# Questioning Genetic Engineering

***an overview of the impacts and history of biotechnology***

## FOOD

### *How much GE food is being grown?*

Over 100 million acres of genetically engineered (GE) crops are grown in the US annually, $^{2}/_{3}$ of the world's total; none were grown commercially before 1996. Varieties of soy, corn, canola and cotton are the only GE crops being grown on a large scale, but many more are awaiting introduction. These four crops are so pervasive in processed foods on our store shelves that 60-70 percent of all processed foods are very likely to contain genetically engineered ingredients.

### *Do GE foods pose health hazards?*

Studies on animals and human blood samples show that GE foods may pose serious health hazards to humans such as allergic reactions, immune suppression, digestive tract irritation as well as altering the development and growth of vital organs. There has been virtually no fully comprehensive, independent research on health risks; the few studies done outside of the biotechnology industry's labs show that there are significant changes to GE foods, and that predicted health effects are indeed likely.

Gene insertion (the basis for GE) is an inherently uncertain and unpredictable technology, which can result in the creation of completely new proteins and disrupt genetic regulation at the cellular level. Genetic engineering changes the chemical composition of foods, which may have unpredictable effects, such as increased toxicity, diminished nutritional value, and the transfer of allergens. The antibiotic resistance genes that are used in the process of genetic engineering can spread antibiotic resistance to disease-causing bacteria, compromising our ability to fight disease, according to the British Medical Association and the Canadian Royal Society.

The 2000-'01 "Starlink corn" scandal demonstrated the danger of allergies spreading from genetically engineered foods. Some 300 consumer products had to be recalled after they were found to contain a type of GE corn that was never approved for human consumption. EPA scientists confirmed that Starlink had a "moderate risk" of serious allergic effects, yet farmers were never told to keep this variety of corn separate from all others.

### *Can biotechnology feed the world?*

Biotechnology will not feed the world. Increasing food production will not solve world hunger, and genetically engineered crops do not have reliably greater crop yields. The UN Food and Agriculture Organization reports that there is enough food to feed the world one and a half times over. The problem of hunger is mainly related to food access—distribution and other political, social, and economic factors. GE crops impair people's ability to feed themselves because of their cost, and the genetic contamination of local varieties. They increase reliance on pesticides, and other industrial agriculture methods that have consistently failed to improve the world hunger situation.

## ENVIRONMENT

### *Are GE crops a substitute for pesticides?*

The biotechnology industry claims that GE crops are a substitute for pesticides, making them more environmentally friendly. However, most GE crops are engineered to tolerate high doses of specific weed killers (herbicides), increasing some farmers' herbicide use by 2-5 times. Other GE crops produce their own insecticides. Insecticidal GE crops contain an activated and concentrated form of toxic proteins—obtained from bacteria—in every part of the plant, including the seeds and kernels that we eat. Farmers have used an estimated 70 million pounds of additional pesticides due to the use of GE crop varieties since 1996.

### *What research has been done on the impacts of GE crops?*

There has not been adequate research on the long-term effects of GE crops on natural ecosystems, plants and microbes. This is especially alarming since they are already being grown, and once GE pollen escapes into the environment it cannot be recalled. The few studies done by independent laboratories have all indicated that there are widespread impacts on ecosystems created by genetically engineered crops—yet the federal government has paid no attention, rubber stamping the biotechnology industry's inadequate and faulty science.

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***Can other plants be contaminated?***

Wild and weedy relatives of domestic crops—canola in Canada and corn in Mexico—have been contaminated through genetic drift and cross-pollination. In Canada, "superweeds," resistant to several different herbicides have been found in close proximity to GE canola fields. GE crops threaten genetic diversity and the stability of living ecosystems. Native corn varieties in the remote mountains of Mexico were found to contain traces of genetically engineered DNA, demonstrating that the spread of genetic contamination can not be controlled.

***What impact do pesticide-producing plants have on their environment?***

GE pesticide-producing (Bt) crops have been shown to cause long-term soil contamination and damage to beneficial insects including monarch butterflies, ladybugs, lacewings, and honeybees. New viruses could be introduced into plants due to interactions between DNA from plants, bacteria and viruses. Continual exposure to pesticidal GE-crops will increase insect resistance to pesticides—making stronger bugs, and requiring new and stronger pesticides.

