of fungi and in the exoskeletons of insects.

Cholecystokinin (CCK)

A hormone secreted by the small intestine (duodenum) in response to the presence of fats. It promotes release of bile from the gallbladder and pancreatic juice from the pancreas, and reduces stomach motility.

Cholesterol

A large, ring shaped lipid found in cell membranes. Cholesterol is the precursor for steroid hormones, and is used to manufacture bile salts.

Chondrocyte

A mature, cartilage cell.

Chorion

The portion of the placenta derived from the zygote.

Choroid

The darkly pigmented middle layer of the eyeball, found between the sclera (outer layer) and the retina (inner layer).

Chromosome

A single piece of double-stranded DNA; part of the genome of an organism. Prokaryotes have circular chromosomes and eukaryotes have linear chromosomes.

Chylomicron

A type of lipoprotein; the form in which absorbed fats from the intestines are transported to the circulatory system.

Chyme

Partially digested, semiliquid food mixed with digestive enzymes and acids in the stomach.

Chymotrypsin

One of the main pancreatic proteases; it is activated (from chymotrypsinogen) by trypsin.

Cilia

A hair-like structure on the cell surface composed of microtubules in a '9+2' arrangement (nine pairs of microtubules surrounding 2 single microtubules in the center). The microtubules are connected with a contractile protein called dynein. Cilia beat in a repetitive sweeping motion, which helps to move substances along the surface of the cell. They are particularly important in the respiratory system, where they sweep mucus out of the trachea and up to the mouth and nose.

Ciliary muscles

Muscles that help focus light on the retina by controlling the curvature of the lens of the eye.

Circular smooth muscles

The inner layer of smooth muscle in the wall of the digestive tract. When the circular muscle contracts, the tube diameter is reduced. Certain areas of the circular muscle are thickened to act as valves (sphincters).

Clathrin

A fibrous protein found on the intracellular side of the plasma membrane (also associated with the Golgi complex) that helps invaginate the membrane. Typically cell surface receptors are associated with clathrin-coated pits at the plasma membrane. Binding of the ligand to the receptor triggers invagination (example: cholesterol uptake via lipoprotein endocytosis).

Cleavage

The rapid mitotic division of a zygote that begins within 24-36 hours after fertilization

Coccus

A bacterium having a round shape
(plural = cocci)

Cochlea

The curled structure in the inner ear that contains the membranes and hair cells that transduce sound waves into action potentials.

Codominance

A situation in which a heterozygote displays the phenotype associated with each of the alleles, e.g., human blood type AB.

Codon

A group of three nucleotides that is specific for a particular amino acid, or that specifies 'stop translating'

Coenzyme

An **organic molecule that associates non-covalently with an enzyme, and that is required for the proper functioning of the enzyme.

Cofactor

An **inorganic molecule that associates non-covalently with an enzyme and that is required for the proper functioning of the enzyme

Collagen

A protein fiber with a unique triple-helix that gives it great strength. Tissues with a lot of collagen fibers are typically very strong, e.g. bone, tendons, ligaments, etc.

Collecting duct

The portion of the nephron where water reabsorption is regulated via antidiuretic hormone (ADH). Several nephrons empty into each collecting duct, and this is the final region through which urine must pass on its way to the ureter.

Common bile duct

The duct that carries bile from the gallbladder and liver to the small intestine (duodenum).

Compact bone

A dense, hard type of bone constructed from osteons (at the microscopic level). Compact bone forms the diaphysis of the the long bones, and the outer shell of the epiphyses and all other bones.

Competitive inhibitor

An enzyme inhibitor that competes with substrate for binding at the active site of teh enzyme. When the inhibitor is bound, no product can be made.

Complement system

A group of blood proteins that bind non-specifically to the surface proteins of foreign cells (such as bacteria), ultimately leading to the destruction of the foreign cell - part of the innate immunity.

Cones

Photoreceptors in the retina of the eye that responds to bright light and provide color vision.

Conjugation

A form of genetic recombination in bacteria in which plasmid and/or genomic DNA is transferred from one bacterium to the toher through a conjugation bridge.

Connective tissue

One of the four basic tissue types in the body (epithelial, connective, muscle, and nervous). Connective tissue is a supportive tissue consisting of a relatively few cells scattered among a great deal of extracellular material (matrix), and includes adipose tissue (fat), bone, cartilage, the dermis of the skin, tendons, ligaments, and blood.

Convergent evolution

A form of evolution in which different organisms are placed into the same environment and exposed to the same selection pressures. This causes the organisms to evolve along similar lines. As a result, they may share functional, but not structural similarity (because they possessed different starting materials). Convergent evolution produces analogous structures.

Cooperativity

A type of substrate binding to a multi-active site enzyme, in which the binding of one substrate molecule facilitates the binding of subsequent substrate molecules. A graph of reaction rate vs. substrate concentration appears sigmoidal. Note that cooperativity can be found in other situations as well, for example, hemoglobin binds oxygen cooperatively.

Cornea

The clear portion of the tough outer layer of the eye ball, found over the iris and pupil

Corona radiata

The layer of granulosa cells that surround an oocyte after it has been ovulated.

Coronary vessels

The blood vessels that carry blood to and from cardiac muscle. The coronary arteries branch off the aorta and carry oxygenated blood to the cardiac tissue. The coronary veins collect deoxygenated blood from the cardiac tissue, merge to form the coronary sinus, and drain into the right atrium.

Corpus callosum

The largest bundle of white matter (axons) connecting the two cerebral hemispheres.

Corpus luteum

'Yellow body.' The remnants of an ovarian follicle after ovulation has occurred. The cells enlarge and begin secreting progesterone, the dominant female hormone during the second half of the menstrual cycle. Some estrogen is also secreted.

Cortex

The outer layer of an organ, e.g. the renal cortex, the ovarian cortex, the adrenal cortex, etc.

Corticosteroids

Steroid hormones secreted from the adrenal cortex. The two major classes are the mineralocorticoids and glucocorticoids. Aldosterone is the principal mineralocorticoid, and cortisol is the principal glucocorticoid.

Cortisol

The principal glucocorticoid secreted from the adrenal cortex. This steroid hormone is released during stress, causing increased blood glucose levels and reducing inflammation. The latter effect has led to a clinical use of cortisol as an anti-inflammatory agent.

Creatine Phosphate

An energy storage molecule used by muscle tissue. The phosphate from creatine phosphate can be removed and attached to an ADP to generate ATP quickly.

Cristae

The folds of the inner membrane of a mitochondrion

Cross bridge

The connection of a myosin head group to an actin filament during muscle contraction (the sliding filament theory).

Crossing over

The exchange of DNA between paired homologous chromosomes (tetrads) during *prophase I* of meiosis.

Cyclic AMP (cAMP)

A cyclic version of adenosine monophosphate, where the phosphate is esterified to both the 5' and 3' carbons, forming a ring. Cyclic AMP is an important intracellular signaling molecule, often called the 'second messenger.' It serves to activate cAMP-dependent kinases, which regulates the activity of other enzymes in the cell. Levels of cAMP are in part regulated by adenylyl cyclase, the enzyme that makes cAMP, and the activity of adenylyl cyclase is ultimately controlled by the binding of various ligands to cell surface receptors.

Cytokinesis

The phase of mitosis during which the cell physically splits into two daughter cells. Cytokinesis begins near the end of anaphase, and is completed during telophase.

Cytosine

One of the four aromatic bases found in DNA and RNA. Cytosine is a pyrimidine; it pairs with guanine.

Dendrite

A projection of the cell body of a neuron that receives a nerve impulse from a different neuron and sends the impulse to the cell body. Neurons can have one or several dendrites!

Dense connective tissue

Connective tissue with large amounts of either collagen fibers (making them strong) or elastic fibers, or both. Dense tissues are typically strong (e.g. bone, cartilage, tendons, etc.)

Depolarization

The movement of the membrane potential of a cell away from rest potential in a more positive direction.

Dermis

A layer of connective tissue underneath the epidermis of the skin. The dermis contains blood vessels, lymphatic vessels, nerves, sensory receptors, and glands.

Desmosome

A general cell junction, used primarily for adhesion.

Determination

The point during development at which a cell becomes committed to a particular fate (sensory, other, etc.). Note that the cell is not differentiated at this point; determination comes before differentiation. Determination can be due to cytoplasmic effects or to induction by neighboring cells.

Diaphragm

The primary muscle of inspiration. The diaphragm is stimulated to contract at regular intervals by the respiratory center in the medulla oblongata (via the phrenic nerve). Although it is made of skeletal muscle (and can therefore be voluntary controlled), these stimulations occur autonomously.

Diaphysis

The shaft of a long bone. The diaphysis is hollow and is made entirely from compact bone.

Diastole

The period of time during which the ventricles of the heart are relaxed.

Diastolic pressure

The pressure measured in the arteries while the ventricles are relaxed (during diastole).

Diencephalon

The portion of the forebrain that includes the thalamus and hypothalamus.

Differentiation

The specialization of cell types, especially during the embryonic and fetal development.

Diffusion

The movement of a particle (the solute) in a solution from its region of high concentration to its region of low concentration (or down it concentration gradient).

Diploid organism

An organism that has two copies of its genome it each cell. The paired genomes are said to be homologous.

Disaccharide

A molecule composed of two monosaccharides. Common disaccharides include maltose, sucrose, and lactose.

Distal convoluted tubule

The portion of the nephron tubule after the loop of Henle, but before teh collecting duct. Selective reabsorption and secretion occur here, most notably regulated reabsorption of water and sodium.

Divergent evolution

A form of evolution in which the same organism is placed into different environments with different selection pressures. This causes organisms to evolve differently, to diverge from their common ancestor. The resulting (new) species may share structural (but not necessarily functional) similarity; divergent evolution produces homologous structures.

DNA polymerase

Also called DNA pol, this is the enzyme that replicates DNA. Eukaryotes have a single version of the enzyme, simply called DNA pol (not need to know much detail); prokaryotes have three versions, called DNA pol I, DNA pol II, and DNA pol III.

Dominant

The allele in a heterozygous genotype that is expressed; the phenotype resulting from either a heterozygous genotype or a homozygous dominant genotype.

Dorsal root ganglion

A group of sensory neuron cell bodies found just posterior to the spinal cord on either side. A pair of root ganglia exists for each spinal nerve that expands from the spinal cord. The ganglia are part of the peripheral nervous system (PNS).

Downstream

Toward the 3' end of an RNA transcript (the 3' end of the DNA coding strand). Stop codons and (in eukaryotes) the pol-A tail are found 'downstream.'

Duodenum

The first (approximately 5%) of the small intestine.

Dynein

A contractile protein connecting microtubules in the '9+2' arrangement of cilia and eukaryotic flagella. The contraction of dynein produces the characteristic movement of these structures.

Ectoderm

One of the three primary (embryonic) germ layers formed during gastrulation. Ectoderm ultimately forms external structures such as the skin, hair, nails, and inner linings of the mouth and anus, as well as the entire nervous system.

Edema

Swelling of tissues, sometimes caused by inflammation letting into many white blood cells (decreasing oncotic pressure at the end of the capillaries & not letting as much water back into capillaries & staying in tissues).

Effector organ

The organ that carries out the command sent along a particular motor neuron

Efferent arteriole

The small artery that carries blood away from the capillaries of the glomerulus.

Efferent neuron

A neuron that carries information (action potentials) away from the central nervous system; a motor neuron.

Ejaculation

A subphase of male orgasm, a reflex reaction triggered by the presence of semen in the urethra. Ejaculation is a series of rhythmic contractions of muscles near the base of the penis that increase pressure in the urethra, forcing the semen out.

Ejection fraction

The fraction of the end-diastolic volume ejected from the ventricles in a single contraction of the heart. The ejection fraction is normally around 60% of the end diastolic volume.

Elastin

A fibrous, connective-tissue protein that has the ability to recoil to its original shape after being stretched. Elastin is found in great amounts in lung tissue, arterial tissue, skin, and the epiglottis.

Electrical synapse

A type of synapse in which the cells are connected by gap junctions, allowing ions (and therefore an action potential) to spread easily from cell to cell, usually in smooth and cardiac muscle. - compared to chemical synapse.

Electron transport chain

A series of enzyme complexes found along the inner mitochondrial membrane. NADH and FADH₂ are oxidized by these enzymes; the electrons are shuttled down the chain and are ultimately passed to oxygen and to produce water. The electron energy is used to pump H⁺ out of the mitochondrial membrane; the resulting H⁺ gradient is subsequently used to drive the production of ATP.

Embryonic stage

The period of human development from implantation through 8 weeks of gestation. Gastrulation, neurulation, and organogenesis occur during this time period. The developing baby is known as embryo during this time period.

Emission

A subphase of male orgasm. Emission is the movement of sperm (via the vas deferens) and semen into the urethra in preparation for ejaculation.

Endocrine gland

A ductless gland that secretes a hormone into the blood

Endocrine system

A system of ductless glands that secrete chemical messengers (into) the blood - has to be into the blood.

Endocytosis

The uptake of material into a cell, usually by invagination. See also 'phagocytosis', pinocytosis, and receptor-mediated endocytosis..

Endoderm

One of the three primary (embryonic) germ layers formed during gastrulation. Endoderm ultimately forms internal structures, such as the inner lining of the GI tract and glandular organs.

Endometrial cycle

The 28 days of the menstrual cycle as they apply to the events in the uterus. The endometrial cycle is also known as the uterine cycle, and has the three subphases: menstruation, the proliferative phase, and the secretory phase.

Endometrium

The inner epithelial lining of the uterus that thickens and develops during the menstrual cycle, into which a fertilized ovum can implant, and which sloughs off during menstruation if a pregnancy does not occur.

