

## OECD BIOECONOMY GLOSSARY (A – C)

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>

### A

#### **Abiotic stress**

Outside (nonliving) factors which can cause harmful effects to plants, such as soil conditions, drought, extreme temperatures.

#### **Abzyme**

See *Catalytic antibody*.

#### **Acidophilus milk**

Milk seeded with living *Lactobacillus acidophilus* bacteria used to improve the balance of beneficial bacteria in the intestines of the person who drinks the milk.

#### **Adaptive radiation**

The evolution of new species or subspecies to fill unoccupied ecological niches.

#### **Adult stem cell**

An undifferentiated cell found in a differentiated tissue that can renew itself and (with certain limitations) differentiate to yield all the specialized cell types of the tissue from which it originated.

#### **Aerobe.**

A microorganism that grows in the presence of oxygen. See *Anaerobe*.

### **Agarose gel electrophoresis**

A matrix composed of a highly purified form of agar that is used to separate larger DNA and RNA molecules ranging 20,000 nucleotides. See *Electrophoresis*.

### **Agrobacterium tumefaciens**

A common soil bacterium that causes crown gall disease by transferring some of its DNA to the plant host. Scientists alter *Agrobacterium* so that it no longer causes the disease but is still able to transfer DNA. They then use this altered *Agrobacterium* to ferry desirable genes into plants.

### **Agroterrorism**

The deliberate act of a person or group against the agricultural industry and/or food supply system, which could include the use of chemical or biological weapons.

### **Alleles**

Alternate forms of a gene or DNA sequence, which occur on either of two homologous chromosomes in a diploid organism. See *DNA polymorphism*.

### **Alternative mRNA splicing**

The inclusion or exclusion of different exons to form different mRNA transcripts. See *RNA*.

### **Amino acid**

The fundamental building blocks of a protein molecule. A protein is composed of a chain of hundreds or thousands of amino acids. Our bodies can synthesize most of the amino acids. However, eight amino acids (called "essential amino acids") must be obtained from food.

### **Ampicillin (beta-lactamase)**

An antibiotic derived from penicillin that prevents bacterial growth by interfering with cell wall synthesis.

### **Amplify (DNA)**

To increase the number of copies of a DNA sequence: in vivo by inserting into a cloning vector that replicates within a host cell; in vitro by polymerase chain reaction (PCR).

### **Anaerobe**

An organism that grows in the absence of oxygen. See *Aerobe*.

### **Anneal**

The pairing of complementary DNA or RNA sequences, via hydrogen bonding, to form a double-stranded polynucleotide. Most often used to describe the binding of a short primer or probe.

### **Antibiotic resistance**

The ability of a microorganism to produce a protein that disables an antibiotic or prevents transport of the antibiotic into the cell.

### **Antibiotics**

A class of natural and synthetic compounds that inhibit the growth of or kill other microorganisms. See *Antibiotic resistance*, *Bactericide*, *Bacteriostat*.

### **Antibody**

An immunoglobulin protein produced by B-lymphocytes of the immune system that binds to a specific antigen molecule. See *Monoclonal antibodies*, *Polyclonal antibodies*.

### **Anticodon**

A nucleotide base triplet in a transfer RNA molecule that pairs with a complementary base triplet, or codon, in a messenger RNA molecule. See *Codon*, *Messenger RNA*, *RNA*.

### **Antigen**

Any foreign substance, such as a virus, bacterium, or protein, that elicits an immune response by stimulating the production of antibodies. See *Antigenic determinant*, *Antigenic switching*.

### **Antigenic determinant**

A surface feature of a microorganism or macromolecule, such as a glycoprotein, that elicits an immune response.

### **Antigenic switching**

The altering of a microorganism's surface antigens through genetic rearrangement, to elude detection by the host's immune system.

### **Antimicrobial agent**

Any chemical or biological agent that harms the growth of microorganisms.

### **Anti-oncogene**

See *Recessive oncogene*.

