

4.1 Glossary of technical terms

This glossary of technical terms indicates the source of the definition. It presents, in some instances, more than one definition of a term, with the second entry providing an expanded explanation. Expanded definitions may also focus on the application of the terms in the field of genetic modification rather than in their widest context. Entries have been edited to conform with report style if necessary. Some entries, marked [New Zealand], provide an explanation particularly applicable to New Zealand circumstances.

allergen

A substance that causes an allergic reaction.

Waiter, there's a Gene in My Food

also **allergic reaction, allergy**: an exaggerated physical response to some antigen, typically a common environmental substance, that produces little or no response in the general population, resulting when histamine or histamine-like substances are released from injured cells. It involves various respiratory and dermatological symptoms, such as sneezing or itching.

Academic Press Dictionary of Science and Technology

also **allergenicity**: Ability to induce various types of allergic responses (also known as hypersensitivity responses).

Virology/Immunology

antibiotic resistance

The ability of a bacterium to synthesise a protein that neutralises an antibiotic.

BioTech Life Sciences Dictionary

also **antibiotic resistance genes:** Genes in a microorganism that confer resistance to antibiotics, for example by coding for enzymes that destroy it, by coding for surface proteins that prevent it from entering the microorganism, or by being a mutant form of the antibiotic's target so that it can ignore it.

BioTech Life Sciences Dictionary

antigen

A usually protein or carbohydrate substance (as a toxin or enzyme) capable of stimulating an immune response.

Merriam-Webster's Collegiate Dictionary

bacteriophage

see **phage**

biocontrol, biological control

The use of one organism to control the population size of another organism.

About Biotechnology

The agricultural use of living things, such as parasites, diseases, and predators, to control or eliminate others, such as weeds and pests, rather than by using chemicals (herbicides and pesticides).

BioTech Life Sciences Dictionary

biodiversity, biological diversity

The existence of a wide range of different types of organisms in a given place at a given time.

BioTech Life Sciences Dictionary

The variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

World Foundation for Environment and Development

also **biodiversity prospecting** or **'bioprospecting'**: The search for useful genetic and biochemical compounds and materials and related information in nature.

biodynamic

Of or relating to a system of farming that uses only organic materials for fertilising and soil conditioning.

Merriam-Webster's Collegiate Dictionary

bioinformatics

The newly developed computer-based discipline that organises biological data, particularly genetic data.

The Current Uses of Genetic Modification

The use of computers in solving information problems in the life sciences; mainly, it involves the creation of extensive electronic databases on genomes, protein sequences, etc. Secondly, it involves techniques such as the three-dimensional modelling of biomolecules and biological systems.

BioTech Life Sciences Dictionary

biomedicine

Medicine based on the application of the principles of the natural sciences and especially biology and biochemistry.

Merriam-Webster's Collegiate Dictionary

also **biomedical engineering**: The use of engineering technology, instrumentation and methods to solve medical problems, such as improving our understanding of physiology and the manufacture of artificial limbs and organs.

BioTech Life Sciences Dictionary

'biopiracy'

The unauthorised and uncompensated taking of biological resources.

World Foundation for Environment and Development

bioremediation

The use of plants or microorganisms to clean up pollution or to solve other environmental problems.

BioTech Life Sciences Dictionary

biosecurity

The protection of people and natural resources from unwanted organisms capable of causing harm.

Environmental Performance Indicators Programme

[*New Zealand*] The cost effective protection of any natural resources from organisms capable of causing unwanted harm. The Biosecurity Act 1993 is the main act dealing with biosecurity issues. It has resulted in changes to the way biosecurity is managed and viewed.

Previously, pest management largely had an agricultural or horticultural focus. But this tended to overlook other pests, like environmental pests. With the

passing of the Biosecurity Act, when we now talk about biosecurity pests, we mean a wide range of organisms that are harmful, not only to production industries, but also to the environment (including the land, freshwater and marine environments, as well as to people). That includes undesirable animals, undesirable plants such as weeds, and organisms that attack animals and plants (including disease-causing microorganisms).