Endospore

A bacterial structure formed in unfavorable growth conditions. Endospores have very rough outer shells made of peptidoglycan and can survive harsh conditions. The bacterium inside the endospore is essentially dormant and can become active (called germination) when conditions again become favorable.

Endosymbiotic theory

the theory that mitochondria and chloroplasts originated as independent unicellular organisms living in symbiosis with larger cells

Endotoxin

A normal component of the outer membrane of Gram-negative bacteria. Endotoxins produce extreme immune reactions (septic shock), particularly when many of them enter the circulation at once.

End plate potential

The depolarization of the motor end plate on a muscle cell.

Enteric nervous system

The nervous system of the gastrointestinal tract. It controls secretion and motility within the GI tract, and is linked to the central nervous system.

Enterogasterone

A hormone secreted by the small intestine (duodenum) in response to the presence of food. It decreases the rate at which chyme leaves the stomach and enters the small intestine.

Enterokinase

A duodenal enzyme that activates trypsinogen (from the pancreas) to trypsin.

Envelope

A lipid bilayer that surrounds the capsid of an animal virus. the envelope is acquired as teh virus buds out through the plasma membrane of its host cell. Not all annimal viruses possess and envelope.

Enzyme

A physiological catalyst. Enzymes are usually proteins, although some RNAs have catalytic activity.

Epidermis

The outermost layer of teh skin. The epidermis is made of epithelial tissue that is constantly dividing at the bottom; teh cells migrate to teh surface (dying along the way) to be sloughed off at the suface.

Epididymis

A long, coiled duct on the outside of the testis in which sperm mature.

Epiglottis

A flexible piece of cartilage in the larynx that flips downward to seal the trachea during swallowing.

Epinephrine

A hormone produced and secreted by the adrenal medulla that prolongs and increases the effects of the sympathetic nervous system.

Epiphyseal plate

A band of cartilage (hyaline) found between the diaphysis and epiphyses of long bones during childhood and adolescence. Cell proliferation in the middle of the epiphyseal plate essentially forces the diaphysis and epiphyses further apart, while the older cartilage at the ends of the plate is replaced with bone. This is what allows bone growth during childhood. The epiphyseal plate gets thinner and thinner the older a person gets, until finally it fuses (the diaphysis and epiphyses connect) in late adolescence, preventing further elongation of the bones.

Epiphysis

One of the two ends of long bone (pl: epiphyses). The epiphyses have an outer shell made of compact bone and inner core of spongy bone. The spongy bone is filled with red bone marrow, the site of blood cell formation.

Epistasis

A situation in which the expression of one gene prevents expression of all allelic forms of another gene, e.g., the gene for male pattern baldness is epistatic to the hair color gene.

Epithelial tissue

One of the four basic tissue types in the body (epithelial, connective, muscle, and nervous). Epithelial tissue is a lining and covering tissue (e.g. skin, the lining of the stomach and intestines, the lining of the urinary tract, etc.) or a glandular tissue (e.g. the liver, the pancreas, the ovaries, etc.)

Epitope

The specific site on an antigenic molecule that binds to a T cell receptor or to an antibody.

EPSP

Excitatory postsynaptic potential; a slight depolarization of a postsynaptic cell, bringing the membrane potential of that cell closer to the threshold for an action potential.

Erectile tissue

Specialized tissue with a lot of space that can fill with blood upon proper stimulation, causing the tissue to become firm. Erectile tissue is found in the penis, the clitoris, the labia, and the nipples.

Erythrocyte

A red blood cell; they are filled with hemoglobin, and the function of the erythrocytes is to carry oxygen in the blood.

Erythropoietin

A hormone produced and released by the kidney that stimulates the production of red blood cells by the bone marrow.

Estrogen

The primary female sex hormone. Estrogen stimulates the development of female secondary sex characteristics during puberty, maintains those characteristics during adulthood, stimulates the development of a new uterine lining after menstruation, and stimulates mammary gland development during pregnancy.

Euchromatin

DNA that is loosely packed around histones. This DNA is more accessible to enzymes and the genes in euchromatin can be activated if needed.

Eukaryotic

A cell characterized by the presence of a nucleus and other membrane-bound organelles. Eukaryotes can be unicellular (protists) or multicellular (fungi, plants and animals).

Exclusion

The removal (and usually the activation) of a viral genome from its host's genome.

Excitation-contraction coupling

The mechanism that ensures that skeletal muscle contraction does not occur without neural stimulation (excitation). At rest, cytosolic [Calcium] is low, and the troponin-tropomyosin complex covers the myosin-binding sites on actin. When the muscle is stimulated by a neuron, calcium is released from the sarcoplasmic reticulum into the cytosol of the muscle cell. Calcium binds to troponin, causing a conformation change in the troponin-tropomyosin complex that shifts it away from the myosin-binding sites. This allows myosin and actin to interact according to the sliding filament theory.

Excretion

The elimination of wastes from the body.

Exocrine gland

A gland that secretes its product into a duct, which ultimately carries the product to the surface of the body or into a body cavity. Some examples of exocrine gland and their products are sweat glands (sweat), gastric glands (acid, mucus, protease), the liver (bile), sebaceous glands (oil), and lacrimal glands (tears).

Exocytosis

The secretion of a cellular product to the extracellular medium through a secretory vesicle.

Exon

A nucleotide sequence in RNA that contains protein-coding information. Exons are typically separated by introns (intervening sequences) that are spliced out prior to translation.

Exotoxin

A toxin that secreted by a bacterium into its surrounding medium that help the bacterium compete with other species. Some exotoxins cause serious disease in humans (botulism, tetanus, diptheria, toxic shock syndrome).

Expiration

The movement of air out of the respiratory tract. Expiration can be passive (caused by relaxation of the diaphragm and elastic recoil of the lungs) or active (caused by contraction of the abdominal muscles, which increases intraabdominal pressure and forces the diaphragm up past its normal relaxed position).

Facilitated diffusion

Movement of a hydrophilic molecuel across the plasma membrane of a cell, down its concentration gradient, through a channel, pore, or carrier molecule in the membrane. Because the hydrophilic nature of the molecule, it requires a special path through the lipid bilayer.

Facultative anaerobe

An organism that will use oxygen (aerobic metabolism) if it is available, and that can ferment (anaerobic metabolism) if it is not.

FADH₂

The reduced from (carries electrons) of FAD (flavin adenine dinucleotide). this is the other main electron carrier in cellular respiration (NADH is the most common).

Fascicle

A bundle of skeletal muscle cells. Fascicles group together to form skeletal muscles.

Fast block to polyspermy

The depolarization of the egg plasma membrane upon fertilization, designed to prevent the entry of more than one sperm into the egg.

Feedback inhibition

Also called negative feedback, the inhibition of an early step in a series of events by the product of a later step in the series. This has the effect of stopping the series of events when the products are plentiful and the series is unnecessary. Feedback inhibition is the most common form of regulation in the body, controlling such things as enzyme reactions, hormone levels, blood pressure, body temperature, etc.

Fermentation

The reduction of pyruvate to either ethanol or lactate in order to regenerate NAD^+ from NADH. Fermentation occurs in the absence of oxygen, and allows glycolysis to continue under those conditions.

Fertilization

The fusion of a sperm with an ovum during sexual reproduction. Fertilization typically occurs in the uterine tubes and requires capacitation of the sperm and release of the acrosomal enzymes. Fertilization is a species-specific process, requiring binding of a sperm protein to an egg receptor.

F (fertility) factor

A bacterial extrachromosomal element that allows the bacterium to initiate conjugation. Bacteria that possess the F factor are known as F+ 'males'.

Fetal stage

The period of human development beginning at 8 weeks of gestation and lasting until birth (38-42 weeks of gestation). During this stage the organs formed in the embryonic stage grow and mature. The developing baby is known as a fetus during this time period.

Fibrinogen

A blood protein essential to blood clotting. The conversion of fibrinogen to its active form (fibrin) is among the final steps in clot formation, and is triggered by thrombin.

Fibroblast

A generic connective tissue cell that produces fibers; the progenitor of all other connective tissue cell types.

Filtration

The movement of a substance across a membrane via pressure. In the kidney, filtration refers specifically to the movement of plasma across the capillary walls of the glomerulus, into the capsule and tubule of the nephron. Filtration at the glomerulus is driven by blood pressure.

Fimbriae

Fingerlike projection of the uterin (fallopian) tubes that drape over the ovary.

First law of Thermodynamics

The law of conservation of energy; the energy of the universe is constant, thus if the energy of a system increases, the energy of its surroundings must decrease, and vice versa.

Flagella

A long, whip-like filament that helps in cell motility. Many bacteria are flagellated, and sperm are flagellated.

Fluid mosaic model

the current understanding of membrane structure, in which teh membrane iscomposed of a mix o lipids and proteins (a mosaic) that are free to move fluidly among themselves.

Follicle

A developing oocyte and all of its surrounding (supporting) cells.

FSH

A tropic hormone produced by the anterior pituitary gland that targets the gonads. In females, FSH stimulates the ovaries to develop follicles (oogenesis) and secrete estrogen; in males, FSH stimulates spermatogenesis.

Follicular phase

The first phase of the ovarian cycle, during which a follicle (an oocyte and its surrounding cells) enlarges and matures. This phase is under the control of FSH from the anterior pituitary, and typically lasts from day 1 to day 14 of the menstrual cycle. The follicle secretes estrogen during this time period.

F1 generation

The first generation of offspring from a given genetic cross.

Formed elements

The cellular elements of blood; erythrocytes, leukocytes, and platelets.

Frameshift mutation

A mutation caused by an insertion or deletion of base pairs in a gene sequence in DNA such that the reading frame of the gene (and thus the amino acid sequence of the protein) is altered.

Frank Starling mechanism

A mechanism by which the stroke volume of the heart is increased by increasing the venous return of the heart (thus stretching the ventricular muscle).

Functional syncytium

A tissue in which the cytoplasm of the cells are connected by gap junctions, allowing the cells to function as a unit. Cardiac and smooth muscle tissues are examples of functional syncytiums.

Gallbladder

A digestive accessory organ near the liver. The gallbladder stores and concentrates bile produced by the liver, and is stimulated to contract by cholecystokin (CCK).

Gametogenesis

The formation of haploid gametes (sperm or ova) via meiosis.

Ganglion

A clump of gray matter (unmyelinated neuron cell bodies) found in the peripheral nervous system.

Gap junction

A junction between cells, consisting of a protein channel called a connexon on each of the two cells that connect to form a single channel between the cytoplasm of both cells. Gap junctions allow small molecules to flow between the cells, and are important in cell-to-cell communication, for example, in relaying the action potential between cardiac muscle cells, and relaying nutrients between osteocytes.

Gap phase

A phase in the cycle between mitosis and S phase (G1) or between S phase and mitosis (G2). During gap phases the cell undergoes normal activity and growth; G1 may include preparation for DNA replication and G2 includes preparation for mitosis. Note that non-dividing cells remain permanently in G1, known as G₀ for these cells.

Gastrin

A hormone released by the G cells of the stomach in the presence of food. Gastrin promotes muscular activity of the stomach as well as secretion of hydrochloric acid, pepsinogen, and mucus.

Gastrulation

the division of the inner cell mass of a blastocyst (developing embryo) into the three primary germ layers. Gastrulation occurs during weeks 2-4 of gestation.

Gene

A portion of DNA that codes for some product, usually a protein, including all regulatory sequences. Some genes code for rRNA and tRNA, which are not translated.

Gene pool

The sum of all genetic material in a population.

Genetic code

The 'language' of a molecular biology that specifies which amino acid corresponds to which three-nucleotide group (codon).

Genome

All the genetic information in an organism; all of an organism's chromosomes.

Genotype

The combination of alleles of an organism carries. In a homozygous genotype, both alleles are the same, whereas in a heterozygous gentortype the alleles are different.

Gibbs free energy

The energy in a system that can be used to drive chemical reactions. If the change in free energy of a reaction (ΔG , the free energy of the products minus the free energy of the energy of the reactants) is negative, the reaction will occur spontaneously.

Glomerulus

The ball of capillaries at the beginning of the nephron where blood filtration takes place.

Glucagon

A peptide hormone produced and secreted by the alpha cells, of the pancreas. It targets primarily the liver, stimulating the breakdown of glycogen, thus increasing blood glucose levels.

Glycolipid

A membrane lipid consisting of a glycerol molecule esterified to two fatty acid chains and a sugar molecule.

Goblet cells

Unicellular exocrine glands found along the respiratory and digestive tracts that secrete mucus.

Golgi apparatus

A stack of membranes found near the rough ER in eukaryotic cells that is involved in the secretory pathway. The Golgi is involved in protein glycosylation (and other protein modification) and sorting and packaging proteins.

Gonadotropin releasing hormone
(GnRH)

A hormone released from the hypothalamus that triggers the anterior pituitary to secrete FSH and LH.

Gonadotropins

Anterior pituitary tropic hormones FSH (follicle stimulating hormone) and LH (luteinizing hormone) that stimulates the gonads (testes and ovaries) to produce gametes and to secrete sex steroids.

G-protein linked receptor

A cell surface receptor associated with an intracellular protein that binds and hydrolyzes GTP. When GTP is bound, the protein is active, and can regulate the activity of adenylyl cyclase; this modifies the intracellular levels of second messenger cAMP. When the GTP is hydrolyzed to GDP, the protein becomes inactive again.

Graafian follicle

A large, mature, ovarian follicle with a well-developed antrum and a secondary oocyte. Ovulation of the oocyte occurs from this type of follicle.

