

GLOSSARY OF BIOTECHNOLOGY TERMS

Until recently, command of technical terms among lawyers was largely limited to patent counsel. Now, with the dramatic increase in the interaction between technology and law, there is a generalized need among lawyers for greater agility and familiarity with scientific jargon. This glossary has been compiled as a checklist of common biotechnology terms to aid the scientifically uninitiated practitioner. Special attention has been paid to terms which appear in the accompanying articles by Bertram I. Rowland¹ and Adrienne B. Naumann.² No attempt, however, has been made to provide a comprehensive biotechnology dictionary. For further technical guidance, please see the accompanying Research Pathfinder.³

Amino acid — Any Organic compound containing both an amino group and a carboxylic group, bound as essential components of a protein molecule.

Antenatal diagnosis — Diagnosis of a condition before birth.

Antibody — A protein produced by the body's immune defense system that can bind to foreign molecules and eliminate them.

Bacterium — Single-celled organism lacking a nucleus and other structures; useful for cloning genes because of fast growth. Bacteria may exist as free living organisms in soil, water, organic matter, or as parasites in the live bodies of plants, animals and other microorganisms.

Biological material — Any chemical compound or structural component unique to a living organism, such as viruses, serums, toxins, antitoxins,

vaccines, blood, blood components and derivatives, or allergenic products.

Biotechnology — Commercial techniques that use living organisms, or substances from these organisms, to make or modify a product, and including techniques used for the improvement of the characteristics of economically important plants and animals and for the development of microorganisms to act on the environment.

Cell — The fundamental unit of living organisms. The cell is characterized by an outer wall or membrane which is selectively permeable to nutrients, water, and other compounds, an inner fluid called cytoplasm, and various structures for the metabolism and reproduction of the cell.

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1. Rowland, *Legal Implications of Letter Licenses for Biotechnology*, 1 HIGH TECH. L.J. 99 (1986).

2. Naumann, *Federal Regulation of Recombinant DNA Technology: Time for Change*, 1 HIGH TECH. L.J. 61 (1986).

3. *Research Pathfinder: Biotechnology and Law*, 1 HIGH TECH. L.J. 233 (1986).

Cell fusion — Formation of a single hybrid cell with nuclei and cytoplasm from different cells.

Cell line — A family of cells, grown from a single parent, and generally having identical characteristics.

Chromosome — Any of several threadlike bodies found in a cell which carry genes in a linear order.

Cloning — The process of producing many copies of a biological material, usually a certain sequence of DNA or type of cell. Because reproduction is asexual, the progeny are genetically identical to the original ancestor.

Culture — The propagation of microorganisms or of living tissue cells in media conducive to their growth; the product of such propagation; also tissue culture.

Cytogenetic disorders — Disorders involving the cellular constituents concerned in heredity, i.e., chromosome abnormalities.

Cytogenetics — A branch of biology that deals with the study of heredity and variation by the methods of both cytology (the study of cells) and genetics.

Cytoplasm — The fluid in a cell, external to the cell's nuclear membrane.

Diploid — A cell with two copies of each chromosome.

Dissemination — The action or process of spreading or sending out freely or widely as though sowing or strewing seed; the state of being dispersed throughout in small particles.

DNA (deoxyribonucleic acid) — The biological molecule that is the genetic basis of heredity in every living cell. Each inherited characteristic is determined precisely by the information found in the DNA code. The

molecule itself is a linear chain of repeating deoxynucleotide units.

DNA hybridization — The pairing of one DNA strand with another, usually from different strains, e.g., recombinant DNA, or containing one DNA strand and one copied RNA strand.

DNA vector — A vehicle for transferring DNA from one cell to another.

Dominant gene — A gene whose characteristic expression prevails over alternative genes for a given trait.

Escherichia coli ("E. coli") — A bacterium that commonly inhabits the human intestine. It is the preferred organism for many microbiological experiments.

Endotoxins — Complex molecules (lipopolysaccharides) that compose an integral part of the cell wall, and are released only when the integrity of the cell is disturbed.

Enzyme — A functional protein that catalyzes a chemical reaction but is itself neither consumed nor altered. Enzymes control the rate of metabolic processes in an organism; they are, for instance, the active agents in the fermentation process.

Eukaryote — A higher, compartmentalized cell characterized by its extensive internal structure and the presence of a nucleus containing the DNA. All multicellular organisms are eukaryotic. The simpler cells, the prokaryotes, have much less compartmentalization and internal structure and have no nucleus; bacteria are prokaryotes.

Exotoxins — Proteins produced by bacteria that are able to diffuse out of the cells; generally more potent and specific in their action than endotoxins.

