

## OECD BIOECONOMY GLOSSARY (J – P)

The following glossary explains technical terms and abbreviations used in the reports compiled for the OECD Bioeconomy project and those found in the source documents cited in the reports. It is based on the following sources:

<http://biotechterms.org/>

<http://www.ncbiotech.org/biotech101/glossary.cfm>

<http://stemcells.nih.gov/info/glossary.asp>

<http://www.gen.ufl.edu/~foodsaf/wi008.html>

<http://members.tripod.com/~bioremediation/>

[http://www.europabio.org/bi\\_glossary.htm](http://www.europabio.org/bi_glossary.htm)

<http://filebox.vt.edu/cals/cses/chagedor/glossary.html>

[http://www.fao.org/documents/show\\_cdr.asp?url\\_file=/DOCREP/003/X3910E/X3910E00.htm](http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/003/X3910E/X3910E00.htm)

The magazine *Science* has a guide to online biotech and medical dictionaries and glossaries here (focusing on genetics and genomics):

<http://www.sciencemag.org/feature/plus/sfg/education/glossaries.shtml>

### J

#### **Joining (J) segment**

A small DNA segment that links genes to yield a functional gene encoding an immunoglobulin.

### K

#### **Kanamycin**

An antibiotic of the aminoglycoside family that poisons translation by binding to the ribosomes.

#### **Kanr. Kanamycin resistance gene**

See *Selectable marker*.

#### **Karyotype**

All of the chromosomes in a cell or an individual organism, visible through a microscope during cell division.

### L

#### **Lactase**

Enzyme in certain yeasts and mammalian intestinal tracts that catalyzes converting lactose to glucose and galactose. See *Lactose*.

### **Lactose**

Milk sugar; also white crystal sugar made from whey used in baby food, baked goods, candies and pharmaceuticals.

### **Lag phase**

The initial growth phase, during which cell number remains relatively constant prior to rapid growth. See *Growth phase*.

### **Lawn**

A uniform and uninterrupted layer of bacterial growth, in which individual colonies cannot be observed.

### **Leukocyte**

A white blood cell, an important component of the body's immune system.

### **Library**

A collection of cells, usually bacteria or yeast, that have been transformed with recombinant vectors carrying DNA inserts from a single species. See *cDNA library*, *Expression library*, *Genomic library*.

### **Ligate**

The process of joining two or more DNA fragments.

### **Lineage**

A chart that traces the flow of genetic information from generation to generation.

### **Linkage map**

See *Genetic linkage map*.

### **Linkage**

The frequency of coinheritance of a pair of genes and/or genetic markers, which provides a measure of their physical proximity to one another on a chromosome.

### **Linked genes/markers**

Genes and/or markers that are so closely associated on the chromosome that they are coinherited in 80% or more of cases.

**Linker**

A short, double-stranded oligonucleotide containing a restriction endonuclease recognition site, which is ligated to the ends of a DNA fragment.

**Liposomes**

Membrane-bound vesicles constructed in the laboratory to transport biological molecules.

**Locus (plural = loci)**

A specific location or site on a chromosome.

**Log phase**

See *Logarithmic phase*.

**Logarithmic phase (log or exponential growth phase)**

The steepest slope of the growth curve, the phase of vigorous growth during which cell number doubles every 20-30 minutes. See *Growth phase*.

**Long-term self-renewal**

The ability of stem cells to renew themselves by dividing into the same non-specialized cell type over long periods (many months to years) depending on the specific type of stem cell.

**Lymphocyte**

A type of leukocyte found in the blood, lymph nodes and certain organs. Lymphocytes are continuously made in the bone marrow. See *B lymphocytes*, *T lymphocytes*.

**Lysis**

The destruction of the cell membrane.

**Lysogen**

A bacterial cell whose chromosome contains integrated viral DNA.

**Lysogenic**

A type or phase of the virus life cycle during which the virus integrates into the host chromosome of the infected cell, often remaining essentially dormant for some period of time. See *Lysogen*.

**Lytic**

A phase of the virus life cycle during which the virus replicates within the host cell, releasing a new generation of viruses when the infected cell lyses.

