

The New Age of Food

Do you know what is in your food; and more importantly, do you want to know? Genetically modified (GM) food has sparked numerous debates whenever discussed amongst politicians or at the United Nations. Many questions are being raised about GM foods, including but are not limited to the potential health hazards on society and the possible negative impact on the environment, as a result of the sale and distribution of GM foods without knowing the possible side effects they may cause. Some of the main objectives of GM food are "to introduce disease resistance, to improve nutritional quality, to provide resistance to agricultural chemicals" and "to introduce natural pesticidal properties, and to reduce fats in meats" (2) as stated in the article "Food Biotechnology's Challenge to Cultural Integrity and Individual Consent" by Paul Thompson. Genetically modified foods not only create resistant lines of plants but also provide products to countries that need extra supplies of food; it also has limited environmental and health concerns attached to the worldwide distribution of GM food.

A common myth about genetically modified food is that it is a new innovation, but in fact GM food has been immersed in the markets since the 1970s. Further, farmers have been practicing this technique for centuries in order to propagate the best possible crops for consumers. With emerging technologies, the range of GM food has increased dramatically over the last 20 years and it has become more prevalent. The process of making and producing GM seeds results when a gene that is desired (such as insect

resistance) is extracted from one plant and placed in another. The new tissue sample can then be regenerated into a new species of the old plant which contains the newly acquired trait. Over the years, scientists have experimented with genes to create new breeds of transgenic crops. With the controversy growing over GM food the Food and Drug Administration (FDA) has approved a limited group of GM foods. Some "examples of currently approved GE crops in the United States include glyphosate - resistant soybeans, insect-resistant corn and potatoes, and virus-resistant squash" which are described in Christine MccCullum's article "Food Biotechnology in the New Millennium: Promises, Realities, and Challenges" (1). Most of the concern surrounding GM products is the environmental impacts, which includes possible disruption of ecological processes and cross-contamination. Additional issues include: the possible health problems related to the consumption of GM food and the proper regulation of GM food.

Environmentalists are concerned with possible ecological impacts that genetically modified seeds might cause. One of these concerns is that if a plant is modified to be resistant to insects, then those insects would no longer have vegetation to eat and would eventually die off, which in turn would affect the animals that eat those bugs. This could create a chain reaction that would eventually impact the entire ecological system of one area. During the National Conference on the Genetic Modification of Foods conducted in London. Dr. Goodwin from Schumacher College gave a speech on the potential environmental impacts, which is summarized in Jennifer Worm's article "National Conference on the Genetic Modification of Foods: The Risks and Hazards to Human Health, BSAENM, London. 5 November 1999." Goodwin believes that "the real danger

of artificial gene transfer is that of unbalancing this complex food web. If the balance is tipped to a point where the food web cannot restabilize itself, the balance of creation and destruction will cause a genetic melt-down of unpredictable consequences" (Worth 2). Another problem is the possibility of cross-contamination among wild and GM plants which could potentially create an enhanced plant that we would not be able to eradicate in the future.

Health concerns and regulation of the uses and distribution processes of genetically modified food has been another hindrance in the process of providing GM food worldwide. In the article "Adequacy of Methods for Testing the Safety of Genetically Modified Foods" Kuiper, Notebom, and Peijnenburg argue how the current methods for testing GM food are adequate, but if future advancements occur than testing methods need to be updated to include testing for the protein structures of genetically enhanced food (1,2). Common misperceptions about the benefits of GM food are currently hindering their advancements. These misperceptions have caused a decline, in the GM food rate as described in the article "US Farmers Desert GM Crops Embattled Bio-Tech Industry Dealt Severe Blow as Survey in Midwest Heartland Reveals Planting of Modified Seeds." Borger goes into depth to describe how consumers in other countries (such as Europe and Africa) unsure of the health risks involved with consuming GM foods have caused distribution rates to decrease over the last few years. In turn farmers have decreased the percentage of their crops that contain GM seeds (Borger 2). A downfall to the decrease in percentage of GM seeds being planted is that many drought, insect and virus resistant plants are not being planted and distributed.

