

## What are GMOs?

You've heard or seen all of these terms: genetic engineering, genetically modified, genetically modified organism (GMO). They are all related to biotechnology. Basically, they refer to the process of taking the gene for a specific characteristic from one organism and transferring it to another.

Why do this? Some plants have a special ability to fight off disease or deal with difficult growing conditions that are controlled by their genes. Genes work by coding for proteins that express traits or characteristics. These characteristics can be desirable - like disease resistance or drought tolerance - or undesirable, such as susceptible to certain pests or insects during the growing cycle. Sometimes these genes can be separated from the organism and given to a different plant,\* allowing the plant that receives the genes to fight a disease or pest, or tolerate harsh growing conditions. When genes from one species of plant or organism are inserted into another plant or organism with the help of biotechnology, the result is a genetically modified organism, or GMO. Genes are genes and are not identifiable as being from a particular living organism. Humans have been breeding plants and animals to have desirable traits as long as they have been farming. Biotechnology is a way to speed up the process of sharing genes without going through the slow cross breeding methods.

## What kinds of traits have been introduced in plants that are genetically modified?

Most of the crops that have been genetically engineered have had genes transferred that make the crop resistant to pests or able to withstand herbicides that allow the desirable crop to grow, but not weeds. For example, corn, canola, potatoes and cotton have had genes from bacteria called *Bacillus thuringiensis* (Bt) added to them that code for insecticidal proteins. In fact, *Bt* is so safe and the insecticidal properties so well known, it has been used on plants for decades by organic farmers. <http://www.bt.ucsd.edu/index.html>

Crops such as soybeans and cotton have been modified so that they can be sprayed with an herbicide (RoundUp) that kills the weeds around them but doesn't affect the crop at all.

Other plants such as papaya and some squash varieties have had genes inserted that make them resistant to plant viruses. In the future, it may be possible to add genes that improve a plant's nutrition profile by adding a beneficial nutrient or changing the fatty acid content.

## **Are GMO foods safe to eat?**

Yes. Commercially grown GMO foods have been safely consumed in the United States since 1994. There is broad scientific consensus among food and safety regulatory bodies – including World Health Organization, American Medical Association, Food and Drug Administration, U.S. Department of Agriculture, Environmental Protection Agency and others across the globe - that approved GMO products currently in the marketplace are as safe to eat as their conventional counterparts. Many scientists have and continue to study the benefits and effects of GMO, and there is no evidence that GMO foods pose a risk to humans.

There are individuals and organizations who question the safety of growing and eating food produced from GMO seeds. Mostly the expressed concerns have to do with people eating foods that are perceived as being “new” and related fears that they may cause allergies or result in unforeseen health consequences.

## **Are GMO products considered a new breed or species?**

The governmental and scientific agencies responsible for food labelling determined that GMO foods should not be treated as a “new” food – therefore requiring a label - because they are not identifiably different from the non GMO version of the same food. The changes at the molecular level are so insignificant that there was no need for the product to be labeled. The major difference is that the GMO products are being developed to be more pathogen resistant and produce better crop yields.

## **Who is responsible for making sure that GMOs are safe to eat?**

GMO technology and applications are overseen by three government agencies. The Food and Drug Administration (FDA) is responsible for the food safety and health effects of GMOs, while the US Department of Agriculture (USDA) is responsible for the safety of GMO crops in agriculture and the trade implications of GMOs. The Environmental Protection Agency (EPA) is responsible for the safety of pesticides, which includes genes used in biotechnology displaying pesticidal traits.

Food-safety tests have been conducted by GMO seed producers as well as others, and reviewed by the FDA. None of the tests have shown any sign of harm, including allergies or other reactions. There is broad consensus among food and safety regulatory bodies that approved biotech (GMO) crops are as safe and acceptable as their conventional counterparts.

## **What crops are most likely to be GMO and where are they grown?**

GMO crops are currently grown in the United States as well as 26 other countries. Over 80% of US farmland is planted with GMO seeds. In 2013, this included 97% of all sugar beets (which provide about 40% of the nation's granulated sugar), 93% of soybeans, 90% of cotton and 90% of field corn (but much less of sweet corn; see below “What products are likely to contain GMO's?”). Canada has a similar high percentage of GMO canola planted.

## **What products are likely to contain GMO's?**

Unless they are certified organic, most products made with corn, sugar beets or soybeans grown in the US contain GMOs or ingredients made from GMO products. If you find this surprising, perhaps it is because you never noticed a difference in the products that you've been eating for nearly 20 years. GMO crops are no different from non-GMO crops except for very specific changes made in their genetic code that made them more efficient – such as more pathogen resistant, more climate adaptable or less labor intensive to grow.

## **Why are GMO crops being grown?**

Individual farmers decide whether or not to grow GMO crops. GMO seeds must be purchased from a biotechnology seed company and are more expensive than conventional seeds. However, since many GMO seeds enable a more efficient use of pesticides (a significant cost), can require less weeding, and produce higher yields, many farmers decide to use GMO seeds because it makes sense in terms of cost and time management.

Farmers who choose not to use GMO seeds typically do so for two reasons: they are a certified organic grower and organic certification disallows use of GMOs and GMO ingredients, or they do not want to pay the additional costs up front. Ultimately, farmers decide what product market is best for them and their farms.

