

11. Glossary of terms, links and resources

The following terms frequently appear in dossiers submitted for safety evaluation. For more information on biotechnology-related terminology, see the FAO Glossary of Biotechnology for Food and Agriculture at http://www.fao.org/biotech/index_glossary.asp

Glossary

Adjuvant

An agent mixed with an antigen that enhances the immune response to that antigen or to immunization.

Antisense gene

A gene that produces a transcript (mRNA) that is complementary to the pre-mRNA or mRNA of a normal gene (usually constructed by inverting the coding region relative to the promoter).

Bioavailability

The proportion of a nutrient or administered drug, etc. that can be taken up by an organism in a biologically effective form. For example, some soils high in phosphorus (P) have a low level of P availability because the pH of the soil renders much of the P insoluble.

Biosafety

Refers to the avoidance of risk to human health and safety, and to the conservation of the environment, during the use for research and commerce of infectious or genetically modified organisms.

Biotechnology (modern)

The application of:

1. *In vitro* nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles; or
2. Fusion of cells beyond the taxonomic family that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection (Cartagena Protocol on Biosafety to the Convention on Biological Diversity).

Biotechnology (traditional)

1. Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use (Convention on Biological Diversity).
2. Interpreted in a narrow sense, which considers only the new DNA techniques, molecular biology and reproductive technological applications, biotechnology covers a range of different technologies such as gene manipulation and gene transfer, DNA typing and cloning of plants and animals (FAO statement on biotechnology).

Comparative approach

The comparative approach, previously referred to as substantial equivalence, embodies the concept that GM foods can be assessed to a large extent by comparison to the benchmark of commonly consumed foods already regarded as safe (the traditional or non-modified counterpart). The comparison is usually made at the level of the composition of the food.

Concatemer

A DNA segment made up of repeated sequences linked head to tail.

Concatenation

Combination of two (or more) strings of DNA in a defined order.

Conventional counterpart

A related plant variety, its components and/or products for which there is experience of establishing safety based on common use as food.

Copy number

The number of copies of a particular plasmid per bacterial cell, or copies of a gene per genome.

Dietary exposure

Contact by ingestion between a physical, chemical or biological agent and an organism.

Gene silencing

Gene silencing is a general term describing epigenetic processes of gene regulation and refers to an event of interruption or suppression of the expression of a gene. Genes are regulated at either the transcriptional or post-transcriptional level. Transcriptional gene silencing is the result of histone modifications, creating an environment of heterochromatin around a gene that makes it inaccessible to transcriptional machinery. Post-transcriptional gene silencing is the result of mRNA of a particular gene being destroyed. The destruction of the mRNA prevents translation to form an active gene product. The term frequently appears in the dossiers often refers to a natural reaction of plants to high levels of foreign gene expression. However, not all foreign gene expression leads to gene silencing. Many factors contribute to gene silencing including the nature and orientation of the foreign transgenes, expression levels and phase of development.

Genetic engineering

Modification of the genotype, and hence the phenotype, by transgenesis, which is the introduction of a gene or genes into animal or plant cells, which leads to the transmission of the input gene (transgene) to successive generations.

Genetically modified foods (GM foods)

Genetically modified (GM) foods are foods produced from genetically modified organisms (GMOs) that have had their genome altered through genetic engineering (e.g. GM corn) or foods that contain ingredients from GMOs (e.g. chocolate containing GM soybeans).

Genetically modified organism (GMO)

An organism that has been transformed by the insertion of one or more transgenes.

Hapten

A small molecule, which by itself is not an antigen, but which as a part of a larger structure when linked to a carrier protein, can serve as an antigenic determinant.

Helper plasmid

A plasmid that provides a function or functions to another plasmid in the same cell.

Immunoglobulin E (IgE)

Class E immunoglobulins (IgE) are highly specialized antibodies that are produced in lymphatic tissue near the respiratory and digestive tracts. Although they make up only 0.001 percent of antibodies, IgE immunoglobulins are involved in virtually every allergic reaction. IgE antibodies dock onto their respective allergen and stimulate the production of substances that cause inflammation. The subsequent immune over-reaction is known as an allergy. Specialized IgE antibodies can be detected in the blood serum of individuals who are sensitive to the respective allergen.

In vitro digestibility assay

Methods are available for determining the digestibility of protein-containing composites, including foods and feed ingredients. The methods comprise incubation of the composite with proteases, followed by determination of the hydrolysed peptide bonds. The methods are suitable for rapid, routine determination of digestibility in food and feed processing plants.

Isogenic parental line

In genetically modified plants, isogenic initial lines mean those non-GM plants from which the GM strains are derived. Thus, the only difference between GM plants and their derivative isogenic line will be those genes that have been transferred transgenically. Evaluating GM plants for possible unexpected effects necessitates comparison with unmodified parental strains. In order to eliminate any possible influence of normal genetic variation between different hereditary lines and varieties, isogenic lines are usually used as a standard for comparison.

Open reading frame (ORF)

A sequence of nucleotides in a DNA molecule that has the potential to encode a peptide or protein. An ORF contains a start triplet (ATG), which is followed by a series of triplets (each of which encodes an amino acid), and ends with a stop codon (TAA, TAG or TGA). The term is generally applied to sequences of DNA fragments for which no function has yet been determined. The number of ORFs provides an estimate of the number of genes transcribed from the DNA sequence.

Outcrossing

A mating between different populations or individuals of the same species that are not closely related. The term "outcrossing" can be used to describe unintended pollination by an outside source of the same crop during hybrid seed production.