### **Antisense**

Way to turn off a gene by putting a "reverse version" or "mirror image" version of the gene into a cell, thereby blocking protein production. See *Marker gene*.

## **Antisense RNA**

A complementary RNA sequence that binds to a naturally occurring (sense) mRNA molecule, thus blocking its translation. See *RNA*.

## **Apoptosis**

A form of programmed cell death, characterized by maintenance of intact cell membranes during the “cell suicide” process to allow adjacent cells to engulf the dying cell so that it does not release its contents and trigger a local inflammatory reaction. An example of apoptosis is the formation of digits by the death of soft tissue during development, e.g. to form the fingers of the human hand.

## **Asexual reproduction**

Nonsexual means of reproduction which can include grafting and budding.

## **Asian Flu (H2N2)**

Influenzas are identified by the type of haemagglutinin (H1 – H15), which is an antigenic glycoprotein found on the surface of the virus and responsible for binding the virus to the host cell, and neuraminidase (N1 – N9), which is an antigenic glycoprotein enzyme found on the surface of the virus. A virulent type of influenza, H2N2 was first identified in China in late February 1957, the Asian flu spread to the United States by June 1957 where it caused about 70,000 deaths. After 1968, H2 flu disappeared, but was maintained in laboratories for research purposes. Between October 2004 and February 2005, the College of American Pathologists (CAP), a professional body which sends unidentified samples of various germs to laboratories for identification, accidentally released test kits containing H2N2 all over the world and efforts are underway to destroy all the samples.

## **Asilomar Conference**

In 1973 after the successful attempt to recombine DNA from one organism with that of another, a group of scientists called for a self-imposed moratorium on certain types of recombinant DNA experiments due to potential risks. Despite no evidence of harm, many scientists complied with the ban and research in the area stagnated. In 1975, a conference at the Asilomar Conference Center brought together 150 scientists from 13 countries, along with attorneys, government officials and members of the press. It was charged to determine whether or not to lift the moratorium and if so to set up strict guidelines under which research could continue safely. Ultimately, the conference produced a set of voluntary guidelines monitoring recombinant DNA experiments.

## **Assay**

Technique for measuring a biological response; a test; a method for determining the presence or quantity of a component.

## **Astrocyte**

One of the large neuroglia cells of neural tissues.

## **The Australia Group**

The Australia Group is a group of 38 countries that have a common commitment to combating the proliferation of chemical and biological weapons. The participating countries are suppliers and trans-shippers of chemicals, biological agents and technology that could be used in chemical and biological weapons programs. The group was formed by 15 countries in 1985 to address the spread of chemical weapons and ensure that their industries were not, either deliberately or inadvertently, assisting other states to acquire and use such weapons. Growing evidence of diversion of dual use materials to biological weapons programs led the countries concerned to take steps in 1990 to address the spread of biological weapons. The Australia Group maintains Common Control Lists, including a list of dual use biological equipment, biological agents, plant pathogens and animal pathogens, which serve as standard reference lists internationally.

### **Autosom**

A chromosome that is not involved in sex determination.

### **Avian Flu (H5N1)**

Influenzas are identified by the type of haemagglutinin (H1 – H15), which is an antigenic glycoprotein found on the surface of the virus and are responsible for binding the virus to the host cell, and neuraminidase (N1 – N9), which is an antigenic glycoprotein enzyme found on the surface of the virus. Because it is generally known to infect birds H5N1 is also known as “bird flu”. This type of influenza usually does not affect humans, but in 1997 the first case of transmission from a bird to a human occurred during an outbreak in poultry in Hong Kong . The virus caused severe respiratory illness in 18 people, 6 of whom died. Since this initial outbreak, human H5N1 infections have been seen in Thailand , Vietnam , and Cambodia during outbreaks in the poultry population.

## **B**

### **B lymphocytes (B cells)**

A type of cell that produces antibodies.

