



CCOF: The Dangers of Genetically Engineered Crops

What is Genetic Engineering?

Genetic engineering (GE) is a new technology that involves the direct transplantation or modification of genes. Unlike traditional selective breeding techniques that have been used for centuries, genetic engineering allows researchers to cross species boundaries. Never before was it possible to transfer animal genes or synthetic genes to plants. These gene changes permanently alter the genetic code of the recipients. Thus, novel organisms are created that will pass the genetic changes onto their offspring through heredity.

CCOF Has a History of Working to Protect Farmers from GE Contamination.

For years CCOF has opposed the commercialization of GE crops because of the threat they pose to organic and non-organic growers. CCOF has worked hard to ensure that the regulations adhered to by growers throughout California and the rest of the country prohibit the use of genetically engineered products in organic production. The USDA's National Organic Program Final Rule classifies genetically modified products as an "excluded method" in organic production.¹ CCOF played an instrumental role in ensuring that GMOs (Genetically Modified Organisms) were excluded from the Final Rule when it was crafted and written into law.

Environmental, Economic and Public Health Considerations Related to Growing Genetically Engineered Crops

There are many unanswered questions about the effects that genetic engineering could have on the health and ecology of our world once released into the environment of open field agriculture. The information below is from the published references listed at the end of this summary. New information is becoming available every day supporting the concerns expressed here. Visit the GE Links page at www.ccof.org.

- GE crops impact beneficial insects and other non-target species.
 - Increased mortality rates in Monarch butterfly larvae have been shown to occur when fed genetically engineered Bt (*Bacillus thuringiensis*) pollen.²
 - Giroux et al. reported that ladybugs, which prey on the Colorado potato beetle, consumed fewer potato beetle eggs when the potatoes had high levels of Bt toxin.³
 - In work conducted at the Swiss Federal Research Station for Agroecology and Agriculture, Hilbeck et al. reported that lacewing larvae reared on prey that were fed Bt-producing corn took longer to develop and had a strikingly elevated mortality rate.⁴
 - Research in Ohio on genetically engineered potatoes found natural enemies reduced to such low levels that aphid outbreaks occurred.⁵
- Pests resistant to herbicides or pesticides are likely to develop with GE agriculture.
 - Recently an herbicide-tolerant canola plant was discovered that cross-pollinates with a related weed.⁶ This could mean, among other results, that weeds will eventually emerge that are herbicide-resistant, requiring more toxic chemicals to get rid of them.
 - A study published in 1999 raises concern that insects may develop resistance to moderate dose Bt corn, potentially undercutting the current strategy recommended to growers by the USDA to avoid pest resistance.⁷
 - The current reliance on just a few broad-spectrum herbicides makes it likely that resistance will develop even faster. Already canola weeds resistant to three herbicides have been found in a field in northern Alberta, Canada.⁸
- Genetic pollution is already affecting organic and non-organic growers and causing economic harm.
 - USDA has admitted that genetically engineered seeds may have moved outside of field test sites due to animal dispersal.⁹ No published studies have examined the extent of the ecological consequences of this impact on natural populations.¹⁰ Yet the potential for economic harm for farmers of genetic pollution are already real and severe.¹¹
 - In September 2000, taco shells sold in supermarkets were contaminated with a variety of GE corn (StarLink) engineered with tolerance to glyphosate and to express the pest toxin Bt.¹² The GE corn was approved for use in animal feed only, due to EPA concerns about possible human allergic reactions. Although it was grown on less than 0.5 % of all U.S. corn acres, more than 300 food products were recalled as a result of the contamination. Experts in Iowa estimated that approximately half the state's corn (roughly 1 billion bushels) could be contaminated.¹³
 - In September 2002, USDA discovered a Prodigene plot of pharmaceutical corn growing near fields of non-organic corn. Fearing that gene flow from the "pharm" corn (engineered to contain an experimental pig vaccine) had contaminated the food corn, the agency ordered 155 acres destroyed. Government regulators then checked its other fields and discovered that volunteer "pharm" corn from a Nebraska field trial had contaminated soybeans there, resulting in the quarantine and destruction of \$3 million worth of beans.¹⁴
 - In Hawaii, independent laboratory testing results issued in September 2004 found genetically modified organisms in papayas grown on organic and non-organic farms. Contamination was also found in the stock of non-genetically engineered seeds being sold commercially by the University of Hawaii.¹⁵