## **M**

### **Macrophage**

A type of white blood cell that ingests dead tissue and cells and is involved in producing Interleukin.

### **Mapping**

Determining the physical location of a gene or genetic marker on a chromosome. See *Continuous map*, *Genetic map*, *Physical map*.

### **Marker gene**

Gene that is easy to find or observe, used to identify which plants have been successfully transformed.

### **Megabase cloning**

The cloning of very large DNA fragments. See *Cloning*.

### **Meiosis**

The reduction division process by which haploid gametes and spores are formed, consisting of a single duplication of the genetic material followed by two mitotic divisions.

### **Mesenchymal stem cells**

Cells from the immature embryonic connective tissue. A number of celltypes come from mesenchymal stem cells, including chondrocytes, which produce cartilage.

### **Mesoderm**

Middle layer of a group of cells derived from the inner cell mass of the blastocyst; it gives rise to bone, muscle, and connective tissue.

### **Messenger RNA (mRNA)**

The class of RNA molecules that copies the genetic information from DNA, in the nucleus, and carries it to ribosomes, in the cytoplasm, where it is translated into protein. See *RNA*.

### **Metabolism**

The biochemical processes that sustain a living cell or organism.

### **Metallothionein**

A protective protein that binds heavy metals, such as cadmium and lead.

### **Microbe**

Microorganism; any organism that can be seen only with the aid of a microscope.

### **Microbial insecticide**

Preparation of living microbes (such as bacteria or fungi) pathogenic to specific groups of insects. See *Bacillus thuringiensis (Bt)*, *Biological control*.

### **Microbial mats (biofilms)**

Layered groups or communities of microbial populations.

### **Microenvironment**

The molecules and compounds such as nutrients and growth factors in the fluid surrounding a cell in an organism or in the laboratory, which are important in determining the characteristics of the cell.

### **Microinjection**

A means to introduce a solution of DNA, protein, or other soluble material into a cell using a fine microcapillary pipet.

### **Mitosis**

The replication of a cell to form two daughter cells with identical sets of chromosomes.

### **Molecular biology**

The study of the biochemical and molecular interactions within living cells.

### **Molecular cloning**

The biological amplification of a specific DNA sequence through mitotic division of a host cell into which it has been transformed or transfected. See *Cloning*.

### **Molecular genetics**

The study of the molecular structure and function of genes. The study of the flow and regulation of genetic information between DNA, RNA, and protein molecules.

### **Monoclonal antibodies**

Immunoglobulin molecules of single-epitope specificity that are secreted by a clone of B cells.

### **Monoclonal antibody**

A highly specific, purified protein antibody that is derived from only one clone of cells and recognizes only one specific foreign substance invading the body (antigen). A monoclonal antibody may be used for early disease diagnosis and therapy.

**Monogenic**

Controlled by or associated with a single gene.

**Movable genetic element**

See *Transposon*.

**mRNA**

See *Messenger RNA*.

**Multigenic**

Many genes are involved in the expression of a trait.

**Multi-locus probe**

A probe that hybridizes to a number of different sites in the genome of an organism. See *Probe*.

**Mutagen**

Agent that causes biological mutation. Examples include chemicals, radioactive elements and ultraviolet light. See *Pentachlorophenol*.

**Mutagen**

Any agent or process that can cause mutations. See *Mutation*.

**Mutant**

A cell microorganism that manifests new characteristics due to a change in its genetic material.

**Mutation**

An alteration in DNA structure or sequence of a gene that may cause that cell and all cells derived from it to look or behave differently.

**N****Neural stem cell**

A stem cell found in adult neural tissue that can give rise to neurons, astrocytes, and oligodendrocytes.

**Neurons**

Nerve cells, the structural and functional unit of the nervous system. A neuron consists of a cell body and its processes, an axon, and one or more dendrites. Neurons function by the initiation and conduction of impulses and transmit impulses to other neurons or cells by releasing neurotransmitters at synapses.

### **Nick translation**

A procedure for making a DNA probe in which a DNA fragment is treated with DNase to produce single-stranded nicks, followed by incorporation of radioactive nucleotides from the nicked sites by DNA polymerase.