### **Bacillus**

Singular for a rod-shaped bacterium (plural, bacilli). Also used as the name of a genus of bacteria, including the species *Bacillus thuringiensis*. See *Bacillus thuringiensis (Bt)*.

### **Bacillus thuringiensis (Bt)**

Bacterium that produces a protein called Bt toxin, a biological insecticide. Bt toxin is used to control insect pests by dusting the crop with Bt bacteria. When ingested, Bt toxin kills certain insect larvae, but is regarded as harmless to humans, pets and most beneficial insects such as bees. Inserting a copy of the Bt gene into plants enables them to produce Bt toxin protein. Such plants can resist some insect pests. See *Biological control, Microbial insecticide*.

### **Backcross**

Crossing an organism with one of its parent organisms.

**Bacteria**

One of the two prokaryotic (meaning that the cell has no nuclear membrane and hence no separate nucleus) domains of living things.

**Bacteriocide**

A class of antibiotics that kills bacterial cells.

**Bacteriophage (phage or phage particle)**

A virus that infects bacteria. Altered forms are used as vectors for cloning DNA.

**Bacteriostat**

A class of antibiotics that prevents growth of bacterial cells.

**Bacterium Class of single-cell organisms without a distinct nucleus (plural, bacteria)**

One member, *E. coli*, is commonly used in recombinant DNA technology for producing proteins and other chemicals.

**Base**

On the DNA molecule, one of the four chemical units that are linked in a series to make a strand of DNA. The four DNA bases are: adenine (A), cytosine (C), guanine (G), and thymine (T). In RNA, uracil (U) substitutes for thymine. See *DNA finger printing*, *Nucleotide*.

**Base pair (bp)**

A pair of complementary nitrogenous bases in a DNA molecule (adenine-thymine and guanine-cytosine). Also, the unit of measurement for DNA sequences.

**beta-DNA**

The normal form of DNA found in biological systems, which exists as a right-handed helix.

**beta-Lactamase**

Ampicillin resistance gene. See *Selectable marker*.

**Bioassay**

A method of determining the effect of a compound by quantifying its effect on living organisms or their component parts.

**Bioaugmentation**

Increasing the activity of bacteria that decompose pollutants; a technique used in bioremediation.

**Biocatalyst**

An enzyme that activates or speeds up a chemical reaction.

**Biodiversity**

The wide diversity and interrelatedness of earth organisms based on genetic and environmental factors.

**Bioenrichment**

Adding nutrients or oxygen to increase microbial breakdown of pollutants.

**Bioethics**

The study of the ethical and moral implications of new biological discoveries, biomedical advances, and their applications as in the fields of genetic engineering and drug research. It considers all living organisms and the environment, from the level of the individual to the biosphere.

**Biofilms**

See *Microbial mats*.

**Biological control (biocontrol)**

Managing pest populations by purposefully manipulating beneficial natural enemies - predatory or parasitic insects that kill pest insects, or microbes that cause insect diseases. See *Bacillus thuringiensis (Bt)*.

**Biological Resource Centre (BRC)**

Service providers and repositories of the living cells, genomes of organisms, and information relating to heredity and the functions of biological systems. BRCs contain collections of culturable organisms, cells and tissues, as well as databases containing molecular, physiological and structural information relevant to these collections and related bioinformatics. Click [here](#) for more information on the OECD's work on the BRC.

**Biological molecules**

Large, complex molecules, such as proteins, nucleic acids, lipids and carbohydrates, that are produced only by living organisms. Biological molecules are often referred to as macromolecules or biopolymers.

**Biological Warfare**

The wartime use of biological weapons.

**Biological Weapon**

The weaponisation of pathogens, parts of them, or their toxins. This may involve modifying the environmental viability of the organism, its dispersal characteristics, its infectivity etc.

