



# Genetically Modified Organism

Smith, Jeffrey (2010) *Non-GMO Shopping Guide* About GMOs

Why repeat OLD news? Because I am always **shocked** when people ask me what is **GMO**, and **why should I care**? Those of us who know can't believe EVERYBODY doesn't know. But they don't and I found this explanation to be the easiest to understand. Hope it helps and please continue to do your own research and teach others to do the same.

## What's a GMO?

A GMO (genetically modified organism) is the result of a laboratory process of taking genes from **one species** and inserting them into **another species** in an attempt to obtain a desired trait or characteristic, hence they are also known as transgenic organisms. This process may be called either Genetic Engineering (GE) or Genetic Modification (GM); they are one and the same.

## What is a gene?

Every plant and animal is made of cells, each of which has a center called a nucleus. Inside every nucleus there are strings of DNA. Short sequences of DNA are called genes. These genes operate in complex networks that are finely regulated to enable the processes of living organisms to happen in the right place and at the right time.

***But haven't growers been grafting trees, breeding animals, and hybridizing seeds for years?***

**Genetic engineering is completely different from traditional breeding and carries unique risks.** In traditional breeding it is possible to mate a pig with another pig to get a new variety, but is not possible to mate a pig with a potato or a mouse. Even when species that may seem to be closely related do succeed in breeding, the offspring are usually infertile—a horse, for example, can mate with a donkey, but the offspring (a mule) is sterile.

With genetic engineering, scientists can breach species barriers set up by nature. For example, they have spliced fish genes into tomatoes. The results are plants (or animals) with traits that would be virtually impossible to obtain with natural processes, such as crossbreeding or grafting.

## How is genetic engineering done?

In order to breach these natural barriers and make possible the introduction of DNA from a different species, genetic engineers have to find ways to force the DNA from one organism into another. These methods include:

- Using viruses or bacteria to "infect" animal or plant cells with the new DNA.
- Coating DNA onto tiny metal pellets, and firing it with a special gun into the cells.
- Injecting the new DNA into fertilized eggs with a very fine needle.
- Using electric shocks to create holes in the membrane covering sperm, and then forcing the new DNA into the sperm through these holes.

### **Is genetic engineering precise?**

The technology of genetic engineering is currently very crude. It is not possible to insert a new gene with any accuracy, and the transfer of new genes can disrupt the finely controlled network of DNA in an organism.

Current understanding of the way in which DNA works is extremely limited, and any change to the DNA of an organism at any point can have side effects that are impossible to predict or control. The new gene could, for example, alter chemical reactions within the cell or disturb cell functions. **This could lead to instability, the creation of new toxins or allergens, and changes in nutritional value.**

### **What combinations have been tried?**

It is now possible for plants to be engineered with genes taken from bacteria, viruses, insects, animals or even humans. Scientists have worked on some interesting combinations:

- Spider genes were inserted into goat DNA, in hopes that the goat milk would contain spider web protein for use in bulletproof vests.
- Cow genes turned pigskins into cowhides.
- Jellyfish genes lit up pigs' noses in the dark.
- Arctic fish genes gave tomatoes and strawberries tolerance to frost.
- Potatoes that glowed in the dark when they needed watering.
- Human genes were inserted into corn to produce spermicide.
- Corn engineered with human genes (Dow)
- Sugarcane engineered with human genes (Hawaii Agriculture Research Center)
- Corn engineered with jellyfish genes (Stanford University)
- Tobacco engineered with lettuce genes (University of Hawaii)
- Rice engineered with human genes (Applied Phytologics)
- Corn engineered with hepatitis virus genes (Prodigene)

### **Does the biotech industry hold any promise?**

Genetic modification of plants is not the only biotechnology. The study of DNA does hold promise for many potential applications, including medicine. However, the current technology of GM foods is based on obsolete information and theory, and is **prone to dangerous side effects**. Economic interests have pushed it onto the market too soon. Moreover, molecular marker technologies - so called Marker Assisted Selection (MAS) used with conventional breeding shows much promise for developing improved crop varieties, without the potentially dangerous side effects.

### **What are the problems created through genetic engineering of food and crops?**

Genetic engineers continually encounter unintended side effects – GM plants create toxins, react to weather differently, contain too much or too little nutrients, become diseased or malfunction and die. When foreign genes are inserted, dormant genes may be activated or the functioning of genes altered, **creating new or unknown proteins**, or increasing or decreasing the output of existing proteins inside the plant. The effects of consuming these new combinations of proteins are unknown.