### **Nicked circle (relaxed circle)**

During extraction of plasmid DNA from the bacterial cell, one strand of the DNA becomes nicked. This relaxes the torsional strain needed to maintain supercoiling, producing the familiar form of plasmid. See *Plasmid*.

### **Nitrocellulose**

A membrane used to immobilize DNA, RNA, or protein, which can then be probed with a labeled sequence or antibody.

### **Nitrogen fixation**

The conversion of atmospheric nitrogen to biologically usable nitrates.

### **Nitrogenous bases**

The purines (adenine and guanine) and pyrimidines (thymine, cytosine, and uracil) that comprise DNA and RNA molecules.

### **Nodule**

The enlargement or swelling on roots of nitrogen-fixing plants. The nodules contain symbiotic nitrogen-fixing bacteria. See *Nitrogen fixation*.

### **Nontarget organism**

An organism which is affected by an interaction for which it was not the intended recipient.

### **Northern blotting**

See *Northern hybridization*.

### **Northern hybridization (Northern blotting)**

A procedure in which RNA fragments are transferred from an agarose gel to a nitrocellulose filter, where the RNA is then hybridized to a radioactive probe. See *Hybridization*.

## **Nuclease**

A class of enzymes that degrades DNA and/or RNA molecules by cleaving the phosphodiester bonds that link adjacent nucleotides. In deoxyribonuclease (DNase), the substrate is DNA. In endonuclease, it cleaves at internal sites in the substrate molecule. Exonuclease progressively cleaves from the end of the substrate molecule. In ribonuclease (RNase), the substrate is RNA. In the S1 nuclease, the substrate is single-stranded DNA or RNA.

## **Nucleic acids**

The two nucleic acids, deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), are made up of long chains of molecules called nucleotides. DNA is made of thousands of sets of four different nucleotides repeated randomly. See *DNA, RNA, Nucleotides*.

## **Nuclein**

The term used by Friedrich Miescher to describe the nuclear material he discovered in 1869, which today is known as DNA.

## **Nucleoside analog**

A synthetic molecule that resembles a naturally occurring nucleoside, but that lacks a bond site needed to link it to an adjacent nucleotide. See *Nucleoside*.

## **Nucleoside**

A building block of DNA and RNA, consisting of a nitrogenous base linked to a five carbon sugar. See *Nucleoside analog*.

## **Nucleotide**

A building block of DNA and RNA, consisting of a nitrogenous base, a five-carbon sugar, and a phosphate group. Together, the nucleotides form codons, which when strung together form genes, which in turn link to form chromosomes. Can be found as individual molecules (e.g., ATP, the "energy molecule"). See *Chromosome, Codon, Complementary nucleotides, Dideoxynucleotide, DNA, Gene, Oligonucleotide, RNA*.

## **Nucleus**

The membrane-bound region of a eukaryotic cell that contains the chromosomes.

# **O**

## **Oligodendrocyte**

A cell that provides insulation to nerve cells by forming a myelin sheath around axons.

## **Oligonucleotide**

A DNA polymer composed of only a few nucleotides. See *Nucleotide*.

**Oncogene**

A gene that contributes to cancer formation when mutated or inappropriately expressed. See *Cellular oncogene*, *Dominant oncogene*, *Immortalizing oncogene*, *Recessive oncogene*.

**Oncogenesis**

The progression of cytological, genetic, and cellular changes that culminate in a malignant tumor.

**Oncology**

The study of tumors.

**Open pollination**

Pollination by wind, insects, or other natural mechanisms.

**Open reading frame**

A long DNA sequence that is uninterrupted by a stop codon and encodes part or all of a protein. See *Reading frame*.

**Operator**

A prokaryotic regulatory element that interacts with a repressor to control the transcription of adjacent structural genes.

**Organelle**

A cell structure that carries out a specialized function in the life of a cell.

**Origin of replication**

The nucleotide sequence at which DNA synthesis is initiated.

**Overlapping reading frames**

Start codons in different reading frames generate different polypeptides from the same DNA sequence. See *Reading frame*.