## **Biological Weapons Convention (BWC)**

The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (referred to as the Biological Weapons Convention, BWC) was the first multilateral disarmament treaty banning the production and use of an entire category of weapons. It was the result of prolonged efforts by the international community to establish a new instrument that would supplement the 1925 Geneva Protocol. Opened for signature on April 10, 1972, it entered into force March 26, 1975 when 22 governments had finalized their instruments of ratification. It commits the 153 states that are party to it to prohibit national development, production, and stockpiling of biological and toxin weapons and to act to ensure that citizens of those countries likewise do not engage in these activities. However, the absence of any formal verification regime to monitor compliance has limited the effectiveness of the Convention. A protracted process of negotiation to add these missing elements began in the 1990s. Click [here](#) for the BWC website.

## **Biologics**

Agents, such as vaccines, that give immunity to diseases or harmful biotic stresses.

## **Biomass**

The total dry weight of all organisms in a particular sample, population, or area.

## **Bioprocessing**

A technique in which microorganisms, living cells, or their components are used to produce a desired end product.

## **Biopulping**

Experimental way of using a fungus to pretreat wood chips before making paper pulp. Biopulping reduces both energy use and water-polluting by-products.

## **Bioreactor**

A container used for bioprocessing.

## **Bioremediation**

Using organisms, usually microorganisms, to remove toxins from soil, air or groundwater. See *Bioaugmentation*, *Bioenrichment*.

## **Biosafety Levels I – IV**

The combination of containment practices (i.e. - laboratory practices and techniques, safety equipment, and facility design) required for a certain type of biological research. There are four levels of biosafety, where biosafety level I is the least stringent and biosafety level IV the most stringent.

## **Biosafety**

The safe handling practices, procedures and proper use of containment facilities to prevent accidental harm caused by living organisms either directly or indirectly to individuals within laboratories or to the environment.

### **Biosecurity**

Measures to protect against the malicious use of pathogens, parts of them, or their toxins in direct or indirect acts against humans, livestock or crops.

### **Biosensor technology**

The use of cells or biological molecules in an electronic system to detect specific substances. Consists of a biological sensing agent coupled with a microelectronic circuit.

### **Biosynthesis**

Production of a chemical by a living organism.

### **Biotechnology**

The application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.

### **Bioterrorism**

The malicious use by terrorists of pathogens, parts of them, or their toxins in direct or indirect acts against humans, livestock or crops.

### **Biotic stress**

Living organisms which can harm plants, such as viruses, fungi, and bacteria, and harmful insects. See *Abiotic stress*.

### **Blastocoel**

The cavity in the blastula of the developing embryo.

### **Blastocyst**

A preimplantation embryo of about 150 cells. The blastocyst consists of a sphere made up of an outer layer of cells (the trophoblast), a fluid-filled cavity (the blastocoel), and a cluster of cells on the interior (the inner cell mass).

### **Bone marrow stromal cells**

A stem cell found in bone marrow that generates bone, cartilage, fat, and fibrous connective tissue.

### **Bovine growth hormone/bovine somatotropin (BGH/BST)**

Two names for one protein hormone produced in the pituitary gland of cattle. BGH/BST can also be produced by inserting a copy of the gene for BGH/BST into laboratory bacteria. Such recombinant BGH/BST is also referred to as rBGH/rBST. Purified from pituitary glands or from bacterial cultures, BGH/BST injected into dairy cows can increase milk production up to 20 percent. Compare to porcine somatotropin (PST).

## **bP**

See *Base pair*.

## **Bt**

See *Bacillus thuringiensis*.

## **C**

### **Callus**

A cluster of undifferentiated plant cells that have the capacity to regenerate a whole plant in some species.

### **Capsid**

See *Coat protein*.

### **Carcinogen**

A substance that induces cancer.

### **Carcinoma**

A malignant tumor derived from epithelial tissue, which forms the skin and outer cell layers of internal organs.

### **Catalyst**

A substance that promotes a chemical reaction by lowering the activation energy of a chemical reaction, but which itself remains unaltered at the end of the reaction. See *Catalytic antibody*, *Catalytic RNA*.