Distribution of the world's food source suffers each year because crops that are not genetically modified are lost to insects, weeds, and disease. GM seeds are changing this statistic by introducing plants that are herbicide, virus, insect, and drought resistant. In the book Eat Your Genes: How GM Food Is Entering Your Diet, the author, biologist Dr. Stephen Nottingham discusses the benefits of herbicide resistant plants and the advantages of weed control. "Weeds compete with crops for moisture, nutrients and light, and therefore uncontrolled weed growth can result in large yield losses" (37). With seeds now herbicide resistant, smaller amounts of plants are being eradicated by weeds. Nottingham also lists the added benefits of insect resistant plants: "growers are no longer dependent on the weather" and "plant parts that are difficult to reach by spraying ... will be protected, and as the control agent is continually present in the field there is no need for scouting to determine spray timing" (54). With the introduction of these new plants, crop yields have increased, enabling more food to be sent to Africa and other countries.

Doubt surrounding genetically modified food benefits has caused a decline in GM crop production. With the current rise in world population, many countries are running out of resources for their citizens. This is where GM food can help; GM food could provide relief to countries suffering resource shortages. However, with GM food production in decline, many countries will not receive the bountiful benefits of GM seeds and foods. One main cause of food shortages is drought. Some of the GM plants being shipped to Africa are drought resistant so they are easier to grow and handle. But complications have ensued because European countries are not willing to accept any foods that contain GM byproducts. As a result, the African countries of Zimbabwe, Mozambique, and Zambia "made the astonishing decision to refuse food aid if it came

from the United States and contained GM food" (Pringle 1). These three African countries were concerned with possible cross contamination among native plants and the genetically modified seeds. They were afraid that the Europeans would no longer accept their imports, and since Europe is primary destination for their food products they were not willing to risk their livelihood. In Christine MccCullum's article "Food Biotechnology in the New Millennium: Promises, Realities, and Challenges," she addresses the added benefits that GM food provides to third world countries. "In developing countries, public sector agricultural biotechnology research could contribute to improved yields for poor farmers and more plentiful, affordable, and nutritious food for consumers worldwide" (MccCullum 1). One thing that most consumers do not realize is that GM seeds provide more nutrients per serving than non-modified seeds. This is especially important for young children who are not receiving all of the nutrients they require. Another product that the bio-industry is trying to promote to help reduce world hunger is "golden rice" which provides vitamin A and can help prevent blindness in malnourished children. With the added aide that GM food provides for third world countries, they are able to distribute more food to their people. However, with the skewed perception of GM food around the world summed up by the saying "better dead than GM fed," many countries are not receiving the health benefits that GM food could provide. These benefits outweigh the possible consequences mat other countries might incur by receiving food with possible GM food byproducts.

One deterrent to genetically modified food is the possible health risks that may be caused by consuming the enhanced food. The numerous studies that have been conducted on the health risks of GM food have yielded conflicting evidence. However,

the preponderance of evidence indicates that GM food is not harmful to our overall health and it is safe to consume. The United States has one of the most rigorous test processes that foods must go through in order to be approved. Europe's main argument for denying GM food is the fact that the food is harmful to our health, but England's chief medical officer Dr. Liam Donaldson says "there is no evidence to suggest that the technologies used to produce genetically modified foods are harmful to health" as mentioned in Linda Beecham's article "Chief Medical Officer Clears Genetically Modified Foods" (1). In the article Beecham goes on to discuss Dr. Donaldson's findings that include how in some patients, non-modified food can have the same allergic reactions as genetically modified food does and his support for the notion of stricter further testing to be conducted on GM food.

With new advancements in GM food production in the last couple of years, companies have recently developed a method of informing consumers if they are eating any genetically modified food by-products. "In the EU, if a food contains or consists of genetically modified organisms (GMOs), or contains ingredients produced from GMOs, this must be indicated on the label" (Food Standards Agency 1). The new labeling has allowed more GM food to be imported to Europe making it the shopper's choice to decide if they want to consume GM food.