**Ovum**

A female gamete.

**P****Palindrome**

See *Palindromic sequence*.

### **Palindromic sequence**

A DNA locus whose 5'-to-3' sequence is identical on each DNA strand. The sequence is the same when one strand is read left to right and the other strand is read right to left. Recognition sites of many restriction enzymes are palindromic. See *DNA*.

### **Pandemic**

The outbreak of an infectious disease over a large geographical region and affecting a large percentage of the human and/or animal population.

### **Parasitism**

The close association of two or more dissimilar organisms where the association is harmful to at least one. See *Commensalism*, *Symbiosis*.

### **Passage**

A round of cell growth and proliferation in cell culture.

### **Pathogen**

Living organism which can cause disease in another organism.

### **Pathogen Security**

See *biosecurity*.

### **pBR322**

A derivation of ColE1, one of the first plasmid vectors widely used. See *Plasmid*.

### **PCR**

See *Polymerase chain reaction*.

### **Pedigree**

A diagram mapping the genetic history of a particular family.

### **Pentachlorophenol**

Chemical formerly widely used to preserve wood from decay and insect damage, now a restricted-use pesticide. According to the U.S. Environmental Protection Agency, it can be an acute toxin causing such problems as burns and breathing difficulty. It may cause developmental effects such as birth defects and affect male and female reproductive capacity. It can also harm wildlife. See *Bioremediation*.

**Persistence**

Ability of an organism to remain in a particular setting for a period of time after it is introduced.

**Phage (particle)**

See *Bacteriophage*.

**Phenotype**

The observable characteristics of an organism as opposed to the set of genes it possesses (its genotype). The phenotype that an organism manifests is a result of both genetic and environmental factors. Therefore, organisms with the same genotype may display different phenotypes due to environmental factors. Conversely, organisms with the same phenotypes may have different genotypes.

**Pheromone**

A hormone-like substance that is secreted into the environment.

**Phosphatase**

An enzyme that hydrolyzes esters of phosphoric acid, removing a phosphate group.

**Phosphodiester bond**

A bond in which a phosphate group joins adjacent carbons through ester linkages. A condensation reaction between adjacent nucleotides results in a phosphodiester bond between 3' and 5' carbons in DNA and RNA.

**Phospholipid**

A class of lipid molecules in which a phosphate group is linked to glycerol and two fatty acyl groups. A chief component of biological membranes. See *Inositol phospholipid*.

**Phosphorylation**

The addition of a phosphate group to a compound.

**Physical map**

A map showing physical locations on a DNA molecule, such as restriction sites, and sequence-tagged sites. See *Mapping*.

**Plaque**

A clear spot on a lawn of bacteria or cultured cells where cells have been lysed by viral infection.

**Plasmid (p)**

A circular DNA molecule, found outside the chromosome in bacteria, capable of autonomous replication, which typically carries one or more genes encoding antibiotic resistance proteins. Plasmids can transfer genes between bacteria and are the principal tools for inserting new genetic information into microorganisms or plants. See *Nicked circle*, *Relaxed plasmid*, *Stringent plasmid*, *Supercoiled plasmid*.

**Plasticity**

The ability of stem cells from one adult tissue to generate the differentiated cell types of another tissue.

**Pleiotrophy**

The effect of a particular gene on several different traits.

**Pluripotent**

Ability of a single stem cell to develop into many different cell types of the body.

**Point mutation**

A change in a single base pair of a DNA sequence in a gene. See *Mutation*.

**Polyacrylamide gel electrophoresis**

Electrophoresis through a matrix composed of a synthetic polymer, used to separate proteins, small DNA, or RNA molecules of up to 1000 nucleotides. Used in DNA sequencing. See *Electrophoresis*.

**Polyclonal antibodies**

A mixture of immunoglobulin molecules secreted against a specific antigen, each recognizing a different epitope.

**Polygalacturonase (PG)**

Enzyme that digests part of the pectin that forms plant cell walls. Polygalacturonase causes ripening fruit to become soft.

**Polygenic**

Controlled by or associated with more than one gene.