MAF Rural Bulletin May 1999

biosphere

- (1) The part of the world in which life can exist.
- (2) Living beings together with their environment.

Merriam-Webster's Collegiate Dictionary

biotechnology

Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

World Foundation for Environment and Development

The industrial use of living organisms or biological techniques developed through basic research. Biotechnology products include antibiotics, insulin, interferon, recombinant DNA, and techniques such as waste recycling. Much older forms of biotechnology include breadmaking, cheesemaking and brewing wine and beer.

BioTech Life Sciences Dictionary

clone

(of DNA): An identical copy. The term may be applied to a fragment of DNA, a plasmid that contains a single fragment of DNA, or a bacterium that contains such a plasmid.

(of animal): An identical offspring, generally created by transfer of an identical nucleus into a recipient egg.

The Current Uses of Genetic Modification

- (1) To insert a piece of DNA into a vector for subsequent amplification and isolation of that specific piece;
- (2) A piece of DNA composed of a vector and its insert.

Bernie May

also cloning vector: Biological carriers such as plasmids, bacteriophages, or cosmids used to amplify an inserted DNA sequence.

Bernie May

containment

(biological): Containment based on a biological barrier that prevents the transmission or escape of an organism.

(physical): Containment achieved by the control of access, restriction of air circulation, and/or the provision of other secure physical barriers.

The Current Uses of Genetic Modification

also containment facility: [*New Zealand*] A place approved in accordance with section 39 of the Biosecurity Act, for holding organisms that should not become established in New Zealand.

MAF Biosecurity Authority

also PC1 containment: [*Australia/New Zealand*] PC1 containment applies to microorganisms with low community and individual risk, which are unlikely to cause human, animal or plant disease. Special containment is not necessary, open bench work is permissible, with standard laboratory practices.

University of Technology, Sydney

copyright

The exclusive legal right to reproduce, publish, and sell the matter and form (as of a literary, musical, or artistic work).

Merriam-Webster's Collegiate Dictionary

crippled bacteria, viruses

Bacteria and viruses that have had parts of their genomes that would make them infective, removed.

David Heaf

cross-pollination

The transfer of pollen from the anther of the flower of one plant to the flowers of a different plant.

Garden Web

cultivar

A cultivated plant or animal that has no known wild ancestor.

BioTech Life Sciences Dictionary

A variety of plant produced through selective breeding by humans and maintained by cultivation.

The Genomics Lexicon

cytogenetics

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

An Agricultural and Environmental Biotechnology Annotated Dictionary

DNA

Deoxyribonucleic acid, the chemical at the centre of the cells of living things which controls the structure and purpose of each cell and carries genetic information during reproduction.

Cambridge International Dictionary of English

A nucleic acid that constitutes the genetic material of all cellular organisms and the DNA viruses; DNA replicates and controls through messenger RNA the inheritable characteristics of all organisms. A molecule of DNA is made up of two parallel twisted chains of alternating units of phosphoric acid and deoxyribose, linked by crosspieces of the purine bases and the pyrimidine bases, resulting in a right-handed helical structure, that carries genetic information encoded in the sequence of the bases.

Academic Press Dictionary of Science and Technology

ecosystem

The complex of a community of organisms and its environment functioning as an ecological unit.

Merriam-Webster's Collegiate Dictionary

enzymes

Proteins that control the various steps in all chemical reactions.

An Agricultural and Environmental Biotechnology Annotated Dictionary

Any of numerous complex proteins that are produced by living cells and catalyse specific biochemical reactions at body temperatures.

Merriam-Webster's Collegiate Dictionary

also **restriction enzyme:** any of various enzymes that break DNA into fragments at specific sites in the interior of the molecule — called also restriction endonuclease.

Merriam-Webster's Collegiate Dictionary

expression (gene)

The process by which proteins are made from the instructions encoded in DNA.

