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Genetically Engineered Foods FAQ

Executive Summary

- Studies on laboratory animals have shown that GMOs can cause birth defects, high infant mortality rates, fertility problems, sterility, immune system deregulation, and accelerated aging, in addition to many other side effects.
- No independent studies have proven that GMOs are safe for human consumption. In fact, there is growing evidence to the contrary.
- GMOs do not generate higher crop yields, and have no role to play in alleviating global food scarcity.
- Labeling GMO products will allow consumers to make informed choices for them and their families.

What are GMOs?

Genetically modified organisms (GMOs) and genetically engineered (GE) foods and products have had some of their genetic material altered using recombinant DNA technology. Biotech firms take DNA molecules from different sources, and combine them into one molecule to create a new set of genes. This DNA is then transferred into an organism. Transgenic organisms, a subset of GMOs, are organisms that have had DNA inserted from a different species.

Many crops are genetically modified to withstand the use of extremely toxic herbicides to control weed growth; the most common of these is Monsanto's Roundup, which contains glyphosphate. These crops are called Roundup Ready crops. However, weeds are becoming increasingly tolerant of Roundup, creating "superweeds,"[1] so a new generation of crops is being engineered to withstand an even more toxic herbicide containing 2,4-D[2] (a known carcinogen and one of the two ingredients in the infamous Agent Orange, used as chemical warfare in Vietnam).

In addition, corn[3] is genetically engineered to resist several different kinds of insects; salmon[4] are given genes from an eel-like creature to make them grow faster; and apples[5] are modified to keep them from browning if cut or bruised.

How much of our food is genetically engineered?

In the US, 90% of sugar beets[6] (which account for about half of the US sugar production), 85% of soybeans[7] (which is present in up to 70% of all food products found in US supermarkets, including cereals, breads, and even meat, as animals are fed GM soy), and 85% of corn[8] (which yields the high-fructose corn syrup, or HFCS, used in nearly all processed foods) are genetically modified.

Some argue that GMO crops are "substantially equivalent" to regular crops. Is this accurate?

No. GE crop technology thwarts the natural reproductive process. Because it shares genetic combinations across different species, it circumvents the mechanisms which nature has built in[9] to protect against dangerous combinations. Natural breeding evolved over thousands of years, whereas GMO technology has been used commercially for only a little over a decade.

Another way GMOs are not substantially equivalent is that GE soy, canola,[10] corn, and experimental rice varieties[11] have nutritional, size, and textural differences.

Why are GMOs problematic?

The greatest concern is that there is no reason to believe that GMOs are harmless to humans. In fact, they have never been fully tested for safety.

The genetic engineering process causes mutations in hundreds or thousands of locations throughout the plant's DNA[12] and changes the DNA blueprint, which can be passed down over generations. One single change at the DNA level can cause multiple changes known as pleiotropic effects.[13] Natural genes can be deleted or permanently turned on or off, and hundreds may change their behavior. Even the inserted gene itself can be damaged or rearranged, and may create new proteins that can trigger allergies or promote disease[14].

Do GE crops pose a public health risk?

While there have been no long-term studies on the effect of GMOs on humans, initial studies show that genetically modified foods can cause an allergenic response.[15] Allergies have already skyrocketed in the US, and with the introduction of GE soy in the UK, soy-related allergies rose to 50%.

Most of the studies so far have been on laboratory animals. For example, GMO corn is implanted with the Bt toxin (*Bacillus thuringiensis*) as a biological pesticide. Mammals that ingest Bt toxin develop liver and kidney toxicity;[16] they also produce a potent immune response, and their immune response to other substances is heightened. With its introduction into corn, which is ubiquitous in processed food, Bt toxin has been found in the blood of 93% of pregnant mothers and in 80% of umbilical cord blood.[17]

Scientists are seeing birth defects, high infant mortality rates, fertility problems,[18] and sterility in hamsters, rats, mice, and livestock fed GMO soy and corn, and some hamster pups even began growing hair inside their mouths. Studies indicate other serious health risks[19] as well:

- immune system dysregulation,[20] with changes in the number of immune response cells showing up in the gut, spleen, and blood—all of which points to an allergenic and inflammatory response to GMOs;
- increased aging (especially in the liver);[21]
- dysregulation of genes associated with cholesterol synthesis, insulin regulation, cell signaling, and protein formation;
- and changes in the liver, kidney, spleen, and gastrointestinal system.