Gram-negative
bacteria

Bacteria that have a thin peptidoglycan cell wall covered by an outer plasma membrane. They stain very lightly (pink) in Gram stain. Gram-negative bacteria are typically more resistant to antibiotics than Gram-positive bacteria.

Gram-positive bacteria

Bacteria that have a thick peptidoglycan cell wall, and no outer membrane. They stain very darkly (purple) in Gram stain.

Granulosa cells

the majority of the cells surrounding an oocyte in a follicle. Granulosa cells secrete estrogen during the follicular phase of the ovarian cycle (before ovulation).

Gray matter

Unmyelinated neuron cell bodies and short unmyelinated axons.

Growth hormone

A hormone released by the anterior pituitary that targets all cells in the body. Growth hormone stimulates whole body growth in children and adolescents, and increases cell turnover rate in adults.

Guanine

One of the four aromatic bases found in DNA and RNA. Guanine is a purine; it pairs with cytosine.

Gustatory receptors

Chemoreceptors on the tongue that respond to chemicals in a food.

Gyrase

A prokaryotic enzyme used to twist the single circular chromosome of prokaryotes upon itself to form supercoils. Supercoiling helps to compact prokaryotic DNA and make it sturdier.

Hair cells

Sensory receptors found in the inner ear. Cochlear hair cells respond to vibration in the cochlea caused by sound waves and vestibular hair cells respond to changes in position and acceleration (used for balance).

Haploid organism

An organism that has only a single copy of its genome in each of its cells. Haploid organisms possess no homologous chromosomes.

Hardy-Weinberg law

A law of population genetics that states that the frequencies of alleles in a given gene pool do not change over time. There are five assumptions required for this law to hold true: there must be no mutation, there must be no migration, there must be no random mating between individuals in the population, and the population must be large. A population meeting all of these conditions, in which the allele frequency is not changing, is said to be in Hardy-Weinberg equilibrium.

hCG

Human Chorionic Gonadotropin, a hormone secreted by the trophoblast cells of a blasocyst (i.e. developing embryo) that prolongs the life of the corpus luteum, and thus increases the duration and amount of secreted progesterone. This helps to maintain the uterine lining so that menstruation does not occur. The presence of hCG in the blood or urine of a woman is used as a positive indicator of pregnancy.

Helicase

An enzyme that unwinds the double helix of DNA and separates the DNA strands in preparation for DNA replication.

Hematocrit

The percentage of wholeblood made up of erythrocytes The typical hematocrit value is between 40-45%.

Hematopoiesis

The synthesis of blood cells (occurs in the red bone marrow)

Hemizygous gene

A gene appearing in a single copy in diploid organisms, e.g. X-linked genes in human males.

Hemoglobin

A four-subunit protein found in red blood cells that binds oxygen. Each subunit contains a heme group, a large multi-ring molecule with an iron atom at its center. One hemoglobin molecule can bind four oxygen molecules in a cooperative manner.

Hemophilia

An X-linked recessive disorder in which blood fails to clot properly, leading to excessive bleeding if injured.

Hemostasis

The stoppage of bleeding; blood clotting.

Hepatic portal vein

A vein connecting the capillary bed of the intestines with the capillary bed of the liver. This allows amino acids and glucose absorbed from the intestines to be delivered first to the liver for processing before being transported throughout the circulatory system.

Heterochromatin

DNA that is densely packed around histones. The genes in heterochromatin are generally inaccessible to enzymes and are turned off.

Heterotroph

An organism that cannot make its own food, and thus must ingest other organisms.

Heterozygous

A genotype in which two different alleles are possessed for a given gene.

Hexokinase

The enzymes that catalyzes the phosphorylation of glucose to form glucose-6-phosphate in the first step of glycolysis. This is one of the ain regulatory steps of this pathway. Hexokinase is feedback-inhibited by glucose-6-P.

Hfr bacterium

High frequency of recombination bacterium An F+ bacterium that has the fertility factor integrated into its chromosome. When conjugation takes place, it is able to transfer not only the F factor, but also its genomic DNA.

Histones

Globular protein that assist in DNA packaging in eukaryotes. Histones form octamers around which DNA is wound to form a nucleosome.

hnRNA

Heterogeneous nuclear RNA; the primary transcript made in eukaryotes before splicing.

Homeostasis

The maintenance of relatively constant internal conditions (such as temperature, pressure, ion balance, pH, etc.) regardless of external conditions.

Homologous chromosomes

A pair of similar chromosomes that have the same genes in the same order, but may have different versions (alleles) of those genes. One of the pair of chromosomes came from Mom in an ovum, and the other came from Dad in a sperm. Humans have 23 pairs of homologous chromosomes.

Homologous structures

Physical structures in two different organisms that have structural similarity due to a common ancestor, but may have different functions. Homologous structures arise from divergent evolution.

Homozygous

A genotype in which two identical alleles are possessed for a given gene. The alleles can both be dominant (homozygous dominant) or both be recessive (homozygous recessive)

Humoral immunity

Specific defense of the body by antibodies, secreted into the blood by B-cells.

Hydroxyapatite

Hardy crystals consisting of calcium and phosphate that form the bone matrix.

Hyperpolarization

The movement of the membrane potential of a cell away from rest potential in a more negative direction.

Hypodermis

Also called a subcutaneous layer, this is a layer of *fat located under the dermis of the skin. The hypodermis helps to insulate the body and protects underlying muscles and other structures.

Hypophysis

The pituitary gland.

Hypothalamic-pituitary portal system

A set of veins that connect a capillary bed in the hypothalamus (the primary capillary plexus) with a capillary bed in the anterior pituitary gland (the secondary capillary bed). Releasing and inhibiting factors from the hypothalamus travel along the veins to directly affect cells in the anterior pituitary.

Hypothalamus

The portion of the diencephalon involved in maintaining body homeostasis. the hypothalamus also controls the release of hormones from the pituitary gland.

H zone

The region at the center of an A band of a sarcomere that is made up of myosin only. The H zone gets shorter (and may disappear) during muscle contraction.

I band

The region of the sarcomere made up only of thin filaments. The I band is bisected by a Z line. I bands alternate with A bands to give skeletal and cardiac muscle a striated appearance. I bands get shorter (and may disappear completely) during muscle contraction.

Ileocecal valve

The sphincter that separates the final part of the small intestine (the ileum) from the front part of the large intestine (the cecum). It is typically kept contracted (closed) so that chyme can remain in the small intestine as long as possible. The ileocecal valve is stimulated to relax by the presence of food in the stomach.

Ileum

The final section (approximately 55%) of the small intestine.

Implantation

The burrowing of a blastocyst (a developing embryo) into the endometrium of the uterus, typically occurring about a week after fertilization.

Incomplete dominance

A situation in which a heterozygote displays a blended version of the phenotypes associated with each allele, e.g. pure-breeding white-flowered plants crossed with pure-breeding red-flowered plants produces heterozygous offspring plants with pink flowers.

Inducible enzymes

An enzyme whose transcription can be stimulated by an abundance of its substrate (as opposed to repressible enzyme). Usually in catabolism.

Induction

The process by which neighboring cells can influence the determination (and subsequent differentiation) of a cell.

Inflammation

An irritation of a tissue caused by infection or injury.
Inflammation is characterized by four cardinal symptoms; redness (rubor), swelling (tumor), heat (calor), and pain (dolor).

Inhibin

A protein hormone secreted by sustentacular cells of the testes that acts to inhibit the release of FSH and LH from the anterior pituitary.

Innate immunity

General, non-specific protection to the body, including the skin (barrier), gastric acid, phagocytes, lysozyme, and complement.

Inner cell mass

The mass of cells in the blastocyst that ultimately give rise to the embryo and other embryonic structures (the amion, the umbilical vessels, etc.)

Inspiration

The movement of air into the respiratory tract.
Inspiration is an *active process*, requiring contraction of the diaphragm.

Insulin

A peptide hormone produced and secreted by the Beta cells of the pancreas. Insulin targets cells in the body, especially the liver and muscle, and allows them to take glucose out of the blood (thus lowering blood glucose levels).

Integral membrane protein

A protein embedded in the lipid bilayer of a cell. These are typically cell surface receptors, channels, or pumps.

Intercalated discs

The division between neighboring cardiac muscle cells. Intercalated discs include gap junctions, which allow the cells to function as a unit.

Intercostal muscles

Muscles located in between the ribs that play a role in ventilation.

Interleukin

A chemical secreted by a T cell (usually the helper Ts) that stimulates activation and proliferation of other immune system cells.

Intermediate filaments

Cytoskeletal filaments with a diameter in between that of the microtubule and the microfilament. Intermediate filaments are composed of many different proteins and tend to play structural roles in cells.

Interneuron

A neuron found completely within the central nervous system. Interneurons typically connect sensory and motor neurons, especially in reflex arcs.

Internodal tract

The portion of the cardiac conduction system between the SA node and the AV node.

Interphase

All of the cell cycle except for mitosis. Interphase includes G₁, S phase, and G₂.

Interstitial cell

Also called Leydig cells, these are the cells within testes that produce and secrete testosterone. They are stimulated by luteinizing hormone (LH).

Intron

A nucleotide sequence that intervenes between protein-coding sequences. In DNA, these intervening sequences typically contain **regulatory sequences, however, in RNA they are simply spliced out to form the mature (translated) transcript.

Ion channel

A protein channel in a cell membrane that is specific for a particular ion, such as Na^+ or K^+ . Ion channels may be constitutively open (leak channels), or regulated (voltage-gated or ligand-gated).

IPSP

Inhibitory postsynaptic potential; a slight hyperpolarization of the postsynaptic cell, moving the membrane potential of that cell further from threshold.

Iris

A pigmented membrane found just in from the lens of the eye. In the center of iris is the pupil, a hole through which light enters the eyeball. The iris regulates the diameter of the pupil in response to the brightness of light.

Islets of Langerhans

Also called simply, "islet cells" these are the endocrine cells of the pancreas. Different cell types within the islets secrete insulin, glucagon, and somatostatin

Jejunum

The middle (approximately 40%) of the small intestine.

Juxtaglomerular apparatus (JGA)

A contact point between the afferent arteriole of the glomerulus and the distal convoluted tubule of the nephron. It is involved in regulating blood pressure.

Juxtaglomerular cells.

The cells of the afferent artery at the juxtaglomerular apparatus. They are baroreceptors that secrete renin upon sensing a decrease in blood pressure.

Keratin

A protein-based substance secreted by cells of the epidermis as they migrate outward. The keratin makes the cells tougher (better able to withstand abrasion) and helps make the skin waterproof.

Kinase

An enzyme that phosphorylates something else. Kinases are frequently used in regulatory pathways, phosphorylating other enzymes.

Krebs cycle

The third stage of cellular respiration, in which acetyl-CoA is combined with oxaloacetate to form citric acid. The citric acid is then decarboxylated twice and isomerized to recreate oxaloacetate. In the process, 3 molecules of NADH, 1 molecule of FADH₂, and 1 molecule of GTP are formed (per acetyl-CoA)

Labia

The folds of skin that enclose the vaginal and urethral openings of females.

Labor contractions

Strong contractions of the uterus (stimulated by oxytocin) that force a baby out of the mother's body during childbirth. Labor contractions are part of a positive feedback cycle, during which the baby's head stretches the cervix, which stimulates stretch receptors that activate the hypothalamus, which stimulates the posterior pituitary to release oxytocin, which stimulates strong uterine contractions (labor contractions) that cause the baby's head to stretch the cervix. The cycle is broken once the baby is delivered.

Lacteals

Specialized lymphatic capillaries in the intestines that take up lipids as well as lymph.

Lactic acid

Produced in muscle cells from the reduction of pyruvate (under anaerobic conditions) to regenerate NAD⁺ so that glycolysis can continue. A rise in lactic acid usually accompanies an increase in physical activity.

Lacunae

Small cavities in the bone or cartilage that hold individual bones or cartilage cells.

Lagging strand

The newly forming daughter strand of DNA that is replicated in a discontinuous fashion, via Okazaki fragments that will ultimately be ligated together; the daughter strand that is replicated in the opposite direction that parallel DNA is unwinding

Lag phase

A short period of time **prior to exponential growth of a bacterial population during which no, or very limited, cell division occurs.

Large intestine

The final phase of the digestive tract, also called the colon. The primary function of the large intestine is to reabsorb water and to store the feces.

Larynx

A rigid structure at the top of the trachea (so it is part of trachea, I assume) made completely out of cartilage. The larynx has three main functions: (1) its rigidity ensures that the trachea is held open (provides an open airway). (2) the epiglottis folds down to seal the trachea during swallowing, thus directing food the esophagus, and (3) this is where the vocal cords are found (voice production).

Law of Independent Assortment

Mendel's second law. States that genes found on different chromosomes, or genes found very far apart on the same chromosome (i.e., unlinked genes) sort independently of one another during gamete formation (meiosis).

Law of Segregation

Mendel's first law. The Law of Segregation states that the two alleles of a given gene will be separated from one another during gamete formation (meiosis).

Lawn

A dense growth of bacteria that covers the surface of a petri dish.

Leading strand

The newly forming daughter strand of DNA that is replicated in a continuous fashion; the daughter strand that is replicated in the same direction that parental DNA is unwinding.

Leak channel

An ion channel that is constitutively open, allowing the movement of the ion across the plasma membrane according to its concentration gradient.

Length-tension relationship

The relationship of muscle length to its ability to generate strong contractions. Maximum tension (contraction strength) is achieved at sarcomere lengths between 2.0 and 2.2 microns. Tension decreases outside of this range <-- remember.

Leukocyte

A type of white blood cell; leukocytes are either B or T cells and are involved in disease defense.