NHGRI Glossary of Genetic Terms

The process by which a gene's coded information is converted into the structures present and operating in the cell. Expressed genes include those

that are transcribed into mRNA and then translated into protein and those that are transcribed into RNA but not translated into protein (eg, transfer and ribosomal RNAs).

BioTech Life Sciences Dictionary

field trial

A trial of a new product in actual situations for which it is intended.

Merriam-Webster's Collegiate Dictionary

gene

A unit of hereditary information. A gene is a section of a DNA molecule that specifies the production of a particular protein.

About Biotechnology

A locus on a chromosome that encodes a specific protein or several related proteins. It is considered the functional unit of heredity.

An Agricultural and Environmental Biotechnology Annotated Dictionary

gene knockout

Inactivation of specific genes. Knockouts are often created in laboratory organisms such as yeast or mice so that scientists can study the knockout organism as a model for a particular disease.

NHGRI Glossary of Genetic Terms

gene therapy

The process of introducing new genes into the DNA of ... cells to correct a genetic disease or flaw. (1) Human gene therapy: Insertion of normal DNA directly into cells to correct a genetic defect. (2) Somatic cell gene therapy: The repair or replacement of a defective gene within somatic tissue.

BioTech Life Sciences Dictionary

(3) Germ-line (gene) therapy: The repair or replacement of a defective gene within the gamete-forming tissues, which produces a heritable change in an organism's genetic constitution.

An Agricultural and Environmental Biotechnology Annotated Dictionary

gene transfer

The transfer of genes into a cell by any of a number of different methods available.

BioTech Life Sciences Dictionary

Insertion of unrelated DNA into the cells of an organism. There are many different reasons for gene transfer: for example, attempting to treat disease by supplying patients with therapeutic genes. There are also many possible ways

to transfer genes. Most involve the use of a vector, such as a specially modified virus that can take the gene along when it enters the cell.

NHGRI Glossary of Genetic Terms

genetic code

The way genetic information is stored in living organisms.

About Biotechnology

The biochemical basis of heredity consisting of codons in DNA and RNA that determine the specific amino acid sequence in proteins and appear to be uniform for all known forms of life.

Merriam-Webster's Collegiate Dictionary

genetic drift

Random variation in gene frequency from one generation to another.

An Agricultural and Environmental Biotechnology Annotated Dictionary

The random change of the occurrence of a particular gene in a population; genetic drift is thought to be one cause of speciation when a group of organisms is separated from its parent population.

BioTech Life Sciences Dictionary

genetic engineering (GE)

see **genetic modification**

genetic marker

A usually dominant gene or trait that serves especially to identify genes or traits linked with it.

Merriam-Webster's Collegiate Dictionary

A segment of DNA with an identifiable physical location on a chromosome and whose inheritance can be followed. A marker can be a gene, or it can be some section of DNA with no known function. Because DNA segments that lie near each other on a chromosome tend to be inherited together, markers are often used as indirect ways of tracking the inheritance pattern of a gene that has not yet been identified, but whose approximate location is known.

NHGRI Glossary of Genetic Terms

genetic modification (GM)

Altering the genetic material of cells or organisms in order to make them capable of making new substances or performing new functions.

The Genomics Lexicon

The technique of removing, modifying or adding genes to a DNA molecule in order to change the information it contains. By changing this information,

genetic engineering changes the type or amount of proteins an organism is capable of producing.

About Biotechnology

Note: for purposes of the Commission, the term “genetic modification” is defined in the Warrant establishing the Commission (see Appendix 1, page 159).

genetically modified organism (GMO)

Organisms that have had genes from other species inserted into their genome.

Functional Genomics Glossary

An organism whose genome has been altered by the inclusion of foreign genetic material. This may be derived from other individuals of the same or wholly different species, or of an artificial nature. Foreign genetic information can be added to the organism during its early development and incorporated in cells of the entire organism. Genetic information can also be added later in development to selected portions of the organism.

Functional Genomics Glossary

genome

The total hereditary material of a cell.

About Biotechnology

The genetic complement contained in the chromosomes of a given organism, usually the haploid chromosome state.