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- GE crops and their effects on human health
 - A public health issue was narrowly averted when independent tests on the GE soybean revealed that people allergic to Brazil nuts also reacted to the engineered soybean.¹⁶
 - Many studies have shown that DNA does not always fully break down in the digestive system.^{17, 18} Gut bacteria can take up genes and fragments of DNA¹⁹ which could potentially lead to the spread of antibiotic resistance.
 - According to Salk Institute cell biologist David Schubert, the crude and unpredictable nature of genetic engineering techniques could lead to “the biosynthesis of molecules that are toxic, allergenic or carcinogenic ... GM (genetically modified) food is not a safe option, given our current lack of understanding of the consequences of recombinant technology.”²⁰ Schubert and others recommend long-term animal feeding studies to test for possible toxic and reproductive effects.
 - GM maize (StarLink corn) that had not been approved for human consumption by the US Food and Drug Administration was found in store-bought taco shells distributed by Kraft Foods in September 2000.¹²
- Increased costs and liability to organic and non-organic farmers
 - A survey of farmers conducted in 2003 by the Organic Farming Research Foundation showed that many organic farmers are incurring more costs to grow their crops because they are having to pay for DNA tests or are undertaking more costly planting processes to ensure that they have not been contaminated by genetically engineered crops.²¹

Federal Agencies: Inconsistent in Their Assessment of the Safety of GE Crops

The FDA states GMO crops are the same as traditional crops for all regulatory purposes. But this policy is inconsistent with the views of many of their own scientists, as well as other Federal government researchers.²² The quotes below highlight the concerns that many scientists are raising about the safety of deregulated GMO crops.

- FDA microbiologist Dr. Louis Pribyl stated: "There is a profound difference between the types of unexpected effects from traditional breeding and genetic engineering"²³
- Dr. E.J. Matthews of the FDA's Toxicology Group warned that ". . . genetically modified plants could ... contain unexpected high concentrations of plant toxicants...", and cautioned that some of these toxicants could be unexpected and could "...be uniquely different chemicals that are usually expressed in unrelated plants."²⁴
- Quote by Dr Suzanne Wuerthele, US Environmental Protection Agency (EPA) toxicologist: "This technology is being promoted, in the face of concerns by respectable scientists and in the face of data to the contrary, by the very agencies which are supposed to be protecting human health and the environment. The bottom line in my view is that we are confronted with the most powerful technology the world has ever known, and it is being rapidly deployed with almost no thought whatsoever to its consequences."²⁵

CCOF Supports a Moratorium on the Open Field Propagation of GE crops until:

1. Adequate, accurate, peer-reviewed research assessing the risks GE crops pose to wildlife, human health, and soil ecology is required to be presented as part of the approval process for any proposed commercialization.
2. Contamination of organic and non-organic crops by GE crops is the liability of the patent owners and growers of these GE crops.
3. An adequate regulatory framework is in place to protect organic and non-organic farmers from GE contamination at all stages of the farming process:
 - a. Development of buffer zones that account for the full possibility of seed and pollen dispersal as estimated by scientific reports.
 - b. Protections are required to prevent pollen dispersal through insect and wind vectors.
 - c. Financial protection is guaranteed to the organic and non-organic growers who become contaminated by GE crops.
 - d. Rigorous precautions are in place throughout the food chain, including specialized mills, processing facilities, transportation systems, and distribution networks to maintain separation of GE materials.
 - e. Labeling standards and requirements to identify GE content are in place for all the above operations but most especially on final product presented to the consumer.