### **Catalytic antibody (abzyme)**

An antibody selected for its ability to catalyze a chemical reaction by binding to and stabilizing the transition state intermediate.

### **Catalytic RNA (ribozyme)**

A natural or synthetic RNA molecule that cuts an RNA substrate.

**Cation**

A positively charged ion.

**cDNA**

DNA synthesized from an RNA template using reverse transcriptase.

**cDNA library**

A library composed of complementary copies of cellular mRNAs. See *Library*.

**Cell**

Smallest unit of living matter able to grow and reproduce independently. Cells contain DNA for storing information, ribosomes for making proteins, and mechanisms for converting energy.

**Cell culture**

A technique for growing cells *in vitro* (under laboratory conditions on an artificial medium) for experimental research.

**Cell division**

Method by which a single cell divides to create two cells. This continuous process allows a population of cells to increase in number or maintain its numbers.

**Cell fusion**

The formation of a hybrid cell produced by fusing two different cells.

**Cell-based therapies**

Treatment in which stem cells are induced to differentiate into the specific cell type required to repair damaged or depleted adult cell populations or tissues.

**Cellular oncogene (proto-oncogene)**

A normal gene that when mutated or improperly expressed contributes to the development of cancer. See *Oncogene*.

**Centers of origin**

Location where the oldest cultivation of a particular crop has been identified.

**Central dogma**

Francis Crick's seminal concept that in nature genetic information generally flows from DNA to RNA to protein.

## **Centrifugation**

Separating molecules by size or density using centrifugal forces generated by a spinning rotor. G forces of several hundred thousand times gravity are generated in ultracentrifugation. See *Density gradient centrifugation*.

## **Centromere**

The central portion of the chromosome to which the spindle fibers attach during mitotic and meiotic division.

## **Characterize**

Describe the distinguishing traits.

## **Chloramphenicol**

An antibiotic that interferes with protein synthesis.

## **Chloroplasts**

The light absorbing structures found in plant cells which give them their green colour.

## **Chromatid**

Each of the two daughter strands of a duplicated chromosome joined at the centromere during mitosis and meiosis.

## **Chromosome**

One or more microscopic rod-shaped elements in the nucleus of a cell that contain genetic information for that cell. Chromosomes are composed of a single DNA molecule and protein. Each chromosome contains numerous genes. Chromosomes occur in pairs: one obtained from the mother; the other from the father. Chromosomes of different pairs are often visibly different from each other.

## **Chromosome walking**

Working from a flanking DNA marker, overlapping clones are successively identified that span a chromosomal region of interest. See *Chromosome*.

## **Chymosin**

Enzyme, also called rennet, used in making cheese. Chymosin can be extracted from the stomach of veal calves, or from genetically engineered bacteria that have the gene for chymosin.

## **Cistron**

A DNA sequence that codes for a specific polypeptide; a gene. See *DNA*, *Gene*.

## **Clinical Trials**

A rigorously controlled scientific test to answer specific question about the effectiveness and safety of a therapeutic agent (such as a drug or vaccine) using consenting human subjects. Clinical trials are normally performed before the agent is made available for general clinical use and after achieving promising results from laboratory and animal studies.

## **Clone**

A cell, collection of cells or organism containing identical genetic material. Clones are produced from a single parent cell. A stem cell produces a line of clones.

## **Cloning**

Technique of creating a group of genetically identical cells or DNA molecules from the mitotic division a single ancestor. See *Directional cloning*, *Megabase cloning*, *Molecular cloning*, *Subcloning*.

## **Coat protein (capsid)**

The coating of a protein that enclosed the nucleic acid core of a virus.

## **Code of Conduct / Code of Ethics / Code of Practice**

Non-legislated guidelines which one or more organisations voluntarily agree to abide by, and which sets out the standard of conduct or behavior with respect to a particular activity.