An Agricultural and Environmental Biotechnology Annotated Dictionary

also **genome projects:** Research and technology development efforts aimed at mapping and sequencing some or all of the genome of human beings and other organisms.

BioTech Life Sciences Dictionary

genomics

The discipline involving the study of the collection of genes found in an organism.

The Current Uses of Genetic Modification

The study of genomes, which includes genome mapping, gene sequencing and gene function.

BioTech Life Sciences Dictionary

also **genomic healthcare:** Healthcare which utilises advances made by the science of genomics.

The Genomics Lexicon

also **genomic library**: A random collection of cloned DNA fragments (usually in viral or cosmid vectors) that together represent virtually all of an organism's DNA. Partial or subgenomic libraries contain only restriction fragments of a certain size range.

Bernie May

herbicide

Any substance that is toxic to plants; usually used to kill specific unwanted plants.

An Agricultural and Environmental Biotechnology Annotated Dictionary

Any agent, either organic or inorganic, used to destroy unwanted vegetation, especially weeds and grasses; selective herbicides eliminate weeds without destroying desirable crop or garden plants; nonselective herbicides destroy all vegetation in the given area.

Academic Press Dictionary of Science and Technology

horizontal gene transfer

The transfer of genes or genetic material directly from one individual to another by processes similar to infection. It is distinct from the normal process of vertical gene transfer — from parents to offspring — which occurs in reproduction. Natural agents exist which can transfer genes horizontally between individuals. These are viruses, many of which cause diseases, and other pieces of parasitic genetic material, called plasmids and transposons, many of which carry and spread antibiotic and drug resistance genes. These are able to get into cells and then make use of the cell's resources to multiply many copies or to jump into (as well as out of) the cell's genome. The natural agents are limited by species barriers, so that for example, pig viruses will infect pigs, but not human beings, and cauliflower viruses will not attack tomatoes. However, genetic engineers make artificial vectors (carriers of genes) by combining parts of the most infectious natural agents, with their disease-causing functions removed or disabled, and design them to overcome species barriers, so the same vector may now transfer, say, human genes, which are spliced into the vector, into the cells of all other mammals, or cells of plants.

ngin (Norfolk Genetic Information Network)

informed consent

The process by which an individual willingly and voluntarily agrees to participate in an activity after first understanding the risks and benefits or participation (as against non-participation) in an activity or research study. In a genetic study, potential participants should be appraised of the study goals, risks, benefits, alternative to participation, disclosure policies, and financial

and time commitments involved in study participation. The informed consent process should be documents, typically with a signed consent form approved by an Institutional Review Board. Special considerations apply to vulnerable populations (ie, minors, mentally handicapped individuals).

The Genomics Lexicon

intellectual property

Useful artistic and industrial information and knowledge.

International Law Dictionary and Directory

That area of the law involving patents, copyrights, trademarks, trade secrets, and plant variety protection.

Shaping Genes

marker genes

Genes that identify which plants [or animals] have been successfully transformed.

About Biotechnology

metabolic disease

An inherited enzyme abnormality.

Nutritional and Metabolic Diseases.

mRNA (messenger RNA)

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.

An Agricultural and Environmental Biotechnology Annotated Dictionary

mutagenesis

The occurrence or induction of mutation.

Merriam-Webster's Collegiate Dictionary

The introduction of permanent heritable changes (ie, mutations) into the DNA of an organism. In the case of site-directed mutagenesis, the substitution or modification of a single amino acid at a defined location in a protein is performed by changing one or more base pairs in the DNA using recombinant DNA technology.

Functional Genomics Glossary

non-tariff trade barriers

Economic, political, administrative or legal impediments to trade other than duties, taxes and import quotas.

World Cargo Alliance, Inc.

nutraceutical

Any substance that is a food or a part of a food and provides medical or health benefits, including the prevention and treatment of disease. [Note: “Nutraceutical” and “nutriceutical” are frequently used interchangeably.]

