

GMOs: Facts About Genetically Modified Food

By Marc Lallanilla, Staff Writer | January 11, 2016 10:49pm ET

A genetically modified organism, or GMO, is an organism that has had its DNA altered or modified in some way through genetic engineering.

In most cases, GMOs have been altered with DNA from another organism, be it a bacterium, plant, virus or animal; these organisms are sometimes referred to as "transgenic" organisms. A gene from a spider that helps the arachnid produce silk, for example, could be inserted into the DNA of an ordinary goat.

That may sound far-fetched, but that exact process was used to breed goats that produce silk proteins in their goat milk. The milk is then harvested and the silk protein is isolated to make a lightweight, ultra-strong silk with a wide range of industrial and medical uses.

Genetically modified food

The range of GMOs can boggle the mind. Geneticists have bred GMO pigs that glow in the dark by inserting into their DNA a gene for bioluminescence from a jellyfish. Tomatoes have been developed that resist frost and freezing temperatures with antifreeze genes from a cold-water fish, the winter flounder (*Pseudopleuronectes americanus*). The Food and Drug Administration also recently approved potatoes that don't bruise and apples that don't brown. The apples have been genetically engineered to reducing levels of enzymes that can cause browning or bruising.

According to the National Library of Medicine (NLM), genetically engineered foods have had foreign genes (genes from other plants or animals) inserted into their genetic codes. The potential benefits are foods that are tastier, more nutritious and resistant to diseases and droughts.

The NLM also lists some potential risks, including that the genetic alterations can cause harm and that modified organisms could be inbred with natural organisms, leading to the possible extinction of the original organism.

By far the biggest use of GMO technology has been in large-scale agricultural crops: At least 90 percent of the soy, cotton, canola, corn and sugar beets sold in the United States have been genetically engineered. The adoption of herbicide-resistant corn, which had been slower in previous years, has accelerated, reaching 89 percent of U.S. corn acreage in 2014 and in 2015, according to the U.S. Department of Agriculture.

One widely used method of incorporating insect resistance into plants is through the gene for toxin production found in the bacterium *Bacillus thuringiensis* (Bt), according to the World Health Organization. GMO crops that are modified with the Bt gene have a proven resistance to insect pests, thus reducing the need for wide-scale spraying of synthetic pesticides.

How safe are GMOs?

There are clearly two very different viewpoints when it comes to the health and safety of genetically engineered food — industry leaders and scientists who support GMOs and those who believe GMOs are harmful.

Vocal anti-GMO activists — who refer to GMO crops as "Frankenfoods" — argue that GMOs can cause environmental damage and health problems for consumers.

One such anti-GMO organization is the Center for Food Safety, which calls the genetic engineering of plants and animals potentially "one of the greatest and most intractable environmental challenges of the 21st century."

Mary Vandewiele, co-owner of The Better Health Store, a chain of 14 health-oriented stores, says that the long-term effect of GMOs remain unknown. "In reading the literature, most of the science and myths are not clear and appear to be intertwined. GMOs have clearly impacted our food industry but to what extent the damage is and can be long term, appears to be uncertain and that is a problem."

"Genetically modified foods have been linked to toxic and allergic reactions, sick, sterile and dead livestock, and damage to virtually every organ studied in lab animals," according to the Institute for Responsible Technology, a group of anti-GMO activists.

"Most developed nations do not consider GMOs to be safe," according to the Non-GMO Project. "In more than 60 countries around the world, including Australia, Japan and all of the countries in the European Union, there are significant restrictions or outright bans on the production and sale of GMOs."

However, many scientific organizations believe the fear-mongering that runs through discussions of GMO foods is more emotional than factual. "Indeed, the science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe," the American Association for the Advancement of Science (AAAS) said in a 2012 statement.

"The World Health Organization, the American Medical Association, the U.S. National Academy of Sciences, the British Royal Society, and every other respected organization that has examined the evidence has come to the same conclusion: Consuming foods containing ingredients derived from GM [genetically modified] crops is no riskier than consuming the same foods containing ingredients from crop plants modified by conventional plant improvement techniques," according to the AAAS.

Others point to the benefits of sturdier crops with higher yields. "GM crops can improve yields for farmers, reduce draws on natural resources and fossil fuels and provide nutritional benefits," according to a statement on the website for Monsanto, the world's largest manufacturer of GMOs.

GMO labeling debated

If there is a meaningful difference in the safety, composition or nutrition of the crop from which the ingredients were derived, the FDA could require additional information be added to the label.

In November 2015, the FDA issued a ruling that only requires additional labeling of foods derived from genetically engineered sources if there is a material difference — such as a different nutritional profile — between the GMO product and its non-GMO equivalent. The agency also approved AquaAdvantage Salmon, a salmon designed to grow faster than non-GMO salmon.

"[In addition to the FDA ruling], recently the American Medical Association re-affirmed that there is no scientific justification for special labeling of foods that contain GM ingredients; the American Association for the Advancement of Science stated a similar stance. We support these positions and the FDA's approach," according to Monsanto.

GMOs are the most regulated and tested product in agricultural history, according to GMO Answers, a website funded by members of the Council for Biotechnology Information, which includes BASF, Bayer CropScience, Dow AgroSciences, DuPont, Monsanto and Syngenta.

"Additionally, many independent scientists and organizations around the world — such as the U.S. National Academy of Sciences, United Nations Food and Agriculture Organization, World Health Organization, American Medical Association and the American Association for Advancement of Science — have looked at thousands of scientific studies and concluded that GM food crops do not pose more risks to people, animals or the environment than any other foods."

The argument over the development and marketing of GMO foods has become a political hot potato in recent years.

The politics of GMOs

In addition to the scientific debate over GMOs, genetically modified foods have also become a political football.

Rep. Mike Pompeo (R-Kan.) sponsored a bill that would block state and local laws from requiring food labels to disclose genetically engineered ingredients, according to the Washington Post. Meanwhile, Vermont, Connecticut and Maine have passed mandatory labeling laws for genetically modified food. At least 15 other states are considering similar regulations."

State-by-state labeling regulations would make it challenging for the food industry to comply, according to attorney Thomas Sullivan of the law firm Morgan Lewis, who recently published a white paper that examines the rise in class action matters related to food-labeling,

diagnosing the government and industry forces spurring this trend. “If the industry is subject to varying degrees of regulation on labeling, that is going to make compliance very difficult, which is why we are advocating for federal law to take precedence.”

In 2012, voters in California were asked if food made from GMOs should be labeled as such. The initiative was defeated — but only after GMO proponents like Monsanto, General Mills, Pepsico, DuPont, Hershey, Cargill, Kellogg, Hormel, Kraft, Mars, Goya, Ocean Spray, Nestle and other industrial food marketers spent millions on advertising to convince voters to vote against the measure.

Opponents in several states and countries continue to push for GMO labels on foods — if not outright bans on GMO foods — but industry and science insists the foods are safe, labels aren't needed and they'll just confuse consumers. Only one thing is certain: The battle for and against GMO crops, and the foods containing them, isn't likely to end soon.

Additional reporting by Kim Zimmermann, Live Science Contributor.