## **What are the benefits of GMO crops?**

Since GMO crops are often engineered to resist damage from pests and herbicides, they often require less application of products, thus reducing worker safety issues on farms and reducing the cost and investment of these products by farmers. For example, Bt cotton which is currently grown in the US, China, and India, has resulted in larger crop yields per acre and lower use of insecticides. GMO soybeans, corn and other crops are tolerant to the herbicide Bt and allow farmer to spend less time eliminating weeds and use less herbicide compared to traditional crop varieties.

Less pest damage means larger yields per acre and more food being produced. This is especially important in developing countries where crop failure – due to pests or weather conditions - is a huge problem and can result in severe hunger and malnutrition.

## What are the concerns about GMO foods?

One concern about GMO foods and crops has focused on the possibility of food allergies caused by introducing new proteins into foods. During the initial premarket safety evaluations for GMO varieties, potential allergens are carefully considered and factored into the safety evaluation.

Another concern is the potential impact of GMO seeds on the natural communities and ecosystems that form around plants and animals. A concern is that widespread use will eventually lead to resistant weeds and pests, requiring the use of harsher chemicals. At this point in time, this has not been the case. Data are being collected and reviewed by the EPA to evaluate the environmental impact of GMO crops. GMO seed companies are working on new technologies and evaluating the environmental impact. Farmers are natural environmentalists because their livelihood depends on a sustainable use of their farmland. They are conservationists and are often the first ones to use a process or technology with a lower environmental footprint. Many farmers have been on the same land for generations and they are the last ones who are going to harm the land or water their family lives on.

Although some have tried to blame GMOs for creating problems for beneficial insects such as honeybees or butterflies, these claims have not held up under close examination. Researchers at the USDA and EPA have been carefully examining potential causes of Colony Collapse Disorder, a syndrome affecting bees which have a variety of contributors unrelated to GMOs. [For more information on this, go to: <http://www.usda.gov/documents/ReportHoneyBeeHealth.pdf>

## How can I avoid GMOs if I want to?

Certified organic foods cannot be grown from GMO seeds nor have any other GMO ingredient. Any food bearing the certified organic label must be produced without the use of GMOs or genetic engineering.

The national organic standards are clear: *GMOs are prohibited in any product that has the word "organic" on the front panel.* So, not only are 100% organic products and 70% organic products non-GMO, but products that claim to be "made with organic ingredients" should not contain anything derived from GMOs.

## Why aren't GMO foods labeled?

The FDA doesn't require labeling of GMO foods unless they are significantly different from their non-GMO counterpart. According to FDA labeling laws, mandatory labeling of foods is only required when foods

- Have a nutritional property that is significantly different than the conventional foods;
- Contain an unexpected allergens that poses a risk;
- Contain a toxin in amounts above acceptable levels.

Since GMO foods that are available commercially do not meet these criteria, they have not been labeled.

Because some consumers remain very concerned about GMO foods, the FDA and others reviewed the issue again and proposed voluntary labeling for GMO foods. There are pros and cons to labeling GMO foods. Individuals on both sides of the argument have important points to consider and they are listed below.

**Issue:** GMO labels on foods

Pros	Cons
Labeling all foods that contain GMOs would allow consumers to make informed choices	Up to 60-70% of US foods may carry a "contain GMO" label, an expense that would be passed onto consumers; In Europe, once labeling occurred many stores stopped carrying GMO foods because consumers perceived the label as a negative
Consumers who want to avoid all GMO foods can do so easily by eating organic foods	Labeling is expensive and requires a monitoring system. All organic foods are already non-GMO, labeled and monitored so there is no need for another label

## Is there a connection between GMOs and the rise in Celiac disease?

It is absolutely true that gluten sensitivity and celiac disease have been rising rapidly in recent years. This does not mean that there's a connection between GMO's and gluten sensitivity. The reasons for the rising rates are not known, but they are rising world-wide and not just in the US, where most GMO foods are eaten. It's important to know that there is no GMO wheat. Gluten, which comes from wheat, is therefore also non-GMO. The best estimates that have been done on celiac disease and non-celiac gluten sensitivity show that about 7 percent of the population is affected - 1percent have celiac disease, 6 percent are estimated to have non-celiac gluten sensitivity. For more information go to: <http://www.celiaccentral.org/non-celiac-gluten-sensitivity/>

The leading celiac disease researchers in the world agree that celiac disease and gluten sensitivity are increasing but the credible theories suggested so far have nothing to do with GMOs.

## **Can foods be tested for GMO's?**

Yes. It is possible to test for the presence of specific DNA sequences or proteins in the food that have been introduced from biotechnology. Doing so would be similar to testing foods for their vitamin and mineral content. If labeling of GMO foods is required then testing for the presence of GMOs would be a likely outcome. The cost for conducting the tests, labeling the products and keeping records of the testing required has been estimated to be between a few dollars per person per year to 10% of annual grocery costs.

## **If GMO's are safe and so beneficial, why does the food industry seem to avoid efforts to label them?**

Great question! The food industry (grocers and food manufacturers) would like to see the creation of national standards that will bring clarity and educate people about GMOs and address misunderstandings. A voluntary system of labeling non-GMO products – similar to the Certified Organic program – could be established and meticulously monitored by the FDA or USDA.

The food industry believes the labeling of non-GMO products would be the economically preferable and most efficient approach to helping customers who wish to avoid GMOs. Although many states have proposed their own GMO labeling initiatives, many in the food industry know from past labeling experiences that this will create confusion because it results in different labeling requirements for each state. Not only would this be very confusing and potentially annoying for customers, it vastly complicates interstate commerce for products being sold in states with varying labeling requirements.