## AGRICULTURE

***Do GE crops save farmers money?***

U.S. farmers and food processors who grow and use GE crops have lost billions of dollars in export markets due to the worldwide consumer rejection of GE foods. Despite industry claims, studies have shown that GE crops often produce less than their traditional counterparts, have increased pesticide use by 70 million pounds, and require additional up-front costs because of "technology agreements" that farmers have to pay for. These licensing agreements to grow GE crops prohibit the saving of seeds for replanting and subject farmers to the threat of corporate lawsuits.

***Who owns GE seeds?***

Over 90 percent of the germplasm (genetic material) used to create GE seeds is owned by one transnational corporation, Monsanto—a company with a 100-year history of chemical and biotech catastrophes, from PCBs and Agent Orange, to toxic herbicides and Bovine Growth Hormone. Biotechnology has helped drive an unprecedented concentration of corporate ownership over seeds: DuPont Chemical owns the world's largest seed company, Pioneer HiBred, and chemical/biotechnology giants Syngenta and Bayer (the world's largest manufacturers of herbicides and insecticides, respectively) have also acquired significant control over the world's seed supply.

***Who has to take responsibility for the dangers of GE?***

Monsanto's "technology agreement" requires growers—rather than the corporations—to assume all liability for problems resulting from planting GE varieties. These include contamination of organic crops, market loss due to use of crops not approved for human consumption, and legal claims resulting from health problems.


## PATENTS AND BIOPIRACY

***What role do patents play in biotechnology?***

Patents allow biotechnology companies to "own" the genetic lineage of the organisms that they create. This means that the offspring of mice or corn created by biotechnology researchers are the intellectual property of the patent holder. The U.S. was the first country to allow patents on living organisms following a 1980 Supreme Court ruling; today the U.S. government and the biotech industry use the World Trade Organization's intellectual property rules to impose these practices on other countries.

***What are the consequences of life patenting?***

Genetic resources and knowledge are appropriated from people worldwide for the proprietary benefit of the biotech industry: for example, basmati rice, neem products, ayahuasca, and numerous other medicinal plants. This is known as biopiracy. The US National Park Service granted the San Diego-based Diversa company the right to patent microbes from Yellowstone National Park. The National Institutes of Health (NIH) patented DNA of people from the Solomon Islands, Panama and Papua New Guinea, but had to renounce these patents under international pressure. Genetic data from the entire population of Iceland has been privatized. Genetic engineering has increased monopoly control over the world's seed supply. GE seeds are "licensed" rather than sold—preventing farmers from saving, breeding, sharing and replanting them, as they have done for millennia.

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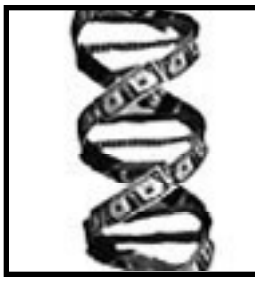
## REGULATION



***Are GE foods regulated and tested?***

GE products are already in our food, with no independent, pre-market safety testing. The FDA (Food and Drug Administration) has ruled that GE foods are the same as, or "substantially equivalent" to non-GE varieties, a claim that has no scientific basis. The FDA bases its decisions on GE crop safety on inadequate, manipulated, and usually confidential industry data.

During the Clinton administration there was a steady flow of personnel between the agencies writing legislation for genetically modified organisms and the industry creating them. Currently, four Bush cabinet members have histories of very close political and financial ties to the biotechnology industry.

The FDA has proposed a policy of "voluntary labeling," which suggests that corporations that use GE ingredients in their products can choose to label if they want to. International trade bodies like the World Trade Organization (WTO) are poised to overturn regulation of genetically engineered products in Europe and elsewhere, dispite widespread international demands to strengthen such polices.