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Footnotes and References

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- ¹ USDA National Organic Program Final Rule. Section 205.105(e) ("Excluded Methods" are defined under "Terms" in Section 205.2)
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- ³ Giroux et al. "Bacteriological Insecticide M-ONE Effects on Predation Efficiency and Mortality of Adult *Coleomegilla maculata lengi* (Coleoptera: Coccinellidae)." *Journal of Economic Entomology* 87: 39-43. 1994.
- ⁴ Hilbeck A., Moar W.J., Puzsai-Carey M., Filippini A. and Bigler F., 1999. Prey-mediated effects of Cry1Ab toxin and protoxin and Cry2A protoxin on the predator *Chrysoperla carnea*. *Entomologia Experimentalis et Applicata*. 91 (2), 305-316.; Hilbeck, A., M. Baumgartner, P.M. Fried, F. Bigler. 1998a. Effects of transgenic *Bacillus thuringiensis* corn-fed prey on mortality and development time of immature *Chrysoperla carnea* (Neuroptera: Chrysopidae). *Environmental Entomology*. 27: 480-487.; Hilbeck, A., W.J. Moar, M. Puzsai-Carey, A. Filippini, and F. Bigler. 1998b. Toxicity of *Bacillus thuringiensis* Cry1Ab toxin to the predator *Chrysoperla carnea* (Neuroptera: Chrysopidae). *Environmental Entomology*. 27: 1255-1263.
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- ⁶ Laura Tangley. "Of Genes, Grain, and Grocers: The Risks and Realities of Engineered Crops." *U.S. News and World Report*. April 10, 2000.
- ⁷ F. Huang, et al. "Inheritance of resistance to *Bacillus thuringiensis* toxin (Dipel ES) in the European corn borer." *Science*. 284: 965-7. May 7, 1999.
- ⁸ Mary MacArthur. Triple-resistant canola weeds found in Alta. *The Western Producer*. February 10, 2000.
- ⁹ Wrubel, R.P., Krimsky, S., and Wetzler, R.E. "Field Testing Transgenic Plants." *Bioscience*. Volume 42, Issue 4. April 1992.
- ¹⁰ L.L. Wolfenbarger and P.R. Phifer. "The Ecological Risks and Benefits of Genetically Engineered Plants." *Science*. December 15, 2000.
- ¹¹ Anthony Shadid. "Blown profits." *Boston Globe*. 8 April 2001.
- ¹² Kay, J., (October 13 2000), *San Francisco Examiner*.
- ¹³ Neil E. Harl, et al, "The StarLink Situation," IA State University. And "Starlink corn crisis sparks regulatory, market concerns," *Food and Chemical News*, October 30, 2000.
- ¹⁴ For instance, see: T. Hesman, "Crop experiments get more watchful look; USDA ordered destruction of soybeans after contamination," *St. Louis Post-Dispatch*, Nov. 22, 2002; E. Weise, "Company is fined for 'escaped' corn," *USA Today*, Dec. 9, 2002.
- ¹⁵ "Genetic Traits Spread to Non-Engineered Papayas in Hawaii," *Environment News Service*, September 10, 2004.
- ¹⁶ Nordlee, J.D., Taylor, S.L., Townsend, J.A., Thomas, L.A. and Bush, R.K. (1996). "Identification of a Brazil Nut Allergen in Transgenic Soybeans" *New England Journal of Medicine*, Vol 334 (11) p. 726
- ¹⁷ Schubbert, R., Lettmann, C. and Doerfler, W. (1994) Ingested foreign (phage M13) DNA survives transiently in the gastrointestinal tract and enters the blood stream of mice. *Molecules, Genes and Genetics* 242, 495-504.
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- ²⁰ Schubert, D. (2002). "A different perspective on GM food," *Nature Biotechnology*, Vol. 20, p. 969.
- ²¹ Elias, P., (June 5, 2003) "Biotech Revolution Costs Organic Farmers". The Associated Press.
- ²² Food & Drug Administration's (FDA) internal memoranda about the hazards of genetically engineered foods, which became available through the lawsuit (Alliance for Bio-Integrity et al., vs. Shalala, et al.)
- ²³ Comments from Dr. Louis J. Pribyl re: the "Biotechnology Draft Document, 2/27/92." *Administrative Record (A.R.)* 19179. Dated March 6, 1992.
- ²⁴ Memorandum from Dr. Edwin J. Mathews to the Toxicology Section of the Biotechnology Working Group. Subject: "Analysis of the Major Plant Toxicants." *Administrative Record (A.R.)* 18572. Dated October 28, 1991.
- ²⁵ Reprinted with permission of Dr Suzanne Wuerthele, US Environmental Protection Agency (EPA) toxicologist