Furthermore, a recent animal study[22] found that glyphosate (the active ingredient in Roundup, Monsanto's widely used pesticide) often leaves a residue on Roundup Ready crops[23]—and this can affect testosterone levels and sperm counts.[24] It is actually toxic to testicle cells, and significantly lowers testosterone synthesis.

But don't many studies show GMOs are safe?

Not really. The biotech industry *says* studies indicate safety, but there is a shocking lack of transparency in such studies. Independent research on GE safety is scarce. Because of the private ownership of GE technology, industry can determine who conducts research and how. Most GMO studies are conducted by the biotech industry itself. Manufacturers can therefore cherry-pick which results to share with the public, and which to hide. Access to the

original research is simply not readily available to the public—or to researchers, universities, and regulators.

Government oversight is lax because there is no federal law specifically for GMOs. Largely, GMOs fall within the purview of the US Department of Agriculture, but since USDA's jurisdiction covers only plant pests and noxious weeds, there are very few studies of actual long-term human health affects of GMO.

Isn't the increased crop yield worth the risk? The biotech companies say the GMOs will feed the world and alleviate poverty.

First, it is simply not true that GMOs generate higher crop yields. The Union of Concerned Scientists released a report[25] detailing the aggregate yield effect of GMOs after more than twenty years of research and thirteen years of commercialization in the US. It found that GE soybeans do not produce increased yields at all, and GE corn has only marginally increased yield. Overall, corn and soybean yields have risen over the past fifteen years, but this is mainly because of traditional breeding or improvement in agricultural practices. More crop rotations, longer rotations, and a larger variety of crops are more eco-friendly and tend to reduce crop losses from pests and diseases, which in turn increases yields. Only Bt corn has been shown to increase yield, but it has only done so marginally.

Second, a 590-page report from the World Bank and the UN concluded that GE crops have no role to play in relieving world poverty.[26] The report stressed that even if GMO crops *were* able to increase overall yield, the limited number of GMO crop varieties would not reduce food scarcity: crops have to be adapted to local conditions, be supported by local infrastructure, and be within the capacity of the local farmers to implement them.

On the other hand, GMO crops have caused a massive worldwide increase in the use of the toxic glyphosate herbicide.[27] Moreover, GE crops can contaminate non-GE crops,[28] affecting the livelihood of conventional and organic farmers.

If GMOs are so prevalent in our food, how can we avoid them?

The answer is simple: label them. If foods containing genetically modified ingredients were clearly labeled as such, consumers could make a rational, informed choice about whether they want their family to eat that food. Polls show that over 90% of Americans believe that GMOs should be labeled.[29]

Most of the public wants GMOs labeled for health reasons, but there are religious and ethical reasons to consider as well: individuals may want to avoid eating animal products including animal DNA, which they cannot do if they aren't told what their food contains.

Labeling would have an economic benefit as well: it would ease trade relations with countries that require differentiation between GMO and non GMO products.

Labeling is inexpensive to business and consumers. A recent cost analysis conducted in California[30] showed that labeling GMO products would cost consumers nothing. The overall cost, an estimated one-time increase of $1.27 in an average family's annual food expenditure, is so minimal that companies would absorb the costs as is customarily done when label changes are made.

The United States is one of the few countries that do not have GE labeling laws. Fifteen of the European Union member nations have labeling laws, as do Japan, Australia, Brazil, and China—nearly fifty countries in all.[31]

The biotech industry is fighting hard against labeling. While officially they claim that labeling is unnecessary, their concern is purely selfish: they fear the public backlash will cause their sales to drop. In 1994, Norman Braksick, president of Asgrow Seed Company, a subsidiary of Monsanto, was quoted in the *Kansas City Star* as saying, "If you put a label on genetically engineered food you might as well put a skull and crossbones on it."

In California, where a citizen-led initiative has put GMO labeling on the ballot in November, the Grocery Manufacturer's Association (GMA) along with direct donations were also made by individual GMA members, including ConAgra Foods, J.M. Smucker, Hormel Foods, Kellogg's, Coca-Cola North America, and PepsiCo total $25 million.[32] Why are these companies—who claim to believe in the safety of GMO products—fighting so hard to keep consumers in the dark about what they are eating? What don't they want us to know about GMOs?