## HUMAN HEALTH

***Will gene therapy and other human biotechnologies cure disease?***

The sequencing of the human genome confirmed that very few human diseases have simple one-gene "causes." Biotechnology focuses on finding genetic solutions to human heath issues that are often more likely related to environmental conditions such as exposure to toxic substances. Today's narrow focus on genetics in medical research has compromised and undermined studies on the environmental causes of disease.

In 1999, gene therapy trials caused the death of an 18-year-old patient in Pennsylvania, leading to revelations of many similar incidents in recent years; the doctor in this case had a financial interest in high-risk gene therapy. Increasingly, important research and medical decisions are being made to further commercial—not scientific—agendas. Nor has the mapping of the human genome resulted in cures; rather it is being used to create more sophisticated diagnostics for incurable conditions. Independent scientists are skeptical that "personalized" medical treatments based on genome sequencing and stem cells will ever prove viable or affordable.

***What are the implications of human genetic engineering?***

"Germ-line" genetic engineering is a dangerous application of biotechnology. This could create a society of "designer babies," engineered to have specific traits. The discussion of genetic expression has been deeply troubling in the past decades, with scientists searching for a hypothetical "fat" gene and a "gay" gene, implying that industry scientists will someday create ways for parents to "turn off" these genes, to make more "perfect" children.

Human GE and cloning advance a research agenda that is driven by profit rather than betterment of the human condition. The fruits of such technologies are unlikely to address real human health needs around the world, rather they will be marketed to a small minority who have tremendous amounts of wealth.

## DEMOCRACY

Despite poll data from news organizations like ABC Television indicating that an overwhelming majority of people want GE foods to be labeled, the U.S. government continues to push anti-labeling policies at home and in international trade agreements. Transnational institutions like the WTO and the North American Free Trade Agreement are responsible for the controversial intellectual property rights laws that allow the biotechnology industry to flourish, despite clear opposition to genetic engineering around the world. The U.S. government has enlisted the WTO to pressure the European Union and 25 other countries to lift their restrictions on GE foods—restrictions that have overwhelming public support.

Decisions that affect all of our lives—from health concerns to agricultural policies, from environmental impacts to medical ethics—are being made in unaccountable corporate back-rooms, instead of in open, democratic, public settings. The biotechnology industry continues to try to evade public demands that science and industry be governed by the interests of citizens at large and not simply by profit.

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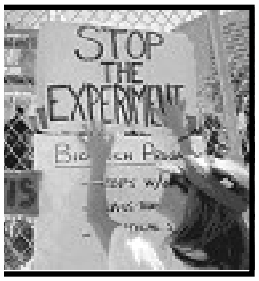


## WHAT CAN WE DO?

People throughout North America and worldwide are saying *no* to the genetic engineering of our food. People in communities across the U.S. are:

- Educating neighbors about the truth surrounding genetic engineering and exposing industry myths—hold a teach-in; find out who's already working on GE issues in your community.
- Taking resolutions for a moratorium on GE crops to city and town councils and state legislatures, supporting local regulation and creating GE-Free Zones.
- Directly pressuring supermarkets and major food companies to stop using GE ingredients. There have been many successes, but we still have a long way to go.
- Spreading the word about and working to promote positive alternatives to GE in agriculture, supporting local, organic agriculture, and sustainable alternatives throughout the world.

## SOURCES

**Overviews:**

***Redesigning Life? The Worldwide Challenge to Genetic Engineering***, edited by Brian Tokar, London: Zed Books, 2001

***Seeds of Deception: Exposing Industry and Government Lies about the Safety of the Genetically Engineered Foods You're Eating***, by Jeffrey M. Smith, Fairfield, Iowa: Yes Books, 2003.

***Genetic Engineering, Food and the Environment***, *by Luke Anderson*, White River Jct., VT: Chelsea Green, 1999

***Exploding the Gene Myth***, by Ruth Hubbard and Elijah Wald, Boston: Beacon Press, Revised edition, 1997

***Genetic Engineering: Dreams or Nightmares***, by Mae-wan Ho, Continuum Publishing Group, Revised edition, 2000

**Food issues**

Stanley W.B. Ewen and Arpad Pusztai, "Effect of diets containing genetically modified potatoes expressing *Galanthus nivalis* lectin on rat small intestine," *The Lancet*, Vol. 354, No. 9187, 16 October 1999, pp. 1353-54.