Ligament

A strong band of connective tissue that connects bones to one another.

Ligand

The specific molecule that binds to a receptor.

Ligand-gated ion channel

An ion channel that is opened or closed based on the binding of a specific ligand to the channel. Once opened, the channel allows the ion to cross the plasma membrane according to its concentration gradient. An example is the acetylcholine receptor at the neuromuscular junction, which, when Ach binds, opens a cation channel in the muscle cell membrane.

Ligase

An enzyme that connects two fragments of DNA to make a single fragment; also called DNA ligase. This enzyme is used during DNA replication and is also used in recombinant DNA research.

Lipoprotein

Large conglomerations of proteins, fats, and cholesterol that transport lipids in the bloodstream. (chylomicrons are a type of lipoprotein).

Linkage

The failure of two separate genes to obey the Law of Independent Assortment, as might occur if the genes were found close together on the same chromosome.

Lipid

A hydrophobic molecule, usually formed from long hydrocarbon chains. The most common forms in which lipids are found in the body are as triglycerides (energy storage), phospholipids (cell membranes), and cholesterol (cell membranes and steroid synthesis).

Liver

The largest organ in the abdominal cavity. The liver has many roles, including processing of carbohydrates and fats, synthesis of urea, production of blood proteins, production of bile, recycling heme, and storage of vitamins.

Local autoregulation

The ability of tissues to regulate their own blood flow in the absence of neural stimulation. This is generally accomplished via metabolic wastes (such as CO₂) that act as vasodilators.

Log phase

The period of exponential growth of bacterial population.

Long bone

The most common class of bone in the body, long bones have a well-defined shaft (the diaphysis) and two well-defined ends (the epiphyses).

Longitudinal muscle

The outer layer of smooth muscle in the wall of the digestive tract. When the longitudinal muscle contracts the tube shortens.

Loop of Henle

The loop of the nephron that dips downward into the renal medulla. The loop of Henle sets up a concentration gradient in the kidney such that from the cortex to the renal pelvis osmolarity increases. The descending limb of the loop of Henle is permeable to water, but not to sodium whereas the ascending limb is permeable to sodium, but not to water (and in fact, actively transports sodium out of the filtrate).

Loose connective tissue

Connective tissue that lacks great amount of collagen or elastic fibers (hence, loose), e.g., adipose tissue and areolar (general connective) tissue.

Lower esophageal sphincter

Formerly called the cardiac sphincter, this sphincter marks the entrance to the stomach. Its function is to prevent reflux of acid stomach contents into the esophagus; note that it does ***not regulate entry into the stomach*.

Lumen

The inside of the a hollow organ (e.g., the somach, intestines, bladder, etc.) or a tube (e.g., blood vessels, ureters, etc.)

Luteal phase

The third phase of the ovarian cycle, during which a corpus luteum is formed from the remnants of the follicle that has ovulated its oocyte. The corpus luteum secretes progesterone and estrogen during this time period, which typically lasts from day 15 to day 28 of the menstrual cycle. Formation of the corpul luteum is triggered by the same LH surge that triggers ovulation, however in the absence of LH (levels quickly decline after the surge) the corpus luteum begins to degenerate.

Luteinizing Hormone (LH)

A tropic hormone produced by the anterior pituitary gland that targets the gonads. In females LH triggers ovulation and the development of a corpus luteum during the menstrual cycle; in males, LH stimulates the production and release of testosterone.

Lymphatic system

A set of vessels in the body that runs alongside the vessels of the circulatory system. It is a one-way system, with lymphatic capillaries beginning at the tissues and ultimately emptying into the large veins near the heart. It serves to return excess tissue fluid (lymph) to the circulatory system, and filters the fluid through millions of white blood cells on its way back to the heart.

Lymph node

A concentrated region of white blood cells found along the vessels of the lymphatic system.

Lymphocyte

The second most common of the five classes of leukocytes. Lymphocytes are involved in specific immunity and include two cell types, B-cells and T cells. B-cells produce and secrete antibodies and T-cells are involved in cellular immunity.

Lymphokine

A chemical secreted by a T cell (usually the helper Ts) that stimulates activation and proliferation of other immune system cells.

Lysogenic cycle

A viral life cycle in which the viral genome is incorporated into the host genome where it can remain dormant for an unspecified period of time. Upon activation, the viral genome is excised from the host genome and typically enters the lytic cycle.

Lysosome

A eukaryotic organelle filled with digestive enzymes (acid hydrolases) that is involved in digestion of macromolecules such as worn organelles or material ingested by phagocytosis.

Lysozyme

An enzyme that lyses bacterial cell walls. Lysozyme is produced in the end stages of the lytic cycle so that new viral particles can escape their host; it is also found in human tears and human saliva.

Lytic cycle

A viral life cycle in which the host is turned into a "virus factory" and ultimately lysed to release the new viral particles.

Macrophage

A large, non-specific, phagocytic cell of the immune system. Macrophages frequently leave the bloodstream to crawl around in the tissues and perform 'clean up' duties, such as ingesting dead cells or cellular debris at an injury site, or pathogens.

Macula densa

The cells of the distal tubule at the juxtaglomerular apparatus. They are receptors that monitor filtrate osmolarity as a means of regulating filtration rate. If a drop in osmolarity is sensed, the macula densa dilates the afferent arteriole (to increase the blood pressure in the glomerulus and thus increase filtration) and stimulates the juxtaglomerular cells to secrete renin (to raise systemic blood pressure).

Maternal inheritance

Genes that are inherited only from the mother, such as mitochondrial genes (all organelles come only from the ovum).

Matrix

The interior of a mitochondrion (the region bounded by the inner membrane)., The matrix is the site of action of pyruvate dehydrogenase complex and the Krebs cycle.

Mechanoreceptors

A sensory receptor that responds to mechanical disturbances, such as shape changes (being squashed, bent, pulled, etc.). Mechanoreceptors include touch receptors in the skin, hair cells, in the ear, muscle spindles, and others.

Medium

The environment in which or upon which bacteria grow. It typically contains a sugar source and any other nutrients that bacteria may require. 'Minimal medium' contain nothing but glucose.

Medulla

The inner region of an organ, e.g., the renal medulla, the ovarian medulla, and the adrenal medulla, etc.

Medulla oblongata

The portion of the hindbrain that controls respiratory and blood pressure, and specialized digestive and respiratory functions such as vomiting, sneezing, and coughing.

Meiosis

A type of cell division (in diploid cells) that reduces the number of chromosomes by half. Meiosis usually produces haploid gametes in organisms that undergo sexual reproduction. It consists of a single interphase (G₁, S, and G₂) followed by two sets of chromosomal divisions, meiosis I and meiosis II. Meiosis I and II can both be subdivided into four phases similar to those in mitosis.

Melanin

A pigment produced by melanocytes in the bottom cell layer of the epidermis. Melanin production is increased on sun exposure and helps prevent cellular damage due to UV radiation.

Memory cell

A cell produced when a B cell is activated by antigen. Memory cells do not actively fight the current infection, but patrol the body in case of future infection with the same antigen. If the antigen should appear again in the future, memory cells are like 'preactivated' B cells, and can initiate a much faster immune response (the secondary immune response).

Meninges

The protective, connective tissue wrapping of the central nervous system (the dura mater, arachnoid mater, and pia mater).

Menopause

The period of time in a woman's life when ovulation and menstruation cease. Menopause typically begins in the late 40s.

Menstruation

The first phase of the uterine (endometrial) cycle, during which the endometrium from the previous cycle is shed off. Estrogen and progesterone levels are low during this time period. Menstruation typically lasts from day 1 to day 5 of the cycle.

Mesoderm

One of the three primary (embryonic) germ layers formed during gastrulation. Mesoderm ultimately forms 'middle' structures such as bones, muscles, blood vessels, heart, kidneys, etc.

Metaphase

The second phase of mitosis. During metaphase chromosomes align at the center of the cell (the metaphase plate).

Metaphase I

The second phase of meiosis I. During metaphase I the paired homologous chromosomes (tetrads) align at the center of the cell (the metaphase plate).

Metaphase II

The second phase of meiosis II. Metaphase II is identical to mitotic metaphase, except that the number of chromosomes was reduced by half during meiosis I.

MHC

Major Histocompatibility complex, a set of proteins found on the plasma membranes of cells that help display antigen to T cells. MHC I is found on all cells and displays bits of proteins from within the cell; this allows T cells to monitor cell contents and if abnormal peptides are displayed on the surface, the cell is destroyed by killer T cells. MHC II is found only on macrophages and B cells. This class of MHC allows these cells (known as antigen presenting cells) to display bits of "eaten" (phagocytosed or internalized) proteins on their surface, allowing the activation of helper Ts --> thus further activating immune response.

Microfilament

The cytoskeleton filaments with the smallest diameter. Microfilaments are composed of the contractile protein actin. They are dynamic filaments, constantly being made and broken down as needed, and are responsible for events such as pseudopod formation and cytokinesis during mitosis.

Microtubule

The largest of the cytoplasmic filaments. Microtubules are composed of two types of protein, alpha tubulin and beta tubulin. They are dynamic fibers, constantly being built up and broken down, according to cellular needs. Microtubules form the mitotic spindle during cell division, form the base of cilia and flagella, and are used for intracellular structure and transport.

Microvilli

Microscopic outward folds of the cells lining the small intestine; microvilli serve to increase the surface area of the small intestine for absorption.

Midbrain

The portion of the brain responsible for visual and auditory startle reflexes.

Milk letdown

The release of milk from the mammary glands via contraction of ducts within the glands. Contraction is stimulated by oxytocin, which is released from the posterior pituitary when the baby begins nursing.

Missense mutation

A point mutation in which a codon that specifies an amino acid is mutated into a codon that specifies a different amino acid.

Mitochondrion

An organelle surrounded by a double-membrane (two lipid bilayers) where ATP production takes place. The interior (matrix) is where PDC and the Krebs cycle occur, and the inner membrane contains the enzymes of the electron transport chain and ATP synthase.

Mitosis

The phase of the cell cycle during which the replicated genome is divided. Mitosis has four phases (prophase, metaphase, anaphase, telophase) and includes cytokinesis (the physical splitting of the cell into two new cells).

Monocistronic mRNA

mRNA that codes for single type of protein, such as is found in eukaryotic cells.

Monosaccharide

The monomer of a carbohydrate. Monosaccharides have the general chemical formula $C_nH_{2n}O_n$, and common monosaccharides include glucose, fructose, galactose, and ribose.

Morula

A solid clump of cells resulting from cleavage in the early embryo. Because there is very little growth of these cells during cleavage, the morula is only about as large as the original zygote.

Motor end plate

The portion of the cell membrane at the neuromuscular junction; essentially the postsynaptic membrane at the synapse.

Motor unit

A motor neuron and all the all the skeletal muscle cells it innervates. Large motor units are typically found in large muscles (e.g., the thighs and buttocks) and produce gross movements. Small motor units are found in smaller muscles (e.g. the rectus muscles that control movements of the eyeball, the fingers) and produce more precise movements.

Motor unit recruitment

A mechanism for increasing tension (contractile length) in a muscle by activating more motor units.

mRNA

Messenger RNA; the type of RNA that is read by a ribosome to synthesize protein.

Mucocilliary escalator

The layer of ciliated, mucus-covered cells in the respiratory tract. The cilia continually beat, sweeping contaminated mucus upward toward the pharynx.

Mucosa

The layer of epithelial tissue that lines body cavities in contact with the outside environment (respiratory, digestive, urinary, and reproductive tracts).

Mullerian ducts

Earlier embryonic ducts that can develop into female internal genitalia in the absence of testosterone.

Mullerian inhibiting factor (MIF)

A substance secreted by embryonic testes that causes the regression of the Mullerian ducts.

Multipolar neuron

A neuron with a single axon and multiple dendrites; the most common type of neuron in the nervous system.

Mutualism

A form of symbiosis in which both organisms involved benefit from the association.

Myelin

An insulating layer of membranes wrapped around the axons of almost all neurons in the body. Myelin is essentially the plasma membranes of specialized cells; Schwann cells in the peripheral nervous system, and oligodendrocytes in the central nervous system.

Myofiber

A skeletal muscle cell, also known as a muscle fiber. Skeletal muscle cells are formed from the fusion of many smaller cells (during development) consequently they are very long and are multinucleate.

Myofibril

A string of sarcomeres with a skeletal muscle cell (hence smaller than myofiber). Each muscle cell contains hundreds of myofibrils.

Myoglobin

A globular protein found in muscle tissue that has the ability to bind oxygen. Myoglobin helps to store oxygen in the muscle for use in aerobic respiration (it does not move, just stays there). Muscles that participate in endurance activities (including cardiac muscle) have abundant supplies of myoglobin.

Myometrium

The muscular layer of the uterus. The myometrium is made of smooth muscles that retains its ability to divide in order to accommodate the massive size increases that occur during pregnancy. The myometrium is stimulated to contract during labor by the hormone oxytocin.

Myosin

One of the contractile proteins in muscle tissue. In skeletal and cardiac muscles, myosin forms the thick filaments. Myosin has intrinsic ATPase activity and can exist in two conformation, either high energy or low energy.

Myosin light-chain kinase (MLCK)

A kinase in smooth muscle cells activated by calmodulin in the presence of Ca^{2+} . As its name implies, this kinase phosphorylates myosin, activating it so that muscle contraction can occur.

NADH

The reduced form of NAD⁺ (nicotinamide adenine dinucleotide). This is the most common electron carrier in cellular respiration.

Na⁺/K⁺ ATPase

A protein found in the plasma membrane of all cells in the body that uses the energy of an ATP (hydrolyzes ATP) to move three Na⁺ ions out of the cell and two K⁺ ions into the cell, thus establishing concentrations gradients for these ions across the cell membrane.