We believe it is our right to know what's in our food, so we can make our own decisions about eating it or avoiding it. This is especially important with genetically modified organisms, about which so little is known and whose effect on our health may be very grave indeed.

Citations

1 William Neuman and Andrew Pollack, “Farmers Cope With Roundup-Resistant Weeds,” *New York Times*, May 3, 2010, http://www.nytimes.com/2010/05/04/business/energy-environment/ 04weed.html/.

2 USDA Animal and Plant Health Inspection Service, “Dow AgroScience LLC; Availability of Petition, Plant Pest Risk Assessment, and Environmental Assessment for Determination of Nonregulated Status of Corn Genetically Engineered for Herbicide Tolerance,” Docket no. APHIS-2010-0103, *Federal Register* 76 FR 80872, accessed September 6, 2012, https://federalregister.gov/a/2011-33009/.

3 USDA Economic Research Service, “Adoption of Genetically Engineered Crops in the U.S.,” July 5, 2012, http://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us/recent-trends-in-ge-adoption.aspx/.

4 US Food and Drug Administration, “An Overview of Atlantic Salmon, Its Natural History, Aquaculture, and Genetic Engineering,” accessed September 6, 2012, http://www.fda.gov/AdvisoryCommittees/CommitteesMeetingMaterials/VeterinaryMedicineAdvisoryCommittee/ucm222635.htm/.

5 Andrew Pollack, “That Fresh Look, Genetically Buffed,” *New York Times*, July 12, 2012, http://www.nytimes.com/2012/07/13/business/growers-fret-over-a-new-apple-that-wont-turn-brown.html/.

6 Andrew Pollack, “U.S. Says Farmers May Grow Engineered Sugar Beets,” *New York Times*, February 4, 2011, http://www.nytimes.com/2011/02/05/business/05beet.html/.

7 “Soybeans,” *GMO Compass*, accessed September 6, 2012, http://www.gmo-compass.org/eng/grocery_shopping/crops/19.genetically_modified_soybean.html/.

8 “Genetically Engineered Crops,” Center for Food Safety, accessed September 6, 2012, http://www.centerforfoodsafety.org/campaign/genetically-engineered-food/crops/.

9 Michael K. Hansen, “Genetic Engineering Is Not an Extension of Conventional Plant Breeding: How Genetic Engineering Differs from Conventional Breeding, Hybridization, Wide Crosses and Horizontal Gene Transfer,” Consumers Union, accessed September 6, 2012, http://www.consumersunion.org/food/widecpi200.htm/.

10 C.K. Shewmaker et al., “Seed-Specific Overexpression of Phytoene Synthase: Increase in Carotenoids and Other Metabolic Effects,” *The Plant Journal for Cell and Molecular Biology* 20, no. 4 (Nov. 1999): 401–412.

11 Zhe Jiao et al., “Unintended Compositional Changes in Transgenic Rice Seeds (*Oryza sativa* L.) Studied by Spectral and Chromatographic Analysis Coupled with Chemometrics Methods, *Journal of Agricultural and Food Chemistry* 58, no. 3 (2010): 1746–1754.

12 Jonathan R. Latham et al., “The Mutational Consequences of Plant Transformation," *The Journal of Biomedicine and Biotechnology* 2006: 1–7; doi: 10.1155/JBB/2006/25376. See also Allison Wilson, et. al., “Transformation-Induced Mutations in Transgenic Plants: Analysis and Biosafety Implications,” *Biotechnology and Genetic Engineering Reviews* 23 (Dec. 2006): 209–237.

13 Allan Campbell, “Epistatic and Pleiotropic Effects on Genetic Manipulation,” in *SCOPE 44: Introduction of Genetically Modified Organisms into the Environment*, ed. Harold A. Mooney and Giorgio Bernardi, Scientific Committee on Problems of the Environment (SCOPE), 1990, accessed Sept. 6, 2012, http://www.scopenvironment.org/downloadpubs/scope44/chapter04.html/.