Most opponents of genetically modified food believe that by planting genetically modified seeds they will cross pollinate with endemic plants and create a "super weed" which we will eventually be unable to eradicate. With the "super weed" plant taking over an area, other groups of plants will be taken over and the environmental process will be disrupted and destroyed. In the article "Biotechnology, the Environment, and

Sustainability" Harry Kuiper discusses other environmental concerns which include "development of resistance in insects against certain crop pesticides, transformation of crops into weeds, harmful effects on non-target organisms, gene flow, and altered use of agrochemicals on transgenic crops" (2). Currently, there are two studies being conducted in Europe that are meant to demonstrate that by planting genetically altered seeds into an area can disrupt the ecological order of the organisms and the soil content. However, the downside to these studies is that they are being conducted on small parcels of land and each experiment has a different set of controls, therefore the results of these studies will be difficult to compare to one another since their premise is flawed.

An additional problem with the conclusion of these experiments is there is no way of knowing if there are environmental causes that are affecting the reported data. As a result data could possibly be skewed and would not account for outside factors that may change or alter the findings. Overall, the results of the two experiments are inconclusive and therefore cannot be taken as absolute word and need to be compared with other , results in the future (Kuiper 3, "Biotech ..."). With some plants now insect, herbicide, virus, and drought resistant, environmentalists are concerned with the possible ecological disturbances. Also, the "increased use of herbicides, due to widespread deployment of herbicide-resistant crops, could have a number of undesirable environmental effects" (Nottingham 44). Now that plants are more herbicide resistant, farmers could consolidate the herbicides they use into one, which would cut down on the environmental impact, making it safer for plants and animals.

In addition to environmental concerns, there are also health concerns. As a result, there are studies being conducted on the side effects of consuming genetically modified

food. At the National Conference in the Genetic Modification of Foods in London in 1999, one case study at the Rowen Institute Aberdeen was discussed at length as summarized in Jennifer Worth's article "National Conference on the Genetic Modification of Foods: The Risks and Hazards to Human Health, BSAENM, London, 5 November 1999." The study is testing the effects on rats that have consumed GM food. After feeding rats for ten days with GM potatoes and some with non-GM potatoes, they were killed and dissected in order to reveal the effects of consuming the GM food. The results showed the following effects on the rats, which included a "thickening of the stomach mucosa... mucosal binding randomly dispersed throughout the gut... colonic enlargement" (Worth 3). Dr. Puszati and Dr. Ewen (who worked on the project together) concluded that the GM potatoes were harmful for the rats to eat. Dr. Puszati stated, "Experiments raise the possibility of a plant vector in common use in some GM plants affecting the mucosa of the gastrointestinal tract and exerting powerful biological effects" (4). The study revealed that there can be harmful side effects to consuming GM potatoes and other products, and the study hints that the side effects may not be limited to intestinal problems but could also led to fertility issues.

The study concluded that the Rowen Institute experiment had many flaws, which are discussed in the article "Adequacy of Methods for Testing the Safety of Genetically Modified Foods" in which the authors Kuiper, Notebom, and Peijnenburg argue against the experiment at the Rowen Institute. Kuiper and others cite that the experiment had too few test subjects and did not supply the rats with an adequate diet to retrieve results from the experiment. "Another shortcoming of the study is that the diets were protein deficient; they contained only 6 protein by weight. There is convincing evidence that

short-term protein stress and starvation impair the growth rate, development, and hepatic metabolism, and immune functions of rats" (1). This article provides evidence that GM food is safe to consume.

Most consumers do not want to eat a product which may cause them stomach problems and possible fertility issues when they are older. Therefore, more testing of GM food must be conducted before any more food is distributed to other countries. Another factor in the health arena is the regulation of the testing being conducted on GM food. Since testing is not regulated in the United States, legislation needs to be passed setting guidelines that biotech companies will be required to follow when producing GM food and seeds.