Natural selection

The mechanism described by Charles Darwin that drives evolution. Through mutation, some organisms possess genes that make them better adapted to their environment. These organisms survive and reproduce more than those that do not possess the beneficial genes, thus these genes are passed on to offspring, making the offspring better adapted. Over time, these genes (and the organisms that possess them) become more abundant, and the less beneficial genes (and the organisms that possess them) become less abundant.

Nephron

The function unit of the kidney. Each kidney has about a million nephrons; this is where blood filtration and subsequent modification of the filtrate occurs. The nephron empties into collecting ducts, which empty into the ureter.

Neuron

The basic functional and structural unit of the nervous system. The neuron is a highly specialized cell, designed to transmit action potentials.

Neuromuscular junction

The synapse between a motor neuron and a muscle cell. At the NMJ, the muscle cell membrane is invaginated and the axon terminus is elongated so that a greater area of membrane can be depolarized at one time.

Neurotransmitter

A chemical released by the axon of a neuron in response to an action potential that binds to receptors on a postsynaptic cell and causes that cell to either depolarize slightly (EPSP) or hyperpolarize slightly (IPSP). Examples are acetylcholine, norepinephrine, GABA, dopamine, and others.

Neuralation

The formation of the nervous system during weeks 5-8 of gestation. Neuralation begins when a section of the ectoderm invaginates and pinches off to form the neural groove, which ultimately forms the neural tube, from which the brain and spinal cord develop.

Nociceptors

Pain receptors. Nociceptors are found everywhere in the body except for the brain.

Nodes of Ranvier

Gaps in the myelin sheath of the axons of peripheral neurons. Action potentials can 'hump' from node to node, thus increasing the speed of conduction (saltatory conduction).

Noncompetitive inhibitor

An enzyme inhibitor that binds at a site other than the active site of an enzyme (binds at an allosteric site). This changes the three-dimensional shape of the enzyme such that it can no longer catalyze the reaction

Nondisjunction

The failure of homologous chromosomes or sister chromatids to separate properly during cell division. This could occur during *anaphase I of meiosis (homologous chromosomes) [→ leaving 2 gametes w/ 2 copies and 2 gametes w/ no copies of chromosome], or during *anaphase II of meiosis or *anaphase of mitosis (sister chromatids).

Nonsense mutation

A point mutation in which a codon that specifies an amino acid is mutated into a stop (nonsense) codon.

Norepinephrine

The neurotransmitter used by the sympathetic division of the ANS at the postganglionic (organ-level) synapse.

Nuclear envelope

The membrane surrounding the DNA in eukaryotic cells made of two lipid bilayers.

Nuclear localization sequence

A sequence of amino acids (usually basic) that directs a protein to the nuclear envelope, where it is imported by a specific transport mechanism.

Nuclear pore

A protein channel in the nuclear envelope that allows the free passage of molecules smaller than 60 kD.

Nucleolus

A region within the nucleus where rRNA is transcribed and ribosomes are partially assembled.

Nucleoside

A structure composed of a ribose molecule linked to one of the aromatic bases. In a deoxynucleoside, the ribose is replaced with deoxyribose.

Nucleosome

A structure composed of two coils of DNA wrapped around an octet of histone proteins. The nucleosome is the primary form of packaging of eukaryotic DNA.

Nucleotide

A nucleoside with one or more phosphate groups attached. Nucleoside triphosphates (NTPs) are the building blocks of RNA and are also used as energy molecules, especially ATP. Deoxynucleoside triphosphates (dNTPs) are the building blocks of DNA; in these molecules, the ribose is replaced with deoxyribose.

Nucleus

An organelle bounded by a double membrane (double lipid bilayer) called the nuclear envelope. The nucleus contains the genome and is the site of replication and transcription.

Linker DNA

The string between beads of DNA on histones. They are also wrapped around a single histone, called linker histone - may not really have to know..

Obligate aerobe

An organism that requires oxygen to survive (aerobic metabolism only).

Obligate anaerobe

An organism that can only survive in the absence of oxygen (anaerobic metabolism); oxygen is toxic to obligate anaerobes.

Okazaki fragments

Small fragments of DNA produced on the lagging strand during DNA replication, joined later by DNA ligase to form a complete strand.

Olfactory receptors

Chemoreceptors in the upper nasal cavity that respond to odor chemicals.

Oncotic pressure

The osmotic pressure in the blood vessels due only to plasma proteins (primarily albumin) --> causes water to rush back into capillaries at end.

Oogonium

A *precursor* cell that undergoes mitosis during fetal development to produce more oogonium. These cells are then activated to produce primary oocytes, which remain dormant until stimulated to undergo meiosis I during some future menstrual cycle.

Operator

A specific DNA nucleotide sequence where transcriptional regulatory proteins can bind.

Operon

A nucleotide sequence on DNA that contains three elements: a coding sequence for one or more enzymes, a coding sequence for a regulatory protein, and upstream regulatory sequences where the regulatory proteins can bind. An example is the lac operon found in prokaryotes.

Optic disk

The 'blind spot' of the eye, this is where the axons of the ganglion cells exist to form the optic nerve. There are no photoreceptors in the optic disk.

Optic nerve

The nerve extending from the back of the eyeball to the brain that carries visual information. The optic nerve is made up of the axons of the ganglion cells of the retina.

Organ of Corti

The structure in the cochlea of the inner ear made up of the basilar membrane, the auditory hair cells, and the tectorial membrane. The Organ of Corti is the site where auditory sensation is detected and transduced to action potentials.

Organogenesis

The stage of human development during which the organs are formed. Organogenesis begins after gastrulation and is completed by the eighth week of gestation.

Orgasm

A function of the reproductive system controlled by the sympathetic nervous system. In males, organs includes emission and ejaculation; in females it is mainly a series of rhythmic contraction of the pelvic floor muscles and the uterus.

Origin of replication

The specific location on a DNA strand where replication begins.. Prokaryotes typically have a single origin of replication, while eukaryotes have several per chromosome.

Osmosis

The movement of water (the solvent) from its region of high concentration to its region of low concentration. NOte that the water concntration gradient is opposite to the solute concentration gradient, since where solutes are concentrated, water is scarce.

Osmotic pressure

The force required to resist the movement of water by osmosis. Osmotic pressure is essentially a measure of the concentration of a solution. A solution that is hyighly concntrated has a strong tendency to draw water into itself, so the pressure required to resist that movement would be high. Thus, highly concentrated solutions are said to have high osmotic pressures.

Ossicles

The three small bones found in the middle ear (the malleus, the incus, and the stapes) that help to amplify the vibrations from sound waves. The malleus is attached to the tympanic membrane and the stapes is attached to the oval window of the cochlea.

Osteoblast

A cell that produces bone.

Osteoclast

A phagocytic-like bone cell that breaks down bone matrix to release calcium and phosphate into the bloodstream.

Osteocyte

A mature, dormant osteoblast.

Osteon

The unit of compact bone, also called a Haversian system. Osteons are essentially long cylinders of bone; the hollow center is called the central canal, and is where blood vessels, nerves, and lymphatic vessels are found. Compact bone is laid down around the central canal in rings (lamellae).

Outer ear

The portion of the ear consisting of the pinna and the external auditory canal. The outer ear is separated from the middle ear by the tympanic membrane (the eardrum).

Oval window

The membrane that separates the middle ear from the inner ear.

Ovarian cycle

The 28 days of the menstrual cycle as they apply to events in the ovary. The ovarian cycle has three subphases: the follicular phase, ovulation, and the luteal phase.

Ovary

The female primary sex organ. The ovary produces female gametes (ova) and secretes estrogen and progesterone.

Ovulation

The release of a secondary oocyte (along with some granulosa cells) from the ovary at the approximate midpoint of the menstrual cycle (typically around day 14). Ovulation is triggered by a surge in LH.

Oxaloacetate

A four-carbon molecule that binds with the two-carbon acetyl unit of acetyl-CoA to form citric acid in the first step of the Krebs cycle.

Oxidation

To attach oxygen, to remove hydrogen, or to remove electrons from a molecule.

Oxidative phosphorylation

The oxidation of high-energy electron carriers (NADH and FADH₂) coupled to the phosphorylation of ADP, producing ATP. In eukaryotes, oxidative phosphorylation occurs in the mitochondria.

Oxytocin

A hormone released by the posterior pituitary that stimulates uterine contractions during childbirth and milk ejection during breastfeeding.

Pacemaker potential

A self-initiating action potential that occurs in the conduction system of the heart and triggers action potentials (and thus contraction) in the cardiac muscle cells. The pacemaker potential is triggered by the regular, spontaneous depolarization of the cells of the conduction system, due to slow inward leak of positive ions (Na⁺ and Ca²⁺). Because the SA node has the fastest leak, it typically reaches the threshold for the pacemaker potential before any other region of the conduction system, and thus sets the pace of the heart.

Pancreas

An organ in the abdominal cavity with two roles. The first is an exocrine role: to produce digestive enzymes and bicarbonate, which are delivered to the small intestine via the pancreatic duct. The second is an endocrine role: to secrete insulin and glucagon into the bloodstream to help regulate blood glucose levels.

Pancreatic duct

The main duct of the pancreas. The pancreatic duct carries the exocrine secretions of the pancreas (enzymes and bicarbonate) to the small intestine (duodenum).

Parasite

An organism that requires the aid of a host organism to survive, and that harms the host in the process.

Parasympathetic nervous system

The division of the autonomic nervous system known as the 'resting and digesting' system. It causes a general decrease in body activities such as heart rate, respiratory rate, and blood pressure, and an increase in blood flow to the GI tract and digestive function. Because the preganglionic neurons all originate from either the brain or the sacrum, it is also known as the craniosacral system.

Parathyroid hormone (PTH)

A hormone produced and secreted by the parathyroid glands that increases serum calcium levels. It targets the bones (stimulates osteoclasts), the kidneys (increases calcium reabsorption), and the small intestine (increases calcium absorption).

Parietal cells

Cells found in gastric glands that secrete hydrochloric acid (for hydrolysis of ingested food) and gastric intrinsic factor (for absorption of vitamin B-12).

Partial pressure

The contribution of an individual gas to the total pressure of a mixture of gases. Partial pressures are used to describe the amounts of the various gases carried in the bloodstream.

Passive transport

Movement across the membrane of a cell that does not require energy input from the cell. Passive transport relies on concentration gradients to provide the driving force for movement, and includes both simple and facilitated diffusion.

Penetrance

The percentage of individuals with a particular genotype that actually displays the phenotype associated with the genotype.

Penetration

The second step in viral infection, the injection of the viral genome into the host cell.

Pepsin

A protein-digesting enzyme secreted by the chief cells of the gastric glands. Pepsin is secreted in its inactive form (pepsinogen) and is activated by gastric acid. It is unusual in that its pH optimum is around 1-2; most of these enzymes in the body function best at neutral pHs.

Peptide bond

The bond formed between the carboxyl group of one amino acid and the amino group of another.

Peptide hormone

A hormone made of amino acids (in some cases just a single, modified amino acid). Peptide hormones are generally hydrophilic and cannot cross the plasma membranes of cells, thus receptor for peptide hormones must be found on the cell surface. An exception is thyroxine, which is hydrophobic enough to enter the cells easily. Binding of a peptide hormone to its receptor usually triggers a second messenger system within the cell.

Peptidoglycan

A complex polymer of sugars and amino acids; the substance from which bacterial cell walls are made.

Perfusion

The flow of blood through a tissue; ischaemia is when there is no blood flow, anoxia when there is no O₂ available (ischemia is more dangerous b/c of waste build-up)

Peripheral chemoreceptors

Receptors in the carotid arteries and the aorta that monitor blood pH to help regulate ventilation rate.

Peripheral membrane protein

A protein that is associated with the plasma membrane of a cell, but that is not embedded in the lipid bilayer. Peripheral proteins typically associate with embedded proteins through hydrogen bonding or electrostatic interactions.

Peripheral nervous system

All parts of the nervous system except for the brain and spinal cord.

Peripheral resistance

The resistance to blood flow in the systemic circulation. Peripheral resistance increases if arteries constrict (diameter decreases), and an increase in peripheral resistance leads to an increase in blood pressure.

Periplasmic space

The space between the inner and outer cell membranes in Gram-negative bacteria. The peptidoglycan cell wall is found in the periplasmic space, and this space sometimes contains enzymes to degrade antibiotics.

Peristalsis

A wave of contraction that sweeps along a muscular tube, pushing substances along the tube (e.g., food through the digestive tract, urine through the ureters, etc.)

Peroxisome

Small organelles that contain the hydrogen peroxide produced as a byproduct of lipid metabolism. Peroxisomes convert hydrogen peroxide to water and oxygen by way of the enzyme catalase.

Phagocytosis

The non-specific uptake of solid material by a cell accomplished by engulfing the particle with plasma membrane and drawing it into the cell.

Pharynx

A passageway leading from behind the nasal cavity to the trachea. The pharynx is divided into three regions, named for their location. The nasopharynx is behind the nasal cavity, the oropharynx is behind the oral cavity, and the laryngopharynx is behind the larynx. The nasopharynx is a passageway for air only, but the oropharynx and laryngopharynx are passageways for both air and food; consequently they are lined with a much thicker layer of cells to resist damage due to abrasion.

Phenotype

The physical characteristics resulting from the genotype. Phenotypes are usually described as dominant or recessive.

Phosphofructokinase

The enzyme that catalyzes the phosphorylation of fructose-6-phosphate to form fructose-1-6-bisphosphate in the third step of glycolysis. This is the main regulatory step of glycolysis. PFK is feedback-inhibited by ATP.