14 Gilles-Eric Seralini, et al, “Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize,” *Food Chemical Toxicology* 50, no. 11 (Sep. 19 2012): 4221-31

15 Julie A. Nordlee, et al, "Identification of a Brazil-Nut Allergen in Transgenic Soybeans," *New England Journal of Medicine* 334, no. 11 (Mar. 14, 1996): 688–692.

16 G.E. Séralini et al., "New Analysis of a Rat Feeding Study with a Genetically Modified Maize Reveals Signs of Hepatorenal Toxicity," *Archives of Environmental Contamination and Toxicology* 52, no. 4 (May 2007): 596–602.

17 Aziz Aris and S. Leblanc, "Maternal and Fetal Exposure to Pesticides Associated to Genetically Modified Foods in Eastern Townships of Quebec, Canada," *Reproductive Toxicology* 31, no. 4 (May 2011): 528–533.

18 Alberta Velimirov et al., "Biological Effects of Transgenic Maize NK603xMON810 Fed in Long Term Reproduction Studies in Mice," Austrian Federal Ministry of Health, Family, and Youth. (November 2008).

19 "Genetically Modified Foods," American Academy of Environmental Medicine position paper, accessed September 6, 2012, http://aaemonline.org/gmopost.html/.

20 Alberto Finamore et al., "Intestinal and Peripheral Immune Response to MON810 Maize Ingestion in Weaning and Old Mice," *Journal of Agricultural and Food Chemistry* 56, no. 23 (2008): 11533–11539, doi: 10.1021/jf802059w.

21 M. Malatesta et al., "A Long-Term Study on Female Mice Fed on a Genetically Modified Soybean: Effects on Liver Ageing," *Histochemistry and Cell Biology* 130, no. 5 (Nov. 2008): 967–977.

22 E. Clair et al., "A Glyphosate-Based Herbicide Induces Necrosis and Apoptosis in Mature Rat Testicular Cells in Vitro, and Testosterone Decrease at Lower Levels," *Toxicology in Vitro* 26, no. 2 (March 2012): 269–279.

23 Gilles-Eric Séralini et al., "Genetically Modified Crops Safety Assessments: Present Limits and Possible Improvements," *Environmental Sciences Europe* 23, no. 10 (2011), doi:10.1186/2190-4715-23-10.

24 M.I. Yousef et al., "Toxic Effects of Carbofuran and Glyphosate on Semen Characteristics in Rabbits," *Journal of Environmental Science and Health* 30, no 4 (July 1993): 513–534.

25 Doug Gurian-Sherman, *Failure to Yield: Evaluating the Performance of Genetically Engineered Crops* (Cambridge, MA: Union of Concerned Scientists, 2009). Available online at http://www.ucsusa.org/assets/documents/food_and_agriculture/failure-to-yield.pdf/.

26 Beverly D. McIntyre et al., eds., *Agriculture at a Crossroads: Global Report* (Johannesburg: International Assessment of Agricultural Knowledge, Science and Technology for Development, 2008).

27 Charles Benbrook, "Impacts of Genetically Engineered Crops on Pesticide Use: The First Thirteen Years," The Organic Center (November 2009), available online at http://www.organic-center.org/science.pest.php?action=view&report_id=159/.

28 Environmental Data Services (ENDS) Europe, "EU States Back 0.1% GM Contamination Limit" (February 2011).

29 "Polls Show Overwhelming Support for GMO Labeling," Press Release, California Right to Know, accessed Sept. 6, 2012, http://www.carighttoknow.org/prop_37_polling/.

30 Joanna M. Shepherd-Bailey, "Economic Assessment: Prop 37 Likely to Cause No Change in Food Prices, Minor Litigation Costs, and Negligible Administrative Costs," accessed Sept. 6, 2010, http://www.anh-usa.org/wp-content/uploads/2012/08/GE-Food-Act-Costs-Assessment.pdf/.

31 Guillaume P. Gruère, "Labeling Policies of Genetically Modified Food: Lessons from an International Review of Existing Approaches," *AgBioForum: The Journal of Agrobiotechnology Management & Economics* 10, no. 1 (2007).

32 California Secretary of State, "Campaign Finance: No on 37: Coalition against the Deceptive Food Labeling Scheme, Sponsored by Farmers and Food Producers," accessed Sept. 6, 2012, http://cal-access.sos.ca.gov/Campaign/Committees/Detail.aspx?id=1344135/.