Fermentation — A biochemical process which generates energy by converting a raw material such as glucose into simpler products such as ethanol. No oxygen is required. Used in the production of products such as alcohols, acids, and cheese by the action of yeasts, molds, and bacteria.

Fibroblast — A cell that gives rise to connective tissues.

Gene — The basic unit of heredity; a segment of DNA coding for a specific protein.

Gene expression — Translation of the information contained in a gene into protein.

Gene mapping — Determining the relative location of different genes on a given chromosome.

Gene therapy — The insertion of a gene into a patient in a way that corrects a genetic defect.

Gene transfer — The use of genetic or physical manipulation to introduce foreign genes into host cells to achieve desired characteristics in progeny.

Genetic code — The biochemical basis of heredity consisting of codons (base triplets along the DNA sequence) that determine the specific amino acid sequence in proteins. Under normal conditions, the code is not ambiguous—each codon always designates the same amino acid.

Genetic drift — Changes of gene frequency in small populations due to chance preservation or extinction of particular genes.

Genetic engineering — A technology used to alter the hereditary material of a living cell. Genetic engineering can be used to make cells that can produce more or

different chemicals, or perform completely new functions.

Genome — The basic chromosome set of an organism — the sum total of its genes.

Genotype — The genetic constitution of an individual or group of cells, plants or animals.

Germline — A primary source of genes, such as a plant or cell line, from which growth and development of other genes is expected.

Germplasm — The total genetic variability available to an organism, represented by the pool of germ cells or seed.

Glycopeptides — Chains of amino acids with attached carbohydrates.

Glycoprotein — A protein attached to a carbohydrate (sugar).

Growth hormone — A substance that stimulates growth, especially a secretion of the anterior pituitary, that directly influences protein, carbohydrate, and lipid metabolism and controls the rate of skeletal and visceral growth.

Haploid — A cell with only one set (half of the usual number) of chromosomes, or half the number of chromosomes found in diploid cells.

Hematology — The science dealing with the morphology [form and structure] of blood and blood-forming tissues, and with their physiology and pathology.

Heterozygous — When the two copies of a gene controlling a particular trait are different, the organism is heterogeneous for that trait.

Homozygous — When the two copies of a gene controlling a particular trait are identical for a pair of chromosomes, the organism is said to be homozygous for that trait.

Hormones — The “messenger” molecules for the body that help coordinate the actions of various tissues; they produce a specific effect on the activity of cells remote from their point of origin.

Host-Vector Systems — Host — The recipient of genetic information derived from another organism by means of a vector, which allows the development of the transmitted information and carries it into the host cells.

Host-Vector Systems — Vectors — Plasmids and phages which transmit man-made and natural genetic information. A host cell develops, expresses and multiplies the transmitted information.

Hybrid — The offspring of genetically dissimilar parents. Hybrids can be made within a species (crossing two types of peach trees) or across species (fusing two different cell types *in vitro*).

Hybridoma — The product of fusion between a myeloma cell and a lymphocyte. Myeloma cells divide continuously in culture and lymphocytes produce antibodies, so the hybridoma cell grows continuously in culture, being “immortal”, and produces antibodies.

Hydrocarbon — All organic compounds that are composed only of carbon and hydrogen.

Interferon — A protein which helps the human body resist and defeat infections.

Immunoproteins — All the proteins that are part of the immune system (including antibodies, interferon, and cytokines).

In vitro — Outside the living organism and in an artificial environment. Literally, “in glass.”

In vivo — Within the living organism. Literally, “in life.”

Insulin — A hormone that stimulates cell growth via glucose uptake by cells. Many companies are now producing human insulin using genetic technology.

Leukocytes — The white cells of blood.

Lipids — A class of water insoluble biomolecules, including cellular fats and oils.

Lipopolysaccharides — Complex substances composed of lipids and polysaccharides.

Lymphoblastoid — Referring to malignant white blood cells.

Lymphokines — The biologically active soluble factor produced by white blood cells.

Maleic anhydride — An important organic chemical used in the manufacture of synthetic resins, in fungicides, in the dyeing of cotton textiles, and to prevent the oxidation of fats and oils during storage and rancidity.

Messenger RNA — Ribonucleic acid molecules that transmit the genetic information encoded in DNA to the cell's protein manufacturing system.

Metabolism — The sum of the physical and chemical processes involved in the maintenance of life and by which energy is made available.

Microorganism — An organism that is a fungus, prokaryote, protist or virus.

Mitochondria — Structures in higher cells that serve as the “powerhouse” for the cell, producing chemical energy.