Phospholipid

The primary membrane lipid. Phospholipids consist of a glycerol molecule esterified to two fatty acid chains and a phosphate molecule. Additional, highly hydrophilic groups are attached to the phosphate, making this molecule extremely amphipathic.

Photoreceptor

A receptor that responds to light

Phototroph

An organism that utilizes light as its primary energy source.

Pilus

A long projection on a bacterial surface involved in an attachment, e.g., the sex pilus attaches F⁺ and F⁻ bacteria during conjugation.

Pinocytosis

The non-specific uptake of liquid particles into a cell by invagination of the plasma membrane and subsequent 'pinching off' a small bit of the extracellular fluid.

Placenta

An organ that develops during pregnancy, derived in part from the mother and in part from the zygote. The placenta is the site of exchange of nutrients and gases between the mother's blood and the fetus' blood. The placenta is formed during the first three months of pregnancy.

Placental villi

Zygote-derived projections that extend into the endometrium of the uterus during pregnancy. Fetal capillaries grow into the placental villi, which are surrounded by a pool of maternal blood. This facilitates nutrient and gas exchange between the mother and the fetus, without actually allowing the blood to mix.

Plaque

A clear area in a lawn of bacteria. Plaques represent an area where bacteria are lysing (dying) and usually caused by a lytic virus.

Plasma

The liquid portion of blood; plasma contains water, ions, buffers, sugars, proteins, etc. Anything that dissolves in blood dissolves in the plasma portion.

Plasma cell

An activated B cell that is secreting antibody.

Plasmid

A small, extrachromosomal (outside the genome), circular DNA molecule found in prokaryotes.

Platelets

Extremely small pseudo-cells in the blood, important for clotting. They are not true cells, but are broken-off bits of a larger cell (a megakaryocyte).

Pleiotropic gene

A gene that has effects on several different characteristics.

Pleura

The membranes that line the surface of the lungs (visceral pleura) and the inside wall of the chest cavity (parietal pleura).

Pleural pressure

The pressure in the (theoretical) space between the lung surface and the inner wall of the chest cavity.

Point mutation

A type of mutation in DNA where a single base is substituted for another.

Polar body

A small cell with extremely little cytoplasm that results from the unequal cytoplasmic division of the primary (produces the first polar body) and the secondary (produces the second polar body) oocytes during meiosis (oogenesis). The polar bodies degenerate.

Poly-A tail

A string of several hundred adenine nucleotides added to the 3' end of the eukaryotic mRNA.

Poycistronic mRNA

mRNA that codes for several different proteins by utilizing different reading frames, nested genes, etc. Polycistronic mRNA is a characteristic of prokaryotes.

Polysaccharides

A molecule formed by joining many monosaccharides together. Polysaccharides are typically energy-storage molecules (glycogen in animals, starch in plants) or structural molecules (cellulose in plants, chitin in exoskeletons).

Polyspermy

The fertilization of an oocyte by more than one sperm. This occurs in some animals, but in humans, blocks to polyspermy exist (the fast block and the slow block) so that only a single sperm can penetrate the oocyte.

Population

A subset of a species consisting of members that mate and reproduce with one another.

Pore

A pathway through a plasma membrane that restricts passage based only on the size of the molecules. Pore are made from porin proteins.

Portal systems

A system of blood vessels where the blood passes from arteries to capillaries to veins, then through a second set of capillaries, and then through a final set of veins. There are two portal systems in the body, the hepatic portal system and the hypothalamic portal system.

Posterior pituitary gland

Also known as the neurohypophysis, the posterior pituitary is made of nervous tissue and stores and secretes two hormones made by the hypothalamus; oxytocin and ADH. The posterior pituitary is controlled by action potentials from the hypothalamus.

Postganglionic neuron

In the autonomic division of the PNS, a neuron that has its *cell body located in the autonomic ganglion* (where a preganglionic neuron synapses with it) and whose axon synapses with the target axon.

Potassium leak channel

An ion channel specific for potassium found in the plasma membrane of all cells in the body. Leak channels are constitutively open and allow their specific ion to move across the membrane according to its gradient. Potassium leak channels allow potassium to leave the cell.

Power stroke

The step in the sliding filament theory during which myosin undergoes a conformational change to its low energy state, in the process dragging the thin filaments (and the attached Z lines) toward the center of the sarcomere. Note that power stroke requires ATP only indirectly: to set the myosin molecule in its high-energy conformation during a different step of the sliding filament theory.

Preganglionic neuron

In the autonomic division of the PNS, a neuron that has its *cell body located in the CNS*, and whose axon extends into the PNS to synapse with a second neuron at an autonomic ganglion. (The second neuron's axon synapses with the target axon)

Primary active transport

Active transport that relies directly on the hydrolysis of ATP.

Primary bronchi

The first branches of the trachea. There are two primary bronchi, one for each lung.

Primary immune response

The first encounter with an antigen, resulting in activated B cells (antibody secretion) and T cells (cellular lysis and lymphocyte proliferation). The primary immune response takes approximately ten days, which long enough for symptoms of the infection to appear (because initial activation takes long time).

Primary oocytes

Diploid cells resulting from the activation of an oogonium; primary oocytes are ready to enter meiosis I. remember: cyte means ready to undergo meiosis

Primary spermatocytes

Diploid cells resulting from the activation of a spermatogonium; primary spermatocytes are ready to enter meiosis I. remember: cyte means ready to undergo meiosis.

Primase

An RNA polymerase that creates a primer (made of RNA) initiate DNA replication. DNA pol binds to the primer and elongates it.

Productive cycle

A life cycle of animal viruses in which the mature viral particles bud from the host cell, acquiring an envelope (a coating of lipid bilayer) in the process.

Progesterone

A steroid hormone produced by the corpus luteum in the ovary during the second half of the menstrual cycle. Progesterone maintains and enhances the uterine lining for the possible implantation of a fertilized ovum. It is the primary hormone secreted during pregnancy.

Prokaryote

An organism that lacks a nucleus or any other membrane-bound organelles. All prokaryotes belong to the Kingdom Monera (not protista!)

Prolactin

A hormone secreted by the anterior pituitary that targets the mammary glands stimulating them to produce breastmilk.

Proliferative phase

The second phase of the uterine (endometrial) cycle, during which the endometrium (shed off during menstruation) is rebuilt. This phase of the cycle is under the control of estrogen, secreted from the follicle developing in the ovary during this time period. The proliferative phase typically lasts from day 6 to day 14 of the menstrual cycle.

Promoter

The sequence of nucleotides on a chromosome that activates RNA polymerase so that transcription can take place. The promoter is found upstream of the start site, the location where transcription actually takes place.

Prophase

The first phase of mitosis. During prophase the replicated chromosomes condense, the spindle is formed, and the nuclear envelope breaks apart into vesicles.

Prophase I

The first phase of meiosis I. During prophase I the replicated chromosomes condense, homologous chromosomes pair up, crossing over occurs between homologous chromosomes, the spindle is formed, and the nuclear envelope breaks apart into vesicles. Prophase I is the longest phase of meiosis.

Prophase II

The first phase of meiosis II. Prophase II is identical to mitotic prophase, except that the number of chromosomes was reduced by half during meiosis I.

Proprioreceptor

A receptor that responds to changes in body position, such as stretch on a tendon, or contraction of a muscle. These receptor allow us to be consciously aware of the position of our body parts.

Prostate

A small gland encircling the male urethra just inferior to the bladder (only reproductive structure not paired). Its secretion contain nutrients and enzymes and account for approximately 35% of the ejaculate volume.

Prosthetic group

A non-protein, but organic, molecule (such as vitamin) that is covalently bound to an enzyme as part of the active site.

Proteins

Molecules made by connecting amino acids via peptide bonds. Proteins are synthesized (translated) by ribosomes, and function as enzymes, carriers, structural fibers, cell surface receptors, channels, porters, hormones, etc.

Proximal convoluted tubuel

The first portion of the nephron tubuel after the glomerulus. THe PCT is the site of most reabsorption; all filtered nutrients are reabsorbed here as well as most of the filtered water.

P site

Peptidyl-tRNA site; the stie on a ribosome where the growing peptide (attached to a tRNA) is found during translation.

Ptyalin

Salivary amylase

Pulmonary artery

The blood vessel that carries deoxygenated from the right ventricle of the heart to the lungs.

Pulmonary circulation

The flow of blood from the heart, through the lungs, and back to the heart.

Pulmonary edema

The collection of fluid in the alveoli, particularly dangerous because it impedes gas exchange. Common causes of pulmonary edema are increased pulmonary blood pressure or infection of the respiratory system.

Pulmonary vein

One of several vessels that carry oxygenated blood from the lungs to the left atrium of the heart.

Pupil

A hole in the center of the iris of the eye that allows light to enter the eyeball. The diameter of pupil is controlled by the iris in response to the brightness of the light.

Purine bases

Aromatic bases found in DNA and RNA that are derived from purine. They have a double ring structure and include adenine and guanine.

Purkinje fibers

The smallest (and final) fibers in the cardiac conduction system. The Purkinje fibers transmit the cardiac impulse to the ventricular muscle.

Pyloric sphincter

The valve that regulates the passage of chyme from the stomach into the small intestine.

Pyrimidine bases

Aromatic bases found in DNA and RNA that have a single-ring structure. They include cytosine, thymine, and uracil.

Pyruvate dehydrogenase complex

A group of three enzymes that decarboxylates pyruvate, creating an acetyl group and carbon dioxide. The acetyl group is then attached to coenzyme A to produce acetyl-CoA, a substrate in the Krebs cycle. In the process, NAD^+ is reduced to NADH. The pyruvate dehydrogenase complex is the second stage of cellular respiration.

Pyruvic acid

The product of glycolysis; 2 pyruvic acid (pyruvate) molecules are produced from a single glucose molecule. In the absence of oxygen, pyruvic acid undergoes fermentation and is reduced to either lactic acid or ethanol; in the presence of oxygen, pyruvic acid is oxidized to produce acetyl-CoA, which can enter the Krebs cycle.

Receptor-mediated endocytosis

A highly specific cellular uptake mechanism. The molecule to be taken up must bind to cell surface receptor found in a clathrin-coated pit.

Recessive

The allele in a heterozygous genotype that is not expressed; the phenotype resulting from possession of two recessive alleles (homozygous recessive).

Recombination frequency

The RF value, the percentage of recombinant offspring resulting from a given genetic cross. The recombination frequency is proportional to the physical distance between genes on a chromosome. If a recombination frequency is low, the genes under consideration may be linked.

Rectum

The final portion of the large intestine.

Reduction

To remove oxygen, to add hydrogen, or to add electrons to a molecule.

Reflex arc

A relatively direct connection between a sensory neuron and a motor neuron that allows an extremely rapid response to a stimulus, often without conscious brain involvement.

Relative refractory period

The period of time following an action potential when it is possible, but difficult, for the neuron to fire a second action potential due to the fact that membrane is further from threshold potential (hyperpolarized).

Release factor

A cytoplasmic protein that binds to a stop codon where it appears in the A-site of the ribosome. Release factors modify the peptidyl transferase activity of the ribosome, such that a water molecule is added to the end of the completed protein. This releases the finished protein from the final tRNA, and allows the ribosome subunits and mRNA to disassociate.

Renal absorption

The movement of a substance from the filtrate (in the renal tubule) back into the bloodstream. Reabsorption reduces the amount of a substance in the urine.

Renal tubule

The portion of the nephron after the glomerulus and capsule; the region of the nephron where the filtrate is modified along its path to becoming urine.

Renin

An enzyme secreted by the juxtaglomerular cells when blood pressure decreases. Renin converts angiotensinogen to angiotensin I.

Replication

The duplication of DNA

Replication fork(s)

The site(s) where the parental DNA double helix unwinds during replication.

Replication bubbles

Multiple sites of replication found on large, linear eukaryotic linear eukaryotic chromosomes.

Repolarization

The return of membrane potential to normal resting values after a depolarization or hyperpolarization.

Repressible enzyme

An enzyme whose transcription can be stopped by an abundance of its product (as opposed to inducible enzymes). Usually part of anabolism of product.

Repressor

A regulatory protein that binds DNA at a specific nucleotide sequence (sometimes known as the operator) to prevent transcription of downstream genes.

Residual volume

The volume of air remaining in the lungs after a maximal forced exhalation, typically about 1200 mL.

Resolution

A function the reproductive system (controlled by the sympathetic nervous system) that returns the body to its normal resting state after sexual arousal and orgasm.

Respiratory acidosis

A drop in blood pH due to hypoventilation (too little breathing) and a resulting accumulation of CO_2 .

Respiratory alkalosis

Arise in blood pH due to hyperventilation (excessive breathing) and a resulting decrease in CO_2 .

Resting membrane potential

An electrical potential established across the plasma membrane of all cells by the Na^+/K^+ ATPase and the K^+ leak channels. IN most cells, the resting membrane potential is approximately -70 mV with respect to the outside of the cell.

Restriction endonuclease

A bacterial enzyme that recognizes a specific DNA nucleotide sequence and that cuts the double helix at a specific site within the sequence.

Retina

The innermost layer of the eyeball. The retina is made up of a layer of photoreceptors, a layer of bipolar cells, and a layer of ganglion cells.

Retinal

A chemical derived from vitamin A found in the pigment proteins of the rod photoreceptors of the retina. Retinal changes conformation when it absorbs light, triggering a series of reactions that ultimately result in an action potential being sent to the brain.

Retrovirus

A virus with an RNA genome (e.g. HIV) that undergoes a lysogenic life cycle in a host with a double stranded DNA genome. In order to integrate its genome with the host cell genome, the virus must first reverse transcribe its RNA genome to DNA.