**Hasn't research shown GM foods to be safe? No.** The only feeding study done with humans showed that **GM's** survived inside the stomach of the people eating **GMO** food. No follow-up studies were done.

Various feeding studies in animals have resulted in potentially pre-cancerous cell growth, damaged immune systems, smaller brains, livers, and testicles, partial atrophy or increased density of the liver, odd shaped cell nuclei and other unexplained anomalies, false pregnancies and higher death rates.

The American Academy of Environmental Medicine (AAEM)\* recently released its position paper on Genetically Modified foods stating that **"GM foods pose a serious health risk"** and calling for a moratorium on GM foods.

Citing several animal studies, the AAEM concludes "there is more than a casual association between GM foods and adverse health effects" and that **"GM foods pose a serious health risk"** in the areas of toxicology, allergy and immune function, reproductive health, and metabolic, physiologic and genetic health." \*\*

The AAEM further called for a moratorium on GM food, with implementation of immediate long-term safety testing and labeling of GM food. They recommended that Physicians to educate their patients, the medical community and the public to avoid GM foods and to consider the role of GM foods in their patients' disease processes. The AAEM is just one of many organizations worldwide calling for these steps to be taken.

### **Have any GM foods been banned?**

The rules of the World Trade Organization (which the US and other 150 countries are members of) explicitly prohibit countries from banning GM products. Therefore, countries that ban them do so at great risk. If this weren't the case, no doubt many countries would already have done so. Some countries have banned GM crops entirely or not approved certain GM crops that are approved elsewhere.

Europe has greater rejection of GMOs due to a more balanced reporting by their press on the health and environmental dangers. In Europe, at least 174 regions, more than 4,500 councils and local governments have declared themselves GM free.

In the US, GM wheat was not approved when wheat farmers banded together because they were concerned that contamination would seriously hurt exports. So the reason was economic, not safety.

### **What kinds of traits have been added to food crops?**

Although there are attempts to increase nutritional benefits or productivity, the two main traits that have been added to date are **herbicide tolerance** and the ability of the plant to **produce its own pesticide**. These results have no health benefit, only economic benefit. Herbicide tolerance lets the farmer spray weed-killer directly on the crop without killing it.

## **Why do genetically engineered foods have antibiotic resistant genes in them?**

The techniques used to transfer genes have a very low success rate, so the genetic engineers attach "marker genes" that are resistant to antibiotics to help them to find out which cells have taken up the new DNA. **These marker genes are resistant to antibiotics that are commonly used in human and veterinary medicine.** Some scientists believe that eating GE food containing these marker genes could encourage gut bacteria to develop antibiotic resistance.

## **What foods are GM?**

Currently commercialized GM crops in the U.S. include **soy** (91%), **cotton** (88%), **canola** (88%), **corn** (85%), **Hawaiian papaya** (more than 50%), **zucchini** and **yellow squash** (small amount), and tobacco (Quest® brand). About half of the **sugar beets** grown for sugar in 2008 were GM and current projections are that about 90% grown in 2009 will be GM.

## **What are other sources of GMOs?**

Products derived from the above, including oils from **all four**, **soy protein**, **soy lecithin**, **cornstarch**, **corn syrup** and **high fructose corn syrup** among others.

Also:

- meat, eggs, and dairy products from **animals that have eaten GM feed** (and the majority of the GM corn and soy is used for feed);
- dairy products from **cows injected with rbGH** (a GM hormone);
- **food additives, enzymes, flavorings**, and **processing agents**, including the sweetener **aspartame** (NutraSweet®) and **rennet** used to make hard cheeses;
- and **honey** and **bee pollen** that may have GM sources of pollen.
- Non-food items that may contain GM ingredients include **cosmetics, soaps, detergents, shampoo** and **bubble bath**. Pharmaceutical companies use **Aspartame** in some **laxatives, supplements** and **children's vitamins**.

\* The American Academy of Environmental Medicine was founded in 1965, and is an international association of physicians and other professionals interested in the clinical aspects of humans and their environment. AAEM provides research and education in the recognition, treatment and prevention of illnesses induced by exposures to biological and chemical agents encountered in air, food and water.

\*\* The AAEM paper further states, 'several animal studies indicate serious health risks associated with GM food consumption including infertility, immune dysregulation, accelerated aging, dysregulation of genes associated with cholesterol synthesis, insulin regulation, cell signaling, and protein formation, and changes in the liver, kidney, spleen and gastrointestinal system.

***I hope you found this information informative and will continue to do your own research to protect your health and that of your family and friends.***