



Food and Agriculture
Organization of the
United Nations

Information toolkit on
food biotechnologies
with a focus on
food safety

6

Human health



Introduction



Tool 6 provides considerations and four examples that could help address the concerns that are most frequently raised in connection with the safety of foods derived from biotechnologies – namely whether genetically modified (GM) foods in particular, are safe to eat. This topic, along with the topic of GM foods and the environment (the topic of Tool 7 (FAO, 2021b)), was indicated in an expert consultation as a primary concern of the general public regarding food biotechnologies (FAO, 2020a). This tool can be used in conjunction with Tool 4 on GM food safety assessment (FAO, 2021c). It is important to ensure that the messages developed starting from the information in this tool are factual, and that they are based on observations or on what is scientifically assessed as likely, rather than on theoretical possibilities.

1. Approved GM foods are safe to eat.
2. The safety of GM foods is assessed before marketing.
3. People have always eaten deoxyribonucleic acid (DNA), which is found in all plants, animals and microorganisms.
4. Approved GM foods do not cause new allergic reactions.

Materials produced using the information in these examples can be used for various purposes such as educating students or raising public awareness via online platforms. Some people might have further questions on this topic, for example regarding the potential long-term effect of consuming GM foods, or regarding the nutritional compositions and health benefits. Furthermore, interactive discussions on the topic may give rise to further specific questions, and scientific evidence should be sourced from neutral and trusted sources before providing relevant information. The images alongside the texts provided here can be referred to as example-illustrations of how one may present the materials.

Four examples

Approved genetically modified (GM) foods are safe to eat

“Are GM foods safe to eat? – Yes, approved GM foods are safe to eat.” The example below is presented in a question-and-answer format to convey this message effectively. The safety of GM foods is ensured through rigorous scientific safety assessments which examine the quality, allergenicity, toxicity, composition and nutritional value of GM foods. It is worth noting that GM foods are one of the most scrutinized food types from a safety perspective – no other type of food goes through such a comprehensive safety assessment. As mentioned in Tool 4, all foods (including those derived using other non-GM biotechnologies) need to comply with food safety requirements concerning hygiene, additives and residues.

When informing the public about this topic, it is suggested to use examples of GM food varieties that are relevant to the domestic market and that are frequently consumed by the general public, so that people will relate the information to the foods they eat. Apples, tomatoes, papayas and corn are used in the illustration below. Here, the word “examine” is used with regard to the safety assessment of GM foods that governments perform; however, there are several other terms that were suggested during the expert consultation meetings, such as “evaluate” and “conduct”. Users of this toolkit can choose which words to use as appropriate.



Are GM foods safe to eat?

Yes, approved GM foods are safe to eat. Before they can be put on the market, governments examine rigorous safety assessments of GM foods.

GM foods are evaluated to ensure they are as safe as similar non-GM foods.

The safety of GM foods is assessed before marketing

Prior to marketing, developers of the GM foods assess the safety of the product according to the official GM food safety assessment process (see Tool 4), and they submit the results to the government for examination and approval. The example here provided covers the process that helps ensure that GM foods are as safe as similar non-GM foods that have been eaten for centuries. In the example, the statement “GM foods on the market are safe for human consumption” is supported by the extra information on the commercial history of GM foods, which have been on the market since 1994 (when the “Flavr Savr” tomatoes, which were genetically modified to remain firm longer, were introduced).

Information provided may also focus on the government’s role in ensuring the safety of GM foods before they go to market instead of focusing on the role of the developer. The phrase “assesses the safety of GM foods” can be replaced by other alternatives, such as “provides the evidence on the safety of GM foods” or “performs scientific experiments to demonstrate the safety of GM foods”.



GM foods on the market are safe for human consumption.

Prior to marketing, a developer assesses the safety of GM foods. The results are submitted to the government for approval. This process helps ensure that the GM foods are as safe as similar non-GM foods.

GM foods have been on the market since 1994, when “Flavr Savr” tomatoes were introduced.

The infographic features a blue background with a white wavy line. On the left is an illustration of a scientist in a white lab coat holding a DNA helix. On the right is an illustration of a yellow stalk with green leaves. A yellow circle contains text about the Flavr Savr tomato.

People have always eaten DNA, which is found in all plants, animals and microorganisms

The phrase “Eating DNA” may sound scary and surprising to some people. Often people think that only GM foods contain DNA, which is incorrect. All of the cells which make up plants, animals and humans contain DNA. During the digestion process, DNA, similar to proteins and complex carbohydrates, is broken down into pieces. This is done through enzymes that cut the DNA into pieces. This process takes place regardless of whether DNA comes from GM foods or their non-GM counterparts.