Reverse transcriptase

An enzyme that polymerizes a strand of DNA by reading an RNA template (an RNA dependent DNA polymerase); used by retrovirus in order to integrate their genome with the host cell genome.

Ribosome

A structure made of two protein subunits and rRNA; this is the site of protein synthesis (translation) in a cell. Prokaryotic ribosomes (also known as 70S ribosomes) are smaller than eukaryotic ribosome (80S ribosomes). The S value refers to the sedimentation rate during centrifugation.

RNA dependent RNA polymerase

A viral enzyme that makes a strand of RNA by reading a strand of RNA . All prokaryotic and eukaryotic RNA polymerases are DNA dependent; they make a strand of RNA by reading a strand of DNA.

RNA
polymerase

An enzyme that transcribes RNA. Prokaryotes have a single RNA pol, while eukaryotes have three; in eukaryotes, RNA pol I transcribes rRNA, RNA pol II transcribes mRNA, and RNA pol III transcribes tRNA.

Rods

Photoreceptors in the retina of the eye that respond to dim light and provide us with black and white vision.

Rough endoplasmic reticulum

A large system of folded membranes within a eukaryotic cell that has ribosomes bound to it, giving a rough appearance. These ribosomes synthesize proteins that will ultimately be secreted from the cell, incorporated into the plasma membrane, or transported to the Golgi apparatus or lysosome.

rRNA

Ribosomal RNA; the type of RNA that associates with ribosomal proteins to make a functional ribosome. It is thought that the rRNA has the peptidyl transferase activity.

Rule of addition

A statistical rule stating that the probability of either of two independent (and mutually exclusive) events occurring is the sum of their individual probabilities minus the probability of them both occurring together.

Rule of multiplication

A statistical rule stating that the probability of two independent events occurring together is the product of their individual probabilities.

Saltatory conduction

A rapid form of action potential conduction along the axon of a neuron in which the action potential appears to jump from node of Ranvier to node of Ranvier.

Saprophyte

An organism (such as a fungus) that feeds on dead plants and animals.

Sarcolemma

The plasma membrane of a muscle cell.

Sarcomere

The unit of muscle contraction. Sarcomeres are bounded by Z lines, to which thin filaments attach. Thick filaments are found in the center of the sarcomere, overlapped by thin filaments over one another during contraction reduces the distance between Z lines, shortening the sarcomere.

Sarcoplasmic reticulum

The smooth ER of a muscle cell, enlarged and specialized to act as a Ca^{2+} reservoir. The SR winds around each myofibril in the muscle cell.

Schwann cell

One of the two peripheral nervous system supporting (glial) cells. Schwann cells form the myelin sheath on axons of peripheral neurons.

Sclera

The white portion of the tough outer layer of the eyeball

Sebaceous gland

Oil-forming glands found all over the body, especially on the face and neck. The product (sebum) is released to the skin surface through hair follicles.

Secondary active transport	Active transport that relies on an established concentration gradient, typically set up by a primary active transporter. Secondary active transport relies on ATP indirectly.
Secondary immune response	A subsequent immune response to previously encountered antigen that results in antibody production and T cell activation. The secondary immune response is mediated by memory cells (produced during the primary immune response) and is much faster and stronger than the primary response, typically taking only a day or less. This is not long enough for the infection to become established, and symptoms do not appear, thus the person is said to be "immune" to that particular antigen.
Secondary oocyte	A haploid cell resulting from the first meiotic division of oogenesis (not that the cytoplasmic division in this case is unequal, producing one large cell with almost all of the cytoplasm - the secondary oocyte - and one smaller cell with virtually no cytoplasm - the first polar body.). The secondary oocyte (along with some follicular cells) is released from the ovary during ovulation.
Secondary spermatocytes	Haploid cells resulting from the first meiotic division of spermatogenesis. Secondary spermatocytes are ready to enter meiosis II.
Secondary sex characteristics	The set of adult characteristics that develop during puberty under the control of the sex steroids. In males the secondary sex characteristics include enlargement and maturation of the genitalia, growth of facial, body, and pubic hair, increased muscle mass, and lowering of the voice. In females, the characteristics include the onset of menstruation and the menstrual cycle, enlargement of the breasts, widening of the pelvis, and growth of pubic hair.

Second Law of Thermodynamics

The entropy (disorder) of the universe (or system) tends to increase.

Second messenger

An intracellular chemical signal (such as cAMP) that relays instructions from the cell surface to enzymes in the cytosol.

Secretin

A hormone secreted by the small intestine (duodenum) in response to low pH (e.g., from stomach acid). It promotes the release of bicarbonate from the pancreas to act as a buffer.

Secretion

(1) The secretion of useful substances from a cell, either into the blood (endocrine secretion) or into a cavity or onto the body surface (exocrine secretion).
(2) in the nephron, the movement of substances from the blood to the filtrate along the tubule.
Secretion increases the rate at which substances can be removed from the body.

Secretory phase

The third phase of the uterin (endometrial) cycle, during which the rebuilt endometrium is enhanced with glycogen and lipid stores. The secretory phase is primarily under the controll of progestone and estrogen (secreted from the copus luteum during this time period), adn typically lasts from day 15 to day 28 of the menstrual cycle.

Semen

An alkaline, fructose-rich fluid produced by three different glands in the male reproductive tract and released during ejaculation. Semen is very nourishing for sperm.

Semicircular canals

Three loop-like structures in the inner ear that contain sensory receptors to monitor balance.

Semiconservative replication

DNA replication in which each of the parental strands is read to make a complementary daughter strand, thus each new DNA molecule is composed of half the parental molecule paired with a newly synthesized strand.

Semilunar valves

The valves in the heart that separate the ventricles from the arteries. The pulmonary semilunar valve separates the right ventricle from the pulmonary artery, and the aortic semilunar valve separates left ventricle from the aorta. These valves close at the end of systole, preventing the backflow of blood from arteries to ventricles, and producing the second heart sound.

Seminal vesicles

Paired glands found on the posterior external wall of the bladder in males. Their secretions contain an alkaline mucus and fructose, among other things, and make up approximately 60% of the ejaculate volume.

Seminiferous tubules

Small convoluted tubules in the testes where spermatogenesis takes place.

Sertoli cells

Cells that form the walls of the seminiferous tubules and help in spermatogenesis Sertoli cells are also called sustentacular cells.

Serum

Plasma with the *clotting factors removed*. Serum is often used in diagnostic tests because it does not clot.

Sex-linked trait

A trait determined by a gene on either the X or Y chromosomes (the sex chromosomes).

Shine-Dalgarno sequence

The prokaryotic ribosome-binding site on mRNA, found 10 nucleotides 5' to the start codon.

Signal recognition particle (SRP)

A cytoplasmic protein that recognizes the signal sequences of proteins destined to be translated at the rough ER. It binds first to the ribosome translating the protein with the signal sequence then to an SRP receptor on the rough ER>

Signal sequence

A short sequence of amino acids, usually found at the N-terminus of a protein being translated, that directs the ribosome and its associated mRNA to the membranes of the rough ER where translation will be completed. Signal sequences are found on membrane-bound proteins, secreted proteins, and proteins destined for other organelles.

Signal transduction

The intracellular process triggered by the binding of a ligand to its receptor on the cell surface. Typically this activates second messenger pathways.

Silent mutation

A point mutation in which a codon that specifies an amino acid is mutated into a new codon that specifies the same amino acid.

Simple diffusion

The movement of a hydrophobic molecule across the plasma membrane of cell, down its concentration gradient. Since the molecule can easily interact with the lipid bilayer, no additional help (such as a channel or pore) is required.

Single strand binding proteins

Proteins that bind to and stabilize the single strands of DNA exposed when helicase unwinds the double helix in preparation for replication.

Sinoatrial (SA) node

A region of specialized cardiac muscle cells in the right atrium of the heart that initiate the impulses of heart contraction; for this reason the SA node is known as the 'pacemaker' of the heart.

Sister chromatid

Identical copies of a chromosome, produced during DNA replication and held together at the centromere. Sister chromatids are separated during anaphase of mitosis.

Skeletal muscle

Muscle tissue that is attached to the bones. Skeletal muscle is striated multinucleate, and under voluntary control.

Siding filament theory

The mechanism of contraction in skeletal and cardiac muscle cells. It is a series of four repeated steps: (1) myosin binds actin, (2) myosin pulls actin toward the center of the sarcomere (3) myosin releases actin, and (4) myosin resets to its high-energy conformation.

Slow block to polyspermy

Also known as the cortical reaction, the slow block involves an increase in intracellular $[Ca^{2+}]$ in the egg, which causes the release of cortical granules near the egg plasma membrane. This results in the hardening of the zona pellucida and its separation from the surface of the egg, preventing the entry of more than one sperm into the egg.

Small intestine

The region of the digestive tract where virtually all digestion and absorption occur. It is subdivided into three regions: the duodenum, the jejunum, and the ileum.

Smooth Endoplasmic Reticulum

A network of membranes inside eukaryotic cells involved in lipid synthesis (steroid in gonads), detoxification (in liver cells), and/or Ca^{2+} storage (muscle cells).

Smooth muscle

Muscle tissue found in the walls of hollow organs, e.g., blood vessels, the digestive tract, the uterus, etc. Smooth muscle is non-striated, uninucleate, and under involuntary control (controlled by the autonomic nervous system).

Soma

The cell body of a neuron.

Somatic nervous system

The division of the peripheral nervous system that innervates and controls the skeletal muscles; also known as the voluntary nervous system.

Spatial summation

Integration by a postsynaptic neuron of inputs (EPSPs and IPSPs) from multiple sources.

Spermatid

A haploid but immature cell resulting from the second meiotic division of spermatogenesis. Spermatids undergo significant physical changes to become mature sperm (spermatozoa).

Spermatogenesis

Sperm production; occurs in human males on a daily basis from puberty until death. Spermatogenesis results in the production of four mature gametes (sperm) from a single precursor cell (spermatogonium). For maximum sperm viability, spermatogenesis requires cooler temperatures and adequate testosterone.

Spermatogonium

A diploid cell that can undergo mitosis to form more spermatogonium, and can also be triggered to undergo meiosis to form sperm.

S phase

The phase of the cell cycle during which the genome is replicated.

Sphincter of Oddi

The valvecontrolling release of bile and pancreatic juice into the bloodstream.

Sphygmomanometer

A blood pressure cuff

Spirochete

A bacterium having a spiral shape
(plural = spirochetes)

Spleen

An abdominal organ that is considered part of the immune system. The spleen has four functions: (1) it filters antigen from the blood (2) it is the site of B cell maturation, (3) it stors blood, and (4) it destroys old red blood cells.

Splicing

One type of eukaryotic mRNA processing in which introns are removed from the primary transcript and exons are ligated together. Splicing of transcripts can be different in different tissues.

Spongy bone

A looser, more porous type of bone tissue found at the inner core of the epiphyses in long bones and all other bone types. Spongy bone is filled with red bone marrow, important in blood cell formation.

Start site

The location on a chromosome where transcription begins.

Steroid hormone

A hormone derived from cholesterol. Steroids are generally hydrophobic and can easily cross the plasma membrane of cells, thus receptors for steroids are found intracellularly. Once this steroid binds to its receptor, the receptor-steroid complex acts to regulate transcription in the nucleus.

Stomach

The portion of the digestive tract that stores and grinds food. Limited digestion occurs in the stomach, and it has the lowest pH in the body (1-2).

Stop codon

A group of nucleotides that does not specify a particular amino acid, but instead serves to notify the ribosome that the protein being translated is complete. The stop codons are UAA, UGA, and UAG. They are also known as nonsense codons.

Stroke volume

The volume of blood pumped out the heart in a single contraction.

Submucosa

The layer of connective tissue directly under the mucosa of an open body cavity.

Substrate(s)

The reactants in an enzyme-catalyzed reaction. Substrate binds at the active site of an enzyme.

Sudoriferous gland

A sweat gland located in the dermis of the skin. Sweat consists of water and ions (including Na⁺ and urea) and is secreted with temperatures rise.

Summation

(1) The integration of input (EPSPs and IPSPs) from many presynaptic neurons by a single postsynaptic neuron, either temporally or spatially. Summation of all input can either stimulate the postsynaptic neuron and possibly lead to an action potential, or it can inhibit the neuron, reducing the likelihood of an action potential. (2) The integration of single muscle twitches into a sustained contraction (tetanus).

Supercoiling

A method of DNA protection utilized by prokaryotes in which their large circular chromosome is coiled upon itself.

Surfactant

An amphipathic molecule secreted by cells in the alveoli (type 2 alveolar cells) that reduces surface tension on the inside of the alveolar walls. This prevents the alveoli from collapsing upon exhalation and sticking together, thus reducing the effort required for inspiration.

Sympathetic nervous system

The division of the autonomic nervous system known as the "fight or flight" system. It causes a general increase in body activities such as heart rate, respiratory rate, and blood pressure, and an increase in blood flow to skeletal muscle. It causes a general decrease in digestive activity. Because all of its preganglionic neurons originate from the thoracic or lumbar regions of the spinal cord, it is also known as the thoracolumbar system.

Symporter

A carrier protein that transports two molecules across the plasma membrane in the same direction. For example, the Na⁺-glucose cotransporter in intestinal cells is a symporter.

Synapse

A neuron-to-neuron, neuron-to-organ, or muscle to cell-to-muscle cell junction.

Synapsis

Pairing of homologous chromosomes in a diploid cell, as occurs during prophase I of meiosis.

