Genetically Engineered Food and Agriculture in California

ISSUE BACKGROUND

What is Genetic Engineering?

Most frequently, genetic engineering (GE) involves taking the genetic material from one organism and inserting it into the permanent genetic code of another. Biotechnologists have engineered herbicide resistant plants, plants containing biopesticides, fish with growth genes, and even some unlikely products such as pigs with human growth genes, tomatoes with flounder genes, and thousands of other plants, animals and insects. Many of these GE organisms are now being patented and released into the environment and the marketplace at an increasing rate.

Currently, approximately 45 percent of U.S. corn is GE as are 85 percent of soybeans. Estimates indicate that 70 to 75 percent of processed foods on supermarket shelves—from soda to soup, crackers to condiments—contain GE ingredients.

Potential Impacts of GE Crops

A number of peer reviewed studies indicate that GE foods can pose risks to wildlife and the environment, agricultural economies, and even to humans. For example, the use of GE in agriculture could lead to uncontrolled biological pollution. Novel genetic material could contaminate natural species, and possibly threaten these species with extinction. Potential human health effects include higher risks of toxicity, allergenicity, antibiotic resistance, immune-suppression and cancer. The following is a brief synopsis of these potential risks.

Environmental Impacts of GE Crops

▲ ***Superweeds:*** GE crops have already created "superweeds," weeds that are more difficult to eradicate. Plants that are genetically engineered to be resistant to herbicides have a tendency to pass along these traits to create these "superweeds."[1]

▲ ***Genetic Contamination:*** Volunteer plants left over from previous crop plantings, cross pollination, and poorly segregated seed stocks have led to widespread contamination of non-GE crops. This can be costly for organic farmers and others wishing to keep their crops free from GE contamination. Genetic contamination denies farmers and consumers the ability to avoid growing and eating GE crops and foods.[2]

The genetic engineering (GE) of plants and animals poses significant environmental challenges. Already, this novel technology has entered our agricultural fields, our grocery stores, and our kitchens and fundamentally altered some of our most important staple food crops.

Federal agencies continue to approve new GE crops—including GE versions of some of California's most economically important crops—despite the fact that they may jeopardize export markets, threaten organic and conventional farmers who want to provide GE-free products, and may put California's environment and public health at risk. In short, there has been an abdication of responsibility for legislative and regulatory oversight of GE crops and foods, both nationally and in California. As such, California should act now to remedy this regulatory oversight and protect its citizens, economy, and environment.

▲ **Bt *Crops:*** GE *Bacillus thuringiensis* (*Bt*) crops produce a toxin that serves as a pesticide. However, crops engineered to produce pesticides may harm insects that are not considered pests, including pollinators.[3] In addition, widespread adoption of *Bt* crops could hasten the evolution of pests resistant to *Bt*.[4] Scientists have also discovered that *Bt* crops may contaminate the soil in which they are grown.[5]

▲ ***Increased Pesticide Use:*** For years, scientists have warned that heavy reliance on herbicide tolerant GE crops would trigger changes in weed resistance, in turn forcing farmers to increase herbicide use to curb weed populations. In fact, a study based on USDA data found that GE soy, corn, and cotton have led to a 122 million pound increase in pesticide use since 1996.[6]

Health Impacts of GE Foods

▲ ***Toxicity:*** Each genetic insertion creates the added possibility that formerly nontoxic elements in the food could become toxic.[7]

▲ ***Allergic Reactions:*** Genetic engineering can transfer allergens from foods to which people know they are allergic, to foods that they think are safe; and could create different and new allergic responses.[8]

▲ ***Antibiotic Resistance:*** GE foods could make disease-causing bacteria resistant to current antibiotics, resulting in a significant increase in the spread of infections and diseases in the human population.[9]

▲ ***Immune-suppression:*** Scientists have found that animals consuming certain GE foods show impaired organ development, body metabolism, and immune function.[10]

▲ ***Cancer:*** Dairy products from cows treated with the GE animal drug rBGH possess increased levels of a hormone linked to the growth of breast cancer, prostate cancer, and colon cancer.[11]

▲ ***Loss of Nutrition:*** The genetic engineering of foods can change their nutrient content, reducing nutritional value. Its own scientists warned the FDA as far back as 1992 that genetic modification could cause "undesirable alteration in the level of nutrients."

Economic Impacts of GE Agriculture

California's agriculture industry is highly dependent on exporting its products. The introduction of GE crops could lead to significant export market losses for California's farmers and food industries. GE contamination of California's crops will inevitably lead some domestic and foreign markets to reject California agricultural crops and food products. This will cause serious economic harm to farmers, handling and processing industries, and other food industries. For example:

▲ Many of California's most valuable export crops are the subject of numerous GE field trials, indicating the potential for eventual commercialization of GE varieties. These include rice, lettuce, strawberries, tomatoes, walnuts, and wine and table grapes.[12]

▲ California's second and third largest agricultural export markets are the European Union and Japan, both of which have regulations that can restrict imports of GE crops and significant consumer rejection of GE foods.