**Polylinker**

A short DNA sequence containing several restriction enzyme recognition sites that is contained in cloning vectors.

**Polymer**

A molecule composed of repeated subunits.

### **Polymerase (DNA)**

Synthesizes a double-stranded DNA molecule using a primer and DNA as a template. See *Polymerase chain reaction, RNA polymerase, Taq polymerase*.

### **Polymerase chain reaction (PCR)**

Multiplying a particular DNA segment in repeated cycles. The "copies" made in a previous cycle are used as "originals" or templates in the next cycle. For example, PCR enables forensics experts to do DNA testing on very small blood samples.

### **Polymorphisms**

Variant forms of a particular gene that occur simultaneously in a population.

### **Polynucleotide**

A DNA polymer composed of multiple nucleotides. See *Nucleotide*.

### **Polypeptide (protein)**

A polymer composed of multiple amino acid units linked by peptide bonds.

### **Polyploid**

A multiple of the haploid chromosome number that results from chromosome replication without nuclear division.

### **Polysaccharide**

A polymer composed of multiple units of monosaccharide (simple sugar).

### **Polyvalent vaccine**

A recombinant organism into which has been cloned antigenic determinants from a number of different disease-causing organisms. See *Vaccine*.

### **Population**

A local group of organisms belonging to the same species and capable of interbreeding.

### **Porcine somatotropin (PST)**

Pig growth hormone; a protein hormone produced in the pituitary gland of pigs. Like BGH/BST, PST can also be produced by inserting a copy of the gene for PST into laboratory bacteria. When purified from pituitary glands or from bacterial cultures, PST injected into hogs can increase the leanness of pork and improve pork quality.

**Primary cell**

A cell or cell line taken directly from a living organism, which is not immortalized.

**Primer**

A short DNA or RNA fragment annealed to single-stranded DNA, from which DNA polymerase extends a new DNA strand to produce a duplex molecule.

**Principles**

An elementary proposition, fundamental truth, law or doctrine from which others are derived or on which others are founded. A settled rule of action or a governing law of conduct.

**Prion**

See *Proteinaceous infectious particle*.

**Probe**

A sequence of DNA or RNA, labeled or marked with a radioactive isotope, used to identify complementary sequences in genes or DNA fragments of interest by detecting the presence of complementary nucleotide sequences. See *Nucleotide*.

**Prokaryotes**

Organisms whose genetic material is not enclosed by a nucleus; its DNA is usually in one long strand.. The most common examples are bacteria. See *Eukaryote*

**Proliferation**

Expansion of a population of cells by the continuous division of single cells into two identical daughter cells.

**Promoter**

A region of DNA extending 150-300 bp upstream from the transcription start site that contains binding sites for RNA polymerase and a number of proteins that regulate the rate of transcription of the adjacent gene. See *Constitutive promoter*.

**Pronucleus**

Either of the two haploid gamete nuclei just prior to their fusion in the fertilized ovum.

**Protease**

An enzyme that cleaves peptide bonds that link amino acids in protein molecules.

**Protein**

A complex biological molecule composed of a chain of amino acids. Proteins have many different functions: structure (collagen); movement (actin and myosin); catalysis (enzymes); transport (hemoglobin); regulation of cellular processes (insulin); and response to stimuli (receptor proteins on surface of all cells). The information for making proteins is stored in the sequence of nucleotides in the DNA molecule. See *Polypeptide*.

**Protein engineering**

A technique used in the production of proteins with new or artificial amino acid sequences.

**Protein kinase**

An enzyme that adds phosphate groups to a protein molecule at serine, threonine, or tyrosine residues.

**Proteinaceous infectious particle (prion)**

A proposed pathogen composed only of protein with no detectable nucleic acid and which is responsible for Creutzfeldt-Jakob disease and kuru in humans and scrapie in sheep.

**Proteolytic**

The ability to break down protein molecules.

**Proto-oncogene**

See *Oncogene*.

**Protoplast.**

A plant or bacterial cell that has had its cell wall removed

**Provirus**

See *Virus*.

**pUC**

A widely used expression plasmid containing a -galactosidase gene. See *Plasmid*.