The example reported here shows that DNA is present in our daily meals and is a normal part of our diet. DNA is in plants, animals and microorganisms, and it remains in the leaves, roots, grains, nuts, fruit, meat and eggs that are produced. Hence, it is absolutely normal that we eat DNA whether from GM or non-GM foods. This example could be used as a starting point to improve the understanding that GM foods can be safely consumed. This information could be combined with that presented in Tool 2 (FAO, 2021d).

DNA is found in foods of plant, animal and microbial origins.

People have been always eating DNA.

All DNA, whether it's from a GM food or a conventional food, is digested in the same way.

Approved GM foods do not cause new allergic reactions

Before they go to market, GM foods undergo assessments to ensure their overall safety.

Tool 4 (FAO, 2021c) includes details of a stepwise GM safety assessment. One of the steps in the assessment considers whether the genetic modification of a new GM product will produce a protein which could provoke an allergic reaction in susceptible people. As a matter of principle, genetic modifications that involve transferring a gene from a commonly allergenic organism to a non-allergenic one is discouraged, unless it can be demonstrated that the protein product of the transferred gene is not allergenic (FAO & WHO, 2001).

Allergy assessments have been conducted since the 1990s and the safety assessment process is based on guidance of many reliable scientific bodies, including the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), and the joint FAO-WHO food standards programme, Codex Alimentarius (FAO & WHO, 2008).



Approved GM foods do not cause new allergic reactions.

For example, people who are not allergic to non-GM soybeans, will not be allergic to GM soybeans.

All GM foods are analysed for potential allergic reactions as part of the GM food safety assessment.

The infographic features a blue wavy line separating the title from the main text. On the left, there is an illustration of a green soybean pod with several yellow soybeans. On the right, there is an illustration of a female doctor with dark skin and curly hair, wearing a white lab coat and a stethoscope, holding a white clipboard. A purple circular callout box is positioned between the text and the doctor.

References

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- FAO.** 2021b. Information toolkit on food biotechnologies with a focus on food safety - Tool 7: Environment. Rome, FAO.
- FAO.** 2021c. Information toolkit on food biotechnologies with a focus on food safety - Tool 4: GM food safety assessment. Rome, FAO.
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Terminology

Biosafety	Set of measures or actions addressing the safety aspects related to the application of biotechnologies and to the release into the environment of transgenic plants and other organisms, particularly microorganisms, that could negatively affect plant genetic resources, plant, animal or human health, or the environment (FAO, 2001).
Biotechnology	Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for a specific use. In this document, the words “food biotechnology” are used when biotechnology is applied to make or modify foods for human consumption (FAO, 2001).
Conventional counterpart	A related organism/variety, its components and/or products for which there is experience of establishing safety based on common use as food (FAO and WHO, 2009).
Deoxyribonucleic acid	Deoxyribonucleic acid (DNA) is a long chain polymer of deoxyribonucleotides. DNA constitutes the genetic material of most known organisms and organelles, and is usually in the form of a double helix, although some viral genomes consist of a single strand of DNA, and others of a single- or a double-stranded ribonucleic acid (RNA) (FAO, 2001).
Gene	The unit of heredity transmitted from generation to generation during sexual or asexual reproduction. More generally, the term is used in relation to the transmission and inheritance of particular identifiable traits. The simplest gene consists of a segment of nucleic acid that encodes an individual protein or RNA (FAO, 2001).
Genome editing	Techniques utilized by scientists to correct or to introduce specific mutations at a particular site (locus) within the DNA of an organism. The techniques used to accomplish these site-specific corrections or directed mutations (base substitution, addition or deletion) include living modified organism (LMO) genome editing and transcription activator-like effector nucleases (TALEN). The term genome editing may be used interchangeably (FAO, 2019).
Genetic modification	Altering the genetic material of cells or organisms with the intention of making them capable of producing new substances or performing new functions (FAO, 2020a). The term genetic engineering may be used interchangeably.
Genetically modified food	Food produced for human consumption and derived from organisms whose genetic material (DNA) has been modified in a way that does not occur naturally, e.g. through introducing a gene from a different organism (FAO, 2020a).
Genetically modified organism	An organism that has been transformed by inserting one or more transgenes (FAO, 2001).
Living modified organism	A living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology. It is a synonym of GMO, but is restricted to organisms that can endanger biological diversity (FAO, 2001).
Modern biotechnology	Application of: i) <i>In vitro</i> nucleic acid techniques, including r-DNA and direct injection of nucleic acid into cells or organelles, or ii) fusion of cells beyond the taxonomic family that overcome natural physiological reproductive or recombinant barriers and that are not techniques used in traditional breeding and selection (FAO, 2001).

Food and Agriculture Organization of the United Nations
FAO-HQ@fao.org
www.fao.org
Rome, Italy

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