

# Food Safety of Crops and Foods Produced Through Biotechnology

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## **Question: Are biotech foods safe to eat?**

**Answer:** Most scientific experts agree that foods produced through biotechnology are as safe as, or safer than, any other food in the supermarket. Genetically modified crops aren't new. For thousands of years plant breeders have worked to create genetically modified crop varieties. None of the crops that we eat today resembles its wild ancestor. Most ancestors were poisonous and low-yielding wild plants before early humans domesticated them. Today we can choose among hundreds of varieties of some crops, all so genetically different that they differ in size, shape, and even color. And varieties of the same grain, fruit, or vegetable can have different compositions and nutrient contents as well. That is because they are all extensively genetically modified — the “traditional” way.

## **Q: Who regulates genetic modification of foods?**

**A:** There is no regulatory oversight of traditional genetic modification. This kind of plant breeding allows the introduction of thousands of new varieties each year all over the world without any requirement for pre-market safety review. We have learned from thousands of years of experience that plant breeding is almost always safe. By contrast, plants modified with modern biotechnology techniques are subjected to careful pre-market safety evaluation and must be approved by government regulatory agencies before reaching the market.

## **Q: Who says GM foods are safe?**

**A:** In the face of contradictory statements about the safety of GM (genetically modified) foods, the consumer must decide whom to believe. There exists a broad scientific consensus that foods produced through biotechnology are not only as safe as foods produced through conventional plant-breeding technology, but probably they are safer. This is because of the more precise technology that is used to produce them and the closer regulatory scrutiny they undergo.

- That was the conclusion of European Union scientists who studied the safety assessment process used for biotech foods. A similar conclusion was reached in 2003 by United Kingdom scientists who were asked by their government to evaluate the potential risks of GM foods.
- A large number of scientific societies, expert panels, national academies of sciences and international organizations have studied the safety of GM foods and crops and reached the same conclusion: There is no reason to be concerned about the safety of eating foods derived through biotechnology. For more information see the statements of the American Dietetic Association, the American Medical Association, and the Institute for Food Technologists.

**Q: Aren't genetically modified foods fundamentally different?**

**A:** Opponents of crops produced through biotechnology like to call them “Frankenfoods.” In fact, rather than being drastically altered monstrosities, most are crops into which a single new trait has been inserted. Since one or two genes are inserted into a plant that has some 25,000 to 40,000 genes, it's fair to say that not much has really been changed

**Q: Why tinker with plant genes in the first place?**

**A:** Most GM crops on the market today fall into three classes:

- Plants that are resistant to insects by the introduction of a gene that helps them defend themselves,
- Plants into which a gene has been introduced for an enzyme that makes them tolerant to weed-control herbicides, and
- Plants containing a gene for a viral protein that makes them resistant to viruses.

Composition analysis has shown that these biotech crops have the same amounts of protein, lipids, and carbohydrates as other varieties of the same crop. They also have the same vitamin and mineral content. In fact, aside from the one additional trait that is present in very small amounts in the plant, they have the same composition.

**Q: Am I eating GM foods?**

**A:** We all have been eating ingredients derived from biotech crops for about 12 years in the United States. It has been estimated that more than 70 percent of the processed foods in the supermarket have one or more biotech ingredients. Cornstarch and soybean oil are the two most common products with biotech ingredients.

**Q: Who's minding the store?**

**A:** Under the Coordinated Framework for the Regulation of Biotechnology, published in 1986, authority for regulation of biotech crops falls to three lead government agencies: the USDA (United States Department of Agriculture), EPA (Environmental Protection Agency) and the FDA (Food and Drug Administration). In practice, it takes seven to 10 years for a new biotech variety to achieve government permission to be grown commercially. In the process, hundreds of scientific studies must be presented by the developer and evaluated by the agencies and their scientific advisors, most of whom are university experts.

**Q: How does the regulatory process work to ensure safety?**

**A:** There are two very important principles to remember about the regulatory process. First, regulatory review does not seek to prove that all biotech crops or GM foods are safe or not safe. Also, the process does not require that a food or crop be proven to be absolutely safe. Each new variety is different and each will have unique safety issues that must be examined. If one GM crop is found to be safe, it does not mean that all are safe; and if one biotech crop variety were found to be unacceptably risky, it would not mean that all uses of biotechnology are unsafe. This is called case-by-case evaluation. Second, no food or crop is absolutely safe; each poses at least some minimal risk. The regulatory overview requires developers to demonstrate that their new biotech variety is as safe as other varieties in the marketplace today.

**Q: What safety evaluations are performed?**

**A:** The EPA and FDA each have a role in assuring that biotech foods are safe before they are introduced into the marketplace, and each new biotech crop is examined according to published federal guidelines. Three principal questions must be answered:

- 1) Is the newly introduced DNA itself safe to consume?
- 2) Is the product of the newly introduced gene safe to consume?
- 3) Have any unintended or unexpected changes occurred?

The safety assurance process actually begins with the design of the product itself. Developers go to great lengths to avoid introducing traits they believe might be hazardous to consumers. Many ideas fall by the wayside before any developmental research is ever done on them.

While plant breeders try to introduce beneficial traits into a plant, they also are expected to do that without changing the plant in any unintended way. New varieties are expected to grow as fast, yield as much or more than their predecessors, look the same, taste the same, and be resistant to the same diseases and pests. If unintended genetic changes were introduced during breeding, these could affect the way the plant grows and performs. Many experimental plants fail to meet these criteria and are discarded.

Newly developed varieties are tested for equivalence in composition — to prove they have the same composition as other varieties of the same kind of crop. They should have the same nutritional value — proteins, lipids, carbohydrates, fiber, vitamins and minerals. Compositional equivalence also provides strong evidence that no unintended changes have taken place.

Producing changes in composition is sometimes the intent of the plant breeder. High lysine corn and high oleic soybean oil are two examples of such nutritionally altered crops from plant breeders. Biotechnology is a powerful tool that plant breeders can use to improve the nutritional value and health benefits of foods. Golden Rice — a rice variety designed to fight Vitamin A deficiency — is one such example.

**Q: Are GM foods tested first in animals?**

**A:** New biotech varieties have been fed to a number of animal species to test their performance as feeds. No differences have been observed between GM crops and conventional crops when used as feeds. These feeding tests are not intended, however, to prove that long-term consumption of these crops by humans is absolutely safe. That is because there are no valid scientific protocols available for proving that whole foods, developed through conventional breeding or through biotechnology, are safe. It is virtually impossible to provide absolute assurance that food will be safe to consume over a whole lifetime of 80 or more years. With foods that are reasonably safe — like biotech crops — scientists and regulators rely instead on the detailed analysis of composition, toxicity, and potential for allergenicity. If no safety issues are detected during these studies and the composition is unchanged, there is no reason to believe that there will be any long-term safety issues with a biotech food.

**Q: This is somewhat reassuring, but I still can't decide. What's the bottom line?**

**A:** The pre-market safety assessment required for biotech foods is designed to ensure that they are as safe as any other food. It is important that consumers hear all the sides of a debate and that all the information be made available to them. Most scientists believe that, as consumers find out more about biotechnology, their level of comfort with its value to the food system and its safety will rise, so they welcome the dialogue.

Regrettably, the debate over GM foods diverts attention from more important public health issues. In the United States and other developed countries, obesity, overweight, and poor diet choices are by far the food issues most likely to affect our health and longevity. Our major focus should be on consuming an appropriate amount of caloric energy to maintain a healthy weight, and on making sure that we eat a healthful selection of nutrients.

### References and suggestions for future reading

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