Monoclonal antibodies — Antibodies derived from a single source or clone of cells which recognize only one kind of antigen. Useful in many

industrial and medical capacities because of the very high specificity of the antibodies.

Mutant — An organism whose visible properties with respect to some trait differ from the norm of the population due to mutations in its DNA.

Mutation — Any change that alters the sequence of bases along the DNA, changing the genetic material.

Myeloma — A malignant disease in which tumor cells of the antibody producing system synthesize excessive amounts of specific proteins.

Nucleic acid — A linear polymer of nucleotides; a generic term for either DNA or RNA.

Nucleotides — The fundamental units of nucleic acids. They consist of one of the five bases—adenine, guanine, cytosine, thymine (found only in DNA) and uracil (found only in RNA)—and its attached sugar-phosphate group.

Oncology — The study of tumors.

Organic compounds — Chemical compounds based on carbon chains or rings, which contain hydrogen, and also may contain oxygen, nitrogen, and various other elements. All biomolecules are organic, e.g. DNA, RNA, cell wall constituents, lipids and enzymes.

Organism — Any biological entity, cellular or non-cellular, with capacity for self-perpetuation and response to evolutionary forces.

Pathogen — Any disease-producing agent or microorganism.

Peptide — Short, linear chain of amino acids. A longer chain of peptides is sometimes called a polypeptide.

pH — A measure of the acidity or basicity of a solution; on a scale of 0

(acidic) to 14 (basic): for example, lemon juice has a pH of 2.2 (acidic), water has a pH of 7.0 (neutral), and a solution of baking soda has a pH of 8.5 (basic).

Phage — A submicroscopic organism that destroys bacteria. Phages (also known as Bacteriophages) are often viruses lacking cellular mechanisms of their own, and so must infect a host cell to grow and reproduce.

Pharmaceuticals — Products intended for use in humans, as well as *in vitro* applications to humans. Pharmaceuticals include drugs, vaccines, diagnostics, and biological response modifiers.

Phenotype — The visible properties of an organism that are produced by the interaction of the genotype and the environment.

Plasmid — Hereditary material that is not part of a chromosome. Plasmids are circular and self-replicating. Because they are generally small and relatively simple to manipulate, they are used in recombinant DNA experiments to carry foreign DNA.

Plastid — Any specialized organ of the plant cell other than the nucleus, such as the chloroplast.

Polymer — A long-chain molecule formed from smaller repeating structural units, e.g. DNA, peptides and proteins.

Prokaryotic — Pertaining to a one celled organism lacking a true nucleus and nuclear membrane and having genetic material composed of a single circular piece of DNA. Prokaryotes, with the exception of spiroplasmas and mycoplasmas, have a rigid cell wall. Bacteria and blue-green algae are prokaryotes.

Protein — A linear polymer of amino acids, the products of gene expression. Proteins function usually as catalysts, facilitating chemical reactions without being altered themselves.

Protoplast — A cell without a cell wall.

Recessive gene — Any gene whose characteristic expression is dependent on the absence of a dominant gene.

Recombinant DNA — DNA that has been artificially manipulated to form a novel arrangement of genes. When introduced into a cell this DNA can be replicated along with the natural DNA and can alter the genotype and phenotype of the cell.

Restriction enzyme — An enzyme which recognizes and cuts specific sequences in the DNA code. Restriction enzymes allow certain parts of a DNA molecule to be specifically cut, taken out, and recombined with other pieces of DNA. Probably the biochemist's most important tool for studying and manipulating recombinant DNA.

Retrovirus — An animal virus that can insert its DNA into the DNA of the animal cell, thus being reproduced as if it were a normal part of the cell's genome.

Reverse transcriptase — An enzyme, often found in retroviruses, that can synthesize a single strand of DNA

from a messenger RNA, the reverse of the normal direction of processing genetic information within the cell.

RNA (ribonucleic acid) — A nucleic acid that assists in translating the genetic message of DNA into the finished protein. It has three basic forms — messenger RNA, transfer RNA, and ribosomal RNA.

Somatic cell — One of the cells composing parts of the body (e.g., tissues, organs) other than a germ cell (sperm or egg).

Toxin — A poisonous substance, often a protein, which can harm cells.

Transduction — The process by which foreign DNA becomes incorporated into the genetic complement of the host cell.

Transformation — The transfer of genetic information by DNA separated for the cell.

Vector — An agent used to transmit genetic information from one host to another. A DNA vector should be self-replicating and contain cloning sites for the introduction of foreign DNA.

Virus — An infectious agent that requires a host cell in order for it to replicate. It is composed of either RNA or DNA wrapped in a protein coat.

Zygote — A cell formed by the union of two mature reproductive cells.