Nutraceutical Alliance

nutriceutical

Nutriceutical is a term derived from the words ‘nutrition’ and ‘pharmaceutical’. A nutriceutical is a product that combines food and an active ingredient such as a drug or a vitamin or some other chemical substance. These products are on the leading edge of development and are a nineties phenomenon. [Note: “Nutraceutical” and “nutriceutical” are frequently used interchangeably.]

ScienceNet

organic

Of, relating to, yielding, or involving the use of food produced with the use of feed or fertiliser of plant or animal origin without employment of chemically formulated fertilisers, growth stimulants, antibiotics, or pesticides.

Merriam-Webster’s Collegiate Dictionary

organism

An individual animal, plant, or single-celled life form.

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patent

Title by which a government grants the exclusive right to make use of an invention for a fixed time period.

Money Words

PC1 containment

see **containment**

pesticide

A substance that kills harmful organisms (for example, an insecticide or fungicide).

An Agricultural and Environmental Biotechnology Annotated Dictionary

A chemical which is used to kill unwanted organisms such as rats, insects, nematodes, etc. Pesticides often act as nerve poisons, and they are hazardous to animals and humans (some pesticides can cause nerve or liver damage, birth defects and cancer).

Biotech Life Sciences Dictionary

phage, bacteriophage

A virus for which the natural host is a bacterial cell. Used as a vector for cloning segments of DNA.

Functional Genomics Glossary

(Bacteriophage) A virus that parasitises bacteria. It initiates infection by attaching itself by its tail to the wall of bacterial cell. Through enzyme action the bacteria wall is perforated and the bacteriophage DNA or RNA passes through into bacterial cell. It uses the cell's machinery to make more bacteriophage DNA and bacteriophages, which are released by breakage of the bacterial cell.

A Dictionary of Biology

Plant Variety Rights

[New Zealand] A grant of Plant Variety Rights for a new plant variety gives the holder the exclusive right to produce for sale and to sell propagating material of the variety. In the case of vegetatively propagated fruit and ornamental varieties Plant Variety Rights gives the holder the additional exclusive right to propagate the protected variety for the purpose of the commercial production of fruit, flowers or other products of the variety.

Plant Variety Rights Office

plasmid

A small, circular piece of DNA found outside the chromosome in bacteria. Plasmids are the principal tools for inserting new genetic information into microorganisms or plants.

About Biotechnology

A structure composed of DNA that is separate from the cell's genome. In bacteria, plasmids confer a variety of traits and can be exchanged between individuals — even those of different species. Plasmids can be manipulated in the laboratory to deliver specific genetic sequences into a cell.

The Genomics Lexicon

protein

A biological molecule which consists of many amino acids chained together by peptide bonds. The sequence of amino acids in a protein is determined by the sequence of nucleotides in a DNA molecule. As the chain of amino acids is being synthesised, it is also folded into higher order structures shaped, for example, like helices or like flat sheets. Proteins are required for the structure, function, and regulation of cells, tissues, and organs in the body.

The Genomics Lexicon

proteomics

The new discipline that aims to identify and characterise all the proteins present in a cell.

The Current Uses of Genetic Modification

recombinant DNA

DNA molecules that have been created by combining DNA from more than one source.

The Genomics Lexicon

Recombinant DNA is a fragment of DNA incorporated artificially into the DNA molecule of a suitable vector so that it can express itself many times. This way a large quantity of the DNA in question can be obtained. The DNA is usually one that contains genes of interest, such as interferon, insulin, or growth hormone. The DNA may also be intended to fix mutated genes causing diseases, such as haemophilia or sickle cell anaemia. The vector could be plasmids, bacteriophages, and cosmids (packaged plasmid DNA into a phage particle).

BioTech Life Sciences Dictionary

also recombinant clones: Clones containing recombinant DNA molecules.

BioTech Life Sciences Dictionary

also recombinant DNA technology: The technology upon which genetic engineering or genetic modification is based. The process involves DNA being joined together in novel combinations.

The Current Uses of Genetic Modification

sequencing

Determining the order of nucleotides in a DNA or RNA molecule, or determining the order of amino acids in a protein.