British Medical Association "The Impact of Genetic Modification on Agriculture, Food and Health," May, 1999.

"Elements of Precaution: Recommendations for the Regulation of Food Biotechnology in Canada," February, 2001.

*World Hunger: Twelve Myths*, by Frances Moore Lappé, Joseph Collins and Peter Rosset, (Second edition), NY: Grove Press, 1998.

Vandana Shiva, "Genetically Engineered 'Vitamin A Rice': A Blind Approach to Blindness Prevention" in *Redesigning Life?* (see book list).

Charles Benbrook, "Do GM Crops Mean Less Pesticide Use?", *Pesticide Outlook*, October 2001.

*Oligopoly, Inc.: Concentration in Corporate Power*, ETC Group Communiqué No. 82, Nov./Dec. 2003.

**Environment**

P.J. Regal, "Scientific principles for ecologically based risk assessment of transgenic organisms," *Molecular Ecology*, Vol. 3, pp. 5-13, 1994.

Ricarda Steinbrecher, "Ecological Consequences of Genetic Engineering" in *Redesigning Life?*

Charles Benbrook, "Impacts of genetically engineered crops on pesticide use in the United States," AgBiotechInfoNet, November 2003, at www.biotech-info.net.

**Agriculture**

Brian Tokar, "Monsanto: A Checkered History," *The Ecologist*, Sept./Oct. 1998.

Hope Shand, "Gene Giants: Understanding the 'Life Industry'" in *Redesigning Life?*

David R. Moeller, *GMO Liability Threats for Farmers — Legal Issues Surrounding the Planting of Genetically Modified Crops*, Institute for Agriculture & Trade Policy, November, 2001. Updated agronomic data available from www.biotech-info.net.

**Patents and Biopiracy**

Vandana Shiva, *Biopiracy*, Boston: South End Press, 1997.

Beth Burrows, "Patents, Ethics and Spin," in *Redesigning Life? (see book list)*

Kimberly Wilson, "Exclusive Rights, Enclosure and the Patenting of Life," in *Redesigning Life?*

Brian Tokar, "The Human Genome Diversity Project: Indigenous Communities and the Commercialization of Science," Edmonds, WA: Edmonds Institute, 1998.

Victoria Tauli-Corpuz, "Biotechnology and Indigenous Peoples," in *Redesigning Life?*

**Regulation**

Sheldon Krimsky, *Biotechnics and Society: The Rise of Industrial Genetics*, Praeger, 1991.

Union of Concerned Scientists (ucsusa.org)

Consumer Policy Inst. (www.consumer.org)

**Medicine**

Marcy Darnovsky, "The Case Against Designer Babies: The Politics of Genetic Enhancement", in *Redesigning Life?*

R. Hubbard and E. Wald, *Exploding the Gene Myth* (see book list).

Sarah Sexton, "If Cloning is the Answer, What was the Question? Genetics and the Politics of Human Health," *Redesigning Life?*

David King, "Eugenic Tendencies in Modern Genetics," in *Redesigning Life?*

Center for Genetics & Society, at www.geneticsandsociety.org.

**Democracy**

Brian Tokar, "Resisting the Engineering of Life," in *Redesigning Life?*

Chaia Heller, "McDonalds, MTV, and Monsanto: Resisting Biotechnology in the Age of Informational Capital", in *Redesigning Life?*

Brian Tokar, *Gene Traders: Biotechnology, World Trade and the Globalization of Hunger*, Burlington, VT: Toward Freedom, 2004.

European GENET archive www.gene.ch/genet.html

## WHO WE ARE

The Institute for Social Ecology's Biotechnology Project has been working on biotech issues since 1998, offering a unique perspective grounded in the politics of decentralism and direct democracy. We helped establish the neRAGE network (Northeast Resistance Against Genetic Engineering), on the web at www.neRAGE.org, and support the national and Vermont Genetic Engineering Action Networks (GEAN), the GE-Free Vermont and GE-Free Maine campaigns, and the annual "Biodevastation/Biojustice" events (www.biodev.org).

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