## **Codon**

A group of three nucleotides that specifies addition of one of the 20 amino acids during translation of an mRNA into a polypeptide. Strings of codons form genes and strings of genes form chromosomes. See *Initiation codon*, *Termination codon*.

## **Coenzyme (cofactor)**

An organic molecule, such as a vitamin, that binds to an enzyme and is required for its catalytic activity.

## **Cofactor**

See *Coenzyme*.

## **Colony**

A group of identical cells (clones) derived from a single progenitor cell.

## **Commensalism**

The close association of two or more dissimilar organisms where the association is advantageous to one and doesn't affect the other(s). See *Parasitism*, *Symbiosis*.

## **Communicable Disease**

A disease that is transmitted from person to person through direct contact with an infected individual, the infected individual's discharge, or indirectly through a vector. Many of these diseases can be prevented through the use of protective measures, such as increased sanitation or a high level of vaccine coverage of vulnerable populations.

## **Competency**

An ephemeral state, induced by treatment with cold cations, during which bacterial cells are capable of uptaking foreign DNA.

## **Complementary DNA or RNA**

The matching strand of a DNA or RNA molecule to which its bases pair. See *DNA*, *RNA*.

## **Complementary nucleotides**

Members of the pairs adenine-thymine, adenine-uracil, and guanine-cytosine that have the ability to hydrogen bond to one another. See *nucleotide*.

## **Concatemer**

A DNA segment composed of repeated sequences linked end to end.

## **Conjugation**

The joining of two bacteria cells when genetic material is transferred from one bacterium to another.

## **Constitutive promoter**

An unregulated promoter that allows for continual transcription of its associated gene. See *Promoter*.

## **Containment**

The safe methods for managing infectious materials in a laboratory where they are being handled or maintained. The purpose is to eliminate the risk of adverse exposure to harmful agents by laboratory personnel or the outside environment. There are three elements to containment: laboratory practice and technique, safety equipment, and facility design.

## **Contiguous (contig) map**

The alignment of sequence data from large, adjacent regions of the genome to produce a continuous nucleotide sequence across a chromosomal region. See *Mapping*.

## **Convention on Biological Diversity (CBD)**

One of the key agreements adopted at the 1992 Earth Summit in Rio de Janeiro, where many world leaders agreed upon a comprehensive strategy for sustainable development. The Convention established three main goals: the conservation of biological diversity, the sustainable use of its

components, and the fair and equitable sharing of the benefits from the use of genetic resources. Click [here](#) to go to the CDB website.

### **Copy DNA**

See *cDNA*.

### **Cross hybridization**

The hydrogen bonding of a single-stranded DNA sequence that is partially but not entirely complementary to a singlestranded substrate. Often, this involves hybridizing a DNA probe for a specific DNA sequence to the homologous sequences of different species.

### **Cross pollination**

Fertilization of a plant from a plant with a different genetic makeup.

### **Cross protect**

Make a plant resistant to a severe virus by intentionally infecting it with a mild strain of the same virus.

### **Crossing-over**

The exchange of DNA sequences between chromatids of homologous chromosomes during meiosis.

### **Culture**

Cultivate cells or living organisms in a prepared medium under laboratory conditions. "Culture" is both the process and the growing cells.

### **Culture medium**

A nutrient system for artificially growing bacteria or other cells. Growth factors that may be added to direct desired changes in the cells.

### **Cyclic AMP (cyclic adenosine monophosphate)**

A second messenger that regulates many intracellular reactions by transducing signals from extracellular growth factors to cellular metabolic pathways.

### **Cystic fibrosis**

Disease of mucous glands throughout the body that usually develops during childhood, and makes breathing increasingly difficult. If a child receives two copies of the defective gene called the CF gene (one copy from each parent) then the child will develop the disease.

### **Cytogenetics**

Study that relates the appearance and behavior of chromosomes to genetic phenomenon.