Pleiotropy (pleiotropic effects)

The simultaneous effect of a given gene on more than one apparently unrelated trait.

Positional effect

The influence of the location of a gene (particularly a transgene) on its expression and hence on the phenotype.

Post-translational modification

The addition of specific chemical residues to a protein after it has been translated. Common residues are phosphate groups (phosphorylation) and sugars (glycosylation).

Recombinant

A term used in both classical and molecular genetics.

1. In classical genetics: an organism or cell that is the result of meiotic recombination.
2. In molecular genetics: a hybrid molecule made up of DNA obtained from different organisms.
Typically used as an adjective, e.g. recombinant-DNA.

Recombinant-DNA

The result of combining DNA fragments from different sources.

Substantial equivalence

Substantial equivalence is a concept, first described in an OECD publication in 1993, which stresses that an assessment of a novel food, in particular one that is genetically modified, should demonstrate that the food is as safe as its traditional counterpart.

Toxicokinetics

The study of the time-dependent processes related to toxicants as they interact with living organisms. It encompasses absorption, distribution, storage, biotransformation and elimination.

Transfer DNA (T-DNA)

The DNA segment of the Ti plasmid, present in pathogenic *Agrobacterium tumefaciens*, that is transferred to plant cells and inserted into the plant's DNA as part of the infection process. Wild-type T-DNA encodes enzymes that induce the plant to synthesize specific opines that are required for bacterial growth. In engineered T-DNAs, these genes are replaced by one or more transgenes.

Transgene

An isolated gene sequence used to transform an organism. Often, but not always, the transgene has been derived from a different species from that of the recipient.

Weediness

The ability of a plant to colonize a disturbed habitat and compete with cultivated species.

Links and resources

Inter-governmental organizations

Food and Agriculture Organization

The multi-lingual FAO Biotechnology website provides access to updated news and events, documents, an e-mail forum, a glossary, national biotechnology policy documents and other useful information about many aspects of modern biotechnology.
<http://www.fao.org/biotech>

Codex Alimentarius

The Codex Alimentarius Commission was created in 1963 by FAO and WHO to develop food standards, guidelines and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme. Related to GM food safety, the Codex ad hoc Intergovernmental Task Force on Foods Derived from Biotechnology has published *Principles for the risk analysis of foods derived from modern biotechnology* and *Guideline for the conduct of food safety assessment of foods derived from recombinant-DNA plants*, provided in Appendices 1 and 2 of this monograph. http://www.codexalimentarius.net/web/index_en.jsp

World Health Organization

WHO has been addressing a wide range of issues in the field of biotechnology and human health, including safety evaluation of vaccines produced using biotechnology, human cloning and gene therapy. <http://www.who.int/foodsafety/biotech/en/>

Organisation for Economic Co-operation and Development

The OECD's programme of work for the Safety of Novel Foods and Feeds is intended to promote international harmonization in the safety assessment and regulation of GM foods and feeds, including the products of modern biotechnology. The OECD's Task Force for the Safety of Novel Foods and Feeds decided at its first session, in 1999, to focus its work on the development of science-based consensus documents, which are mutually acceptable among member countries. These consensus documents contain information for use during the regulatory assessment of a particular food/feed product. In the area of food and feed safety, consensus documents are being published on the nutrients, antinutrients or toxicants, information on the product's use as a food/feed and other relevant information.

http://www.oecd.org/topic/0,2686,en_2649_37437_1_1_1_1_37437,00.html

Biosafety Clearing House

The Biosafety Clearing-House (BCH) is an information exchange mechanism established by the Cartagena Protocol on Biosafety to assist Parties to implement its provisions and to facilitate sharing of information on, and experience with, living modified organisms (LMOs).

<http://bch.biodiv.org/>

International Centre for Genetic Engineering and Biotechnology

ICGEB offers a rich array of information. The BioSafety web page provides extensive links to international treaties, conventions and meetings, including submissions by member governments. <http://www.icgeb.org>

United Nations Industrial Development Organization

UNIDO is the only organization that maintains detailed databases of key industrial statistics with worldwide coverage. It has established a network of regional centres providing comprehensive training in biosafety. http://binas.unido.org/wiki/index.php/Main_Page

Institute for Health and Consumer Protection of the Joint Research Center

IHCP is part of the Directorate General JRC and fulfils the JRC's mission in providing scientific support to policies related to health and consumer protection. <http://ihcp.jrc.ec.europa.eu/>

Some Governmental regulatory web sites related to GM foods

Australia and New Zealand

Food Safety Australia New Zealand (FSANZ).

<http://www.foodstandards.gov.au/foodmatters/gmfoods/index.cfm>

Canada

Health Canada.

http://www.hc-sc.gc.ca/food-aliment/mh-dm/ofb-bba/nfi-ani/e_novel_foods_and_ingredient.html

European Commission

European Food Safety Authority (EFSA).

<http://www.efsa.europa.eu/en/science/gmo.html>

India

Department of Biotechnology: Biosafety Rules and Regulations.

<http://dbtbiosafety.nic.in/>

Japan

Ministry of Health, Labour and Welfare.

<http://www.mhlw.go.jp/english/topics/food/index.html>

United States

Food and Drug Administration, <http://www.cfsan.fda.gov/~lrd/biotechm.html#reg>

United States Department of Agriculture, <http://www.usda.gov>

United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, <http://www.epa.gov/> ●