The Genomics Lexicon

substantial equivalence

A comparative technique recommended by the Organisation for Economic Co-operation and Development (OECD): when faced with a novel or modified food or food product, you search for its nearest equivalent amongst existing organisms used as food or sources of food. These can then be used as the basis for comparison to assess risk, given that there should be extensive knowledge available.

Waiter, there's a Gene in My Food

'super-weed'/'super-bug'

A weed or pest that has developed a resistance to a herbicide/pesticide that once destroyed it.

Waiter, there's a Gene in My Food

terminator technology

The current popular term applying to the methods used to render plant seeds sterile and unable to germinate.

The Current Uses of Genetic Modification

toxicity test

Controlled laboratory test to determine the toxicity of a chemical to an organism in terms of specific chemical concentrations.

An acute toxicity test establishes the concentration required to kill a predetermined proportion of test organisms within a relatively short period of time, typically four days or less. A chronic toxicity test reveals the effects of a sublethal concentration applied throughout all or part of the life cycle.

On-line Medical Dictionary

transformation

A change in the genetic structure of an organism as a result of the uptake and incorporation of foreign DNA.

About Biotechnology

transgene

A gene transferred to a recipient organism using recombinant technology.

The Current Uses of Genetic Modification

transgenic

An organism that has been genetically engineered to contain the genes from another species.

Waiter, there's a Gene in My Food

An organism whose genome has been altered by the inclusion of foreign genetic material. This foreign genetic material may be derived from other individuals of the same species or from wholly different species. Genetic material may also be of an artificial nature. Foreign genetic information can be added to the organism during its early development and incorporated in cells of the entire organism. As an example, mice embryos have been given the gene for rat growth hormone allowing mice to grow into large adults. Genetic information can also be added later in development to selected portions of the organism. As an example, experimental genetic therapy to

treat cystic fibrosis involves selective addition of genes responsible for lung function and is administered directly to the lung tissue of children and adults.

The Genomics Lexicon

transposon

A [DNA] sequence that can move about in the genome of an organism.

Marine Biological Laboratory

A segment of DNA flanked by transposable elements that is capable of moving its location in the genome.

Bernie May

vaccine

A preparation of dead or weakened pathogen, or of derived antigenic determinants, that is used to induce formation of antibodies or immunity against the pathogen.

An Agricultural and Environmental Biotechnology Annotated Dictionary

vector

An organism or a biological molecule used to transfer material to a different organism or cell. In genetic modification, this refers to an organism, bacterium or plasmid able to transfer DNA.

The Current Uses of Genetic Modification

A self-replicating DNA molecule that exists with, but is separate from the genome of the host cell. Many different vectors have been identified and genetically engineered for use in molecular biology. DNA inserted into a vector will be replicated along with the vector. In this manner, DNA of interest can be obtained in large quantities, ie, cloned. For example, the human insulin gene can be cloned into the plasmid vector pBr 322 which, in turn, will replicate in *E. coli* cultures.

Bernie May

also **cloning vector**: DNA molecule originating from a virus, a plasmid, or the cell of a higher organism into which another DNA fragment of appropriate size can be integrated without loss of the vector's capacity for self-replication; vectors introduce foreign DNA into host cells, where it can be reproduced in large quantities. Examples are plasmids, cosmids, and yeast artificial chromosomes; vectors are often recombinant molecules containing DNA sequences from several sources.

The Genomics Lexicon

virus

An infectious agent composed of a single type of nucleic acid, DNA or RNA, enclosed in a coat of protein. Viruses can multiply only within living cells.

About Biotechnology

Viruses consist of a piece of nucleic acid covered by protein. Viruses can only reproduce by infecting a cell and using the cell's mechanisms for self-replication. They can cause disease; modified viruses can also be used as a tool in gene therapy to introduce new DNA into a cell's genome.

The Genomics Lexicon

xenotransplant

Transplantation of tissue or organs between organisms of different species, genus, or family. A common example is the use of pig heart valves in humans.

The Genomics Lexicon

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