

Guest Commentary

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The Ethical Dilemma of Genetically Modified Food

With an ever-increasing global population, hunger in the developing world, and the health risks of pesticides, some experts view genetically modified food as a panacea. Others view it as one of the most serious threats to human civilization. These diametrically opposing views point to an ethical dilemma, that will certainly be difficult to resolve: whether the benefits of developing and supplying the world with genetically modified foods outweigh future consequences that these products may have for the human species, animal life, and the ecosystem.

Plant and animal modification is not a new concept. Before genetic engineering, gene modification was accomplished through breeding. The traditional breeding method ultimately produces the same desired effect as genetic engineering, but it occurs over a much longer time span and is self-limiting. Selected individual genes are transferred from one organism to another between plants and between animals, but not between plants and animals. Through genetic engineering, genes can be transferred between any organisms: A hypothetical example might be a gene from a fish that lives in cold seas being inserted into a strawberry so that the strawberry could survive frost (Better Health Channel, 1999).

Genetic engineering (GE) belongs to the field of biotechnology, which is the science governing genetic modification, genetic engineering, genetic manipulation, other gene technologies, and recombinant-DNA technology. Recently, use of biotechnology has expanded from the pharmaceutical and medical industries into the agricultural industry.

The collective term "genetically modified organisms," or GMOs, is used frequently in regulatory documents and in the scientific literature to describe "plants, animals and

microorganisms which have had DNA introduced into them by means other than by combination of an egg and a sperm or by natural bacterial conjugation" (Institute of Food Science & Technology, 2004). For instance, the genetic makeup of plants can be altered to produce insect-resistant plants. Genetic engineering may also produce animals, plants, or bacteria that contain desired nutrients.

Despite government approval of genetically modified foods in the nation's foods supply, genetically modified food (GMF) does pose philosophical problems (Formanek, 2001). Opponents argue that government agencies are violating their religious and consumer rights, while proponents have taken a utilitarian approach, arguing that the economic and social benefits of GMF far outweigh any possible negative consequences. Utilitarian ethics hold that "the rightness of an action entirely depends on the value of its consequences, and that the usefulness can be rationally estimated" (About, 2006). Increased productivity and the usefulness of GMF appear to be the driving force rationalizing this new technology.

Genetically modified foods grow faster and larger than non-GMFs and may be more resistant to pests, heat, cold, and drought. They also help the environment by reducing pesticide and herbicide use. Other far-reaching goals are envisioned for GMF, such as stopping the hunger problem in developing countries. Over 800 million people in the world are chronically or severely malnourished. Many eat less than the minimum quantity necessary for survival, resulting in a mortality rate of 36 million deaths per year (United Nations, 2001). Somewhere in the world, a child dies every seven seconds, and the cause of death is directly or indirectly attributable

to hunger (United Nations, 2001). In hunger-stricken areas, malnourished women are iron deficient; in poorer countries, 50 percent of pregnant women suffer from iron deficiency, a condition responsible for nearly 20 percent of maternal deaths (United Nations, 2001). In addition to alleviating world hunger, the production of GMF can easily meet agricultural demands associated with population increase. There will be approximately 1.5 billion more people in the world in the next 20 years, and what better way to keep up with agricultural demand than with GMF (Callahan, 2000)? In spite of the common good offered by GMF, opponents argue that gene manipulation is unsafe. Genetically modified food may have harmful effects on animals, ecosystems, and humans, and these effects may be irreversible.

The debate over genetically modified food originated in the early 1980s. Concerns range from ethical issues related to the long-term health effects of eating GMF to the detrimental effects gene manipulation may have on animals and the ecosystem. In the book *Vexing Nature*, Gary Comstock (2000) describes two ethically derived objections to genetic engineering: intrinsic and extrinsic.

Those who intrinsically object to GMF believe that "it is unnatural to genetically engineer plants, animals and foods" (Comstock, 2000, p. 183). Extrinsic objections focus on the potential to cause harm. These effects may be irreversible. Animals may suffer as a result of genetic modifications or modifications to their genetic material. The component of hereditary material, or germ plasm, that specifies characteristics of different cells may be lost through bioengineering. Comstock justifies the suffering and death of research animals using the "Miniride Principle (MP)."

The MP holds that "where comparable harms are involved, override the fewest individuals' rights" (Comstock, 2000, p. 263). The MP justifies production and killing of genetically modified animals provided that the research addresses comparable harms for the research subjects and human life. For instance, MP would not justify the production and killing of genetically modified mice to study human hair loss. The loss of human hair is not considered to be life threatening (Comstock).

The question becomes whether the damage that has been perpetuated upon the environment through the use of pesticides and harmful chemicals causes more damage to the environment than the narrowing of the germ plasm through the development of GMFs.

The high societal costs associated with rapid destruction of natural habitats and agricultural productive capacity may be most extreme in the developing countries of the tropics, where a wealth of genetic resources vital to U.S. agriculture is endangered. Greater emphasis should be placed on conservation of germplasm through international cooperation. Development and maintenance of stable biological communities in the natural environment should be a high priority goal worldwide. (U.S. Department of Agriculture, 2001)

The proliferation of biogenetic plants also poses a concern. The pollen produced by these plants, carrying new genes, cannot be contained. As a result, genetic pollution of natural crop varieties and of wild plant relatives may occur. Genetic pollution may result from accidental or deliberate release of genetically engineered bacteria, insects, fish, and other life forms into the environment. Unlike other forms of pollution, as Michael

Fox points out in his book *Beyond Evolution*, genetic pollution is uncontrollable, irreversible, and permanent, posing a major threat to biodiversity and to the bio-integrity of the entire life community (Fox, 1999).

Food bio-engineering is a powerful and promising technology that offers both benefits and dangers to modern society. An enormous number of changes can be made through molecular manipulation. Biotechnology research should proceed with precautionary principles in mind. Biotech engineers should ask themselves the following questions. Is this new technology necessary, safe, and effective? Is it traceable—can the product be recalled if necessary? Can it be regulated and, if so, at what cost to society? What are the long- and short-term effects on the ecosystem, on the structure of agriculture here and abroad, and on animal welfare? These are just some of the questions Fox outlines in his bioethical criteria for acceptability (Fox, 1999). The ethics of preserving the earth's bio-integrity must direct and constrain genetic engineering.

The consequences of moving forward too rapidly without a full accounting of the possible adverse impacts are staggering. At the same time, I recognize that there is a need to advance technologically and that those advances could result in an end to world hunger. But what is the most important consideration? Should we be ending hunger by causing genetic mutations we have not anticipated, or moving toward the goal of ending world hunger safely through application of sound scientific principles? 🐜

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