▲ Approximately one-third of the rice produced in California is exported, and 65% of it goes to Japan, Taiwan and Korea, all of which have restrictions on genetically engineered foods. There are clear indications that Japanese consumers and retailers will be opposed to purchasing GE rice just as they have opposed GE wheat.[13]

▲ The American Farm Bureau estimates that U.S. farmers have lost $300 million per year due to European rejection of genetically engineered corn.[14]

California's growing organic agriculture industry is particularly vulnerable to GE contamination. California is the nation's leader in organic crop production, and organic is the fastest growing sector of California agriculture, with revenues increasing more than 20% a year. Since organic farmers are prohibited from using GE seeds in production, the contamination of organic crops with GE material—via inadvertent seed mixing, pollen flow, etc.—may result in market loss for organic farmers since organic products are expected to be free of GE material. In addition to direct losses in the marketplace, hundreds of farmers nationally have been threatened or sued by biotech companies for patent infringement.[15]

Regulatory Failures

Despite these long-term and wide-ranging risks, the federal government has failed to adopt a comprehensive precautionary approach to address GE agriculture. Congress has yet to pass a single law intended to manage GE crops and foods responsibly. On the federal level, eight agencies attempt to regulate biotechnology using 12 different statutes or laws that were written long before GE food, animals, and insects became a reality. The result is a regulatory tangle, where hardly any regulation exists and current laws are inadequate to manage issues and threats they were never intended to regulate. This makes it critically important that the California state government step in to regulate GE agriculture and protect California's public, environmental, and economic health.

Public Opinions about GE Foods

For well over a decade, polls have consistently shown that American consumers do not trust the biotech industry's claims about GE food, and that they expect their government to protect them. For example, the vast majority (94%) of Americans agree that products containing GE ingredients should be labeled. Additionally, 87.5% of Americans said that the federal government should require safety testing of GE foods before they are marketed to the public. Despite these findings, the federal government has failed to require labeling or safety testing of GE products.

ENDNOTES

[1] Paul E. Arriola, "Risks of Escape and Spread of Engineered Genes From Transgenic Crops to Wild Relatives," *AgBiotech News and Information* 9 (1997): 157-160.

[2] "North Dakota Organic Farmers Worry About Biotech Contamination," *Cropchoice News* Feb. 6, 2001.

[3] J. E. Losey et al., "Transgenic Pollen Harms Monarch Butterflies," *Nature* 399 (1999): 214.

[4] Zhao Jian Zhou et al., "Development and Characterization of Diamondback Moth Resistance to Transgenic Broccoli Expressing High Levels of Cry1C," *Applied and Environmental Microbiology* 66 (2000): 3784-3789. See also: Yong-Biao Liu et al., "Development Time and Resistance to Bt Crops," Nature 400 (1999): 519.

[5] Deepak Saxena et al., "Transgenic Plants: Insecticidal Toxin in Root Exudates From Bt Corn," *Nature* 402 (1999): 480.

[6] Benbrook, Charles, "Genetically Engineered Crops and Pesticide Use in the United States: The First Nine Years," October, 2004.

[7] Erik Millstone et al., "Beyond Substantial Equivalence," *Nature* 401 (October 7, 1999).

[8] Julie A. Nordlee et al, "Identification Of A Brazil-Nut Allergen in Transgenic Soybeans," *The New England Journal of Medicine* 334.11 (March 14, 1996). See also: Michael Hansen and Jean Halloran, "Jeopardizing the Future? Genetic Engineering, Food and the Environment," Chapter 1 in *PAN AP Safe Food Campaign* (1998).

[9] Mae-Wan Ho, "Genetically Engineered Foods: The hazards are inherent in the technology," *Third World Resurgence* 79. See also: Mae-Wan Ho, "The Hazards of Genetically Engineered Foods"; Mae-Wan Ho, *Genetic Engineering: Dream or Nightmare* (Bath: Gateway Books, 1998), 143.

[10] Stanley Ewen and Arpad Pusztai, "Effect of diets containing genetically modified potatoes expressing Galanthus nivalis lectin on rat small intestine," *The Lancet* 354.9187 (October 16, 1999). See also: Arad Pusztai, "Report of Project Coordinator on data produced at the Rowett Research Institute," available online at http://www.rri.sari.ac.uk/gmo/ajp.htm, October 22, 1998; and Van Driessche and Bog-Hansen, "Memorandum on Dr. Pusztai's report," available online at http://www.greenpeace.org/%7Egeneng/mem_pusz.html. May 25, 1999.

[11] S. Chopra et al., "rBST (Nutrilac) 'Gaps Analysis' Report," rBST Internal Review Team, Health Protection Branch, Health Canada, April 21, 1998. See also: T. Kimura et al., "Gastrointestinal Absorption of Recombinant Human Insulin-like Growth Factor-1 in Rats," *Journal of Pharmaceutical & Experimental Therapy* 283 (1997): 611-618; S. S. Epstein, "Unlabeled Milk from Cows Treated with Biosynthetic Growth Hormones: A Case of Regulatory Abdication," *International Journal of Health Services* 26.1 (1996): 173-85; Becky Gillette, "Doin' a Body Good? Studies Link rBGHProduced Milk and Increased Cancer Risk," *E Magazine* Sept/Oct 1998, 42; Ben Davis, "Think Before You Drink," *Conscious Choice* Nov/Dec 1995; "rBGH Produced Milk: Cancer From Your Dairy Products?" *Rachel's Environment & Health Weekly* 598 (May 15, 1998).

[12] Virginia Tech University maintains a searchable database of APHIS permits: http://www.nbiap.vt.edu/cfdocs/field-tests1.cfm.

[13] Daniel A. Sumner and Henrich Brunke, *The Economic Contributions of the California Rice Industry* (California Rice Commission: September 2003); available online at http://www.calrice.org/c3a_economic_impact.htm.

[14] U.S. vs. EU: *An Examination of the Trade Issues Surrounding Genetically Modified Food* (Pew Initiative on Food and Biotechnology: August 2003); available online at http://pewagbiotech.org/newsroom/announcements/080603.php.

[15] *Monsanto vs. U.S. Farmers*, Center for Food Safety, Washington, DC. February 2005.

[16] Poll conducted by Rutgers University, Food Policy Institute, October 2003.

[17] Poll conducted by American Viewpoint, November 2002.