One aspect of the health concerns is the regulation of standards that genetically modified foods are being tested against. In the article by Kuiper and others "Adequacy of Methods for Testing the Safety of Genetically Modified Foods" it is argued that current methods are able to safely test GM food, but with the recent and fast growing biotech industry the methods will also need to be developed as well, to include tests for "extensive toxicological and nutritional assessment with a combination of in-vitro and in-vivo techniques as required for novel foods in general" (2). With strict guidelines and increased testing, the benefits of consuming GM foods will become widely accepted; increasing consumer confidence and therefore, more people will be apt to purchase these products.

The uncertainties surrounding genetically modified food are a major deterrent for most consumers and politicians. Currently, there are numerous studies being conducted on the environmental and health risks that GM food might possibly cause. While most

scientists are split down the middle on whether or not GM food is harmful and negatively impacts the environment, most studies have shown GM food to be safe to plant and consume as genetically enhanced food goes through rigorous FDA testing. All GM food must be inspected by the FDA before being placed on the market, so consumers will now be reassured that GM food is safe to consume.

The effects and impact of genetically modified food will continue to be discussed for years to come, there will always be a new study to support one argument and then the opposing argument. But as our world population continues to grow exponentially, something needs to be done in order to provide enough nutritional food to countries that are unable to sustain all of their citizens, and one of the solutions is genetically enhanced food in the form of seeds, wheat, and golden rice. The misguided mentality that GM food is hazardous has blocked advancements in the biotech industry and slowed the distribution rates of GM food. With moderate impact on health and environmental concerns, genetically modified food must become socially acceptable so it can be distributed in order to help third world countries reduce their food shortages and sustain their ever-burgeoning populations.

Works Cited:

Food Standards Agency. "GM Labeling" 20 July 2004

<http://www.food.gov.uk/gmfoods/gm_labelling

Beecham, Linda. "Chief Medical Officer Clears Genetically Modified Foods." British Medical Journal (International edition). 318.7196 (1999): 1441. Proquest Stetson University Lib., Deland, FL. 10/22/2004.

Borger, Julian. "US Farmers Desert GM Crops Embattled Bio-Tech Industry Dealt Severe Blow as Survey in Midwest Heartland Reveals Planting of Modified Seeds in Decline." The Guardian. 17 Feb. 2000: 3.

Kuiper, Harry A. "Biotechnology, the Environment, and Sustainability." Nutrition Reviews. 61.6 (2003): S105-111. ProQuest Direct. Stetson University Lib., Deland, FL. 14 Oct 2001 <http://proquest.umi.com/>.

Kuiper, Harry A. Noteborn, Hub P J M. Peijnenburg, Ad A C M. "Adequacy Of Methods for Testing the Safety of Genetically Modified Foods." The Lancet, 354.9187(1999): 1315-1317. ProQuest Direct. Stetson University Lib., Deland, FL. 14 Oct 2001 <http://proquest.umi.com/>.

MccCullum, Christine. "Food Biotechnology in the New Millennium: Promises, Realities, and Challenges." American Dietetic Association: Journal of the American Dietetic. 100.11 (2000): 1311-1316. Proquest. Stetson University Lib., Deland, FL. 10/22/2004.

Nottingham, Stephen Dr. Eat Your Genes: How Genetically Modified Food Is Entering Our Diet. London: Zed Books Ltd., 1998.

Pringle, Peter. "Hunger and me Biotech Wars." World Policy Journal 20.2 (2003): 43-50. ProQuest Direct. Stetson University Lib., Deland, FL. 14 Oct 2001
<http://proquest.umi.com/>.

Thompson, Paul B. "Food Biotechnology's Challenge to Cultural Integrity and Individual Consent." The Hastings Center Report. 27.4 (1997): 34-39. ProQuest Direct. Stetson University Lib., Deland, FL. 14 Oct 2001
<http://proquest.umi.com/>.

Worth, Jennifer. "National Conference on the Genetic Modification of Foods: The Risks and Hazards to Human Health, BSAENM, London, 5 November 1999." Journal of Nutritional and Environmental Medicine. 10.2 (2000): 163-167. Proquest. Stetson University Lib., Deland, FL. 10/22/2004.