Synaptic cleft

A microscopic space between the axon of one neuron and the cell body or dendrites of a second neuron, or between the axon of a neuron and an organ.

Syncytium

A large multinucleate cell, typically formed by the fusion of many smaller cells during development (e.g. a skeletal muscle cell), or formed by nuclear division in the absence of cellular division.

Synergist

Something that works together with another thing to augment the the second thing's activity. For example, a muscle that assists another muscle is said to be a synergist. An enzyme that helps another enzyme is a synergist.

Synovial fluid

A lubricating, nourishing fluid found in joint capsules.

Systemic circulation

The flow of blood from the heart, through the body (not including the lungs), and back to the heart.

Systole

The period of time during which the ventricles of the heart are contracted.

Systolic pressure

The pressure measured in the arteries during contraction of the ventricles (during systole).

T cell

A type of lymphocyte. The major subtypes of T cells are the helper T cells (CD4) and the killer T cells (CD8, or cytotoxic T cells). Helper T cells secrete chemicals that help killer Ts and B cells proliferate. Killer T cells destroy abnormal self-cells (e.g., cancer cells) or infected cells.

Telencephalon

The cerebral hemispheres.

Telomere

A specialized region at the ends of eukaryotic chromosomes that contains several repeats of a particular DNA sequence. These ends are maintained (in some cells) with the help of a special DNA polymerase called telomerase. In cells that lack telomerase, the telomeres slowly degrade with each round of DNA replication (as the RNA primer, is not replaced and the 5' of the new DNA would not exist); this is thought to contribute to the eventual death of the cell.

Telophase

The fourth (and final) phase of mitosis. During telophase the nuclear envelope reforms, chromosomes decondense, and the mitotic spindle is disassembled.

Telophase I

The fourth of meiosis I. Telophase I is identical to mitotic telophase, except that the number of chromosomes is now reduced by half. After this phase the cell is considered to be haploid. Note however, that the chromosomes are still replicated, and the sister chromatids must still be separated during meiosis II.

Telophase II

The fourth and final phase of meiosis II. Telophase II is identical to mitotic telophase, except that the number of chromosomes was reduced by half during meiosis. I.

Temporal summation

Summation by a postsynaptic cell of input (EPSPs or IPSPs) from a single source over time.

Tendon

Strong bands of connective tissue that connect skeletal muscle to bone.

Testcross

A genetic cross between an organism displaying a recessive phenotype (homozygous recessive) and an organism displaying a dominant phenotype (for which the genotype is unknown), done to determine the unknown genotype.

Testes

The primary male sex organ. The testes are suspended outside the body cavity in the scrotum and have two functions (1) produce sperm, and (2) secrete testosterone.

Testosterone

The primary androgen (male sex steroid). Testosterone is a steroid hormone produced and secreted by the interstitial cells of the testes. It triggers the development of secondary male sex characteristics during puberty (including spermatogenesis) and maintains those characteristics during adulthood.

Tetanus

A smooth sustained muscle contraction, such as occurs in skeletal muscle when stimulation frequency is high enough (this is the normal type of contraction exhibited by skeletal muscle).

Tetrad

A pair of replicated homologous chromosomes. Tetrads form during prophase I of meiosis so that homologous chromosomes can exchange DNA in a process known as 'crossing over.'

Thalamus

The central structure of the diencephalon of the brain. the thalamus acts as a relay station and major integrating area for sensory impulses.

Thecal cells

A layer of cells surrounding the granulosa cells of the follicles in an ovary. Thecal cells help produce the estrogen secreted from the follicle during the first phase of the ovarian cycle.

Thermoreceptor

A receptor that responds to changes in temperature.

Theta replication

DNA replication in prokaryotes, so named because as replication proceeds around the single, circular chromosome, it takes on the appearance of the Greek letter theta.

Thick filament

In skeletal and cardiac muscle tissue, a filament composed of bundles of myosin molecules. The myosin head groups attach to the thick filaments and pull the toward the center of the sarcomere during muscle contraction.

Thin filament

In skeletal and cardiac muscle tissue, a filament composed of actin, tropomyosin, and troponin. Thin filaments are attached to the Z lines of the sarcomers and slide over thick filaments during muscle contraction.

Thrombus

A blood clot that forms in an unbroken blood vessel. Thrombi are dangerous they can break free and begin travel in the bloodstream (become an embolus). Emboli ultimately become stuck in a small vessel and prevent adequate blood delivery to tissues beyond the sticking point, leading to tissue death. A brain embolism can lead to stroke, a heart embolism to a heart attack, and a pulmonary embolism to respiratory failure.

Thymine

One of the four aromatic bases found in DNA. Thymine is a pyrimidine; it pairs with adenine.

Thymus

An immune organ located near the heart. The thymus is the site of T cell maturation and is larger in children and adolescents.

Thyroid stimulating hormone (TSH)

A tropic hormone produced by the anterior pituitary gland that targets the thyroid gland, stimulating it to produce and release thyroid hormone.

Thyroxine

Also called thyroïd hormone, thyroxine is produced and secreted by follicle cells in the thyroid gland. it targets all cells in the body and increases overall body metabolism.

Tidal volume

The volume of air inhaled and exhaled in a normal, resting breath, typically about 500 mL.

Tight junction

Also called occluding junctions, tight junctions form a seal between cells that prevents the movement of substances across the cell layer, except by diffusion through the cell membranes themselves. Tight junctions are found between the epithelial cells lining the intestines and between the cells forming the capillaries in the brain (the blood-brain barrier).

Tolerant anaerobe

An organism that can survive in the presence of oxygen (oxygen is not toxic), but that does not use oxygen during metabolism (anaerobic metabolism only).

Tonsils

Paired masses of lymphatic tissue near the back of the throat that help trap inhaled or swallowed pathogens.

Topoisomerase

An enzyme that cuts one or both strands of DNA to relieve the excess tension caused by the unwinding of the helix by helicase during replication.

Total lung capacity

The maximal volume of air that the lungs can contain. Total lung capacity is the sum of the vital capacity and the residual volume, and is typically about 6000 mL (6L).

Totipotent

Having the ability to become anything; a zygote is totipotent.

Trachea

The main air tube leading into the respiratory system. The trachea is made of alternating rings of cartilage and connective tissue.

Transcription

The enzymatic process of reading a strand of DNA to produce a complementary strand of RNA

Transduction

The transfer by a lysogenic virus of a portion of a host cell genome to a new host.

Transition mutation

A point mutation in which a pyrimidine is substituted for a pyrimidine, or a purine is substituted for a purine.

Translation

The process of reading a strand of mRNA to synthesize protein. Protein translation takes place on a ribosome.

Transmembrane domain

The portion of an integral membrane protein that passes through the lipid bilayer.

Transversion mutation

A point mutation in which a pyrimidine is substituted for a purine, or vice versa.

tRNA

Transfer RNA; the type of RNA that carries an amino acid from the cytoplasm to the ribosome for incorporation into a growing protein.

tRNA loading

The attachment of an amino acid to a tRNA (not that this a specific interaction). tRNA loading requires two high-energy phosphate bonds.

Trophoblast

The outer ring of cells of a blastocyst. The trophoblast takes part in the formation of the placenta.

Tropic hormone

A hormone that controls the release of another hormone.

Tropomyosin

A helical protein that winds around actin helices in skeletal and cardiac muscle cells to form the thin filament of the sarcomere. In the absence of Ca^{2+} , tropomyosin covers the myosin-binding sites on actin and prevents muscle contraction. When calcium is present, a conformation change in tropomyosin occurs so that the myosin-binding sites are exposed and muscle contraction can occur.

Troponin

A globular protein that is associated with tropomyosin as part of the thin filament of the sarcomere. Troponin binds Ca^{2+} , which causes the conformational change in tropomyosin required to expose the myosin-binding sites on actin and initiate muscle contraction.

Trypsin

The main protease secreted by the pancreas; trypsin is activated (from trypsinogen) by enterokinase, and subsequently activates other pancreatic enzymes.

T tubules

Also called transverse tubules, these are deep invaginations of the plasma membrane found in skeletal and cardiac muscle cells. These invaginations allow depolarization of the membrane to quickly penetrate to the interior of the cell.

Tympanic membrane

The membrane that separates the outer ear from the middle ear. The tympanic membrane is also known as the eardrum.

Umbilical cord

The cord that connects the embryo of a developing mammal to the placenta in the uterus of the mother. The umbilical cord contains fetal arteries (carry blood toward the placenta) and veins (carry blood away from the placenta). The umbilical vessels derive from the allantois, a structure that develops from the embryonic gut.

Uniporter

A carrier protein that transports a single molecule across the plasma membrane.

Universal acceptor

A person with blood type AB+. Because this person's red blood cells possess all of the typical blood surface proteins, they will not display an immune reaction if transfused with any of the other blood types.

Universal donor

A person with blood type O-. Because this person's red blood cells possess none of the typical blood surface proteins, they cannot initiate an immune reaction in a recipient.

Upsteam

Toward the 5' end of an Rna transcript (the 5' end of the DNA coding strand). The promoter and start sites are upstream.

Uracil

One of the four aromatic bases found in RNA. Uracil is pyrimidine; it pairs with adnenine.

Urea

A waste product of protein dbreakdown, produced by the liver and relased into the bloodstream to be eliminated by the kidney.

Ureters

The tubes that carry urine from the kindeys to the bladder.

Urethra

The tube that carries urine from the bladder to the to outside of the body. In males it also carries semen and sperm during ejaculation.

Urinary sphincter

The valve that controls the release of urine from the bladder. It has an internal part made of smooth muscle (thus involuntary) and an external part made of skeletal muscle (thus voluntary).

Uterine tubes

Also called falopian tubes, these tubes extend laterally from their side of the uterus and serve as a passageway for the oocyte to travel from the ovary to the uterus. This is also the normal site of fertilization. Severing of the uterine tubes (tubal ligation) results in sterility of the females.

Uterus

The muscular female organ, in which a baby develops during pregnancy.

Vaccination

The deliberate exposure of a person to an antigen in order to provoke the primary immune response and memory cell production. Typically the antigens are those normally associated with pathogens, thus if the live pathogen is encountered in the future, the secondary immune response can be initiated, preventing infection and symptoms.

Vagal tone

The constant inhibition provided to the heart by the vagus nerve. Vagal tone reduces the intrinsic firing rate of the SA node from 120 beats/minute to around 80 beats/minute.

Vagina

The birth canal; the stretchy, muscular passageway through which a baby exits the uterus during childbirth.

Vagus nerves

Cranial nerve pair X. The vagus nerves are very large mixed nerves (They carry both sensory input and motor input) that innervate virtually every visceral organ. They are especially important in transmitting parasympathetic input to the heart and digestive smooth muscle.

Vasa recta

The capillaries that surround the tubules of the nephron. The vasa recta reclaims reabsorbed substances, such as water and sodium ions.

Vas deferens

A thick muscular tube that connects the epididymis of the testes to the urethra. Muscular contractions of the vas deferens during ejaculation help propel the sperm outward. Severing of the vas deferens (vasectomy) results in sterility of the male.

Vein

A blood vessel that carries blood toward the heart chambers. Veins do not have muscular walls, have valves to ensure that blood flows in one direction only, and are typically low-pressure vessels.

Vena cava

One of two large vessels (superior and inferior) that return deoxygenated blood to the right atrium of the heart.

Venous returns

The amount of blood returned to heart by the vena cavae.

Ventricle

One of two large chambers in the heart. The ventricles receive blood from the atria and pump it out of the lungs of the heart. The right ventricle has thin walls and pumps deoxygenated blood to the lungs through the pulmonary artery. The left ventricle has thick walls and pumps deoxygenated blood the body through the aorta.

Vestibular glands

Paired glands near the posterior side of the vaginal that secrete an alkaline mucus upon sexual arousal. The mucus helps to reduce the acidity of the vagina (which could be harmful to sperm) and lubricates the vagina to facilitate penetration.

Villi

(Singular:villus). Folds of the intestinal mucosa that project into the lumen of the intestine; villi serve to increase the surface area of the intestine for absorption.

Virus

A nonliving, intracellular parasite. Viruses are typically just pieces of nucleic acid surrounded by a protein coat.

Vital capacity

The maximum amount of air that can be forcibly exhaled from the lungs after filling them to their maximum level, typically about 4500 mL

Vitamin

One of several different nutrients that must be consumed in the diet, and generally not synthesized in the body. Vitamins can be hydrophobic (fat-soluble) or hydrophilic (water-soluble).

Vitreous humor

A thick, gelatinous fluid found in the posterior segment of the eye (between the lens and the retina). The vitreous humor is only produced during fetal development and helps maintain intraocular pressure (the pressure inside the eyeball).

Voltage-gated ion channel

An ion channel that is opened or closed based on the electrical potential across the plasma membrane. Once opened, the channel allows ions to cross the membrane according to their concentration gradients. Examples are the Na^+ and K^+ voltage-gated channels involved in the action potential of neurons.

White matter

Myelinated axons

Wolffian ducts

Early embryonic ducts that can develop into male internal genitalia under the proper stimulation (testosterone).

Yolk sac

An embryonic structure particularly important in egg-laying animals because it contains the yolk, the only source of nutrients for the embryo developing inside the egg. IN humans, the yolk sac is very small (since mammals get their nutrients via the placenta) and is the site of synthesis of the first red blood cells.

Z lines

The ends of a saromere.

Zona pellucida

A thick, transparent coating rich in glycoproteins that surrounds an oocyte.

Zygote

A diploid cell formed by the fusion of two gametes during sexual reproduction.

Zymogen

An inactive precursor of an enzyme, activated by various methods (acid hydrolysis, cleavage by another enzyme, etc.)