What are GMO's?

GMO's are genetically modified organisms whose genetic material or DNA, has been artificially manipulated in a laboratory setting through a process termed genetic engineering (GE). GE has been around for some time and creates combinations of plant, animal, bacteria and viral genes that do not occur normally in nature or through traditional crossbreeding methods such as hybridization of plants or animals. Agricultural GMO's were developed to withstand direct application of herbicides that will eliminate competing plants and/or to produce an insecticide to protect a crop. Attempts at developing animal GMO's have to date not met with much success compared to hybridization from cross breeding.

Who Produces GMO's and Why Have They Been Developed?

A number of companies such as Monsanto, DuPont-Pioneer, Syngenta, Dow Agrosciences, BASF, and Bayer Cropscience, have been developing GMO's since the late 1990's. A number of smaller companies located abroad also produce GMO's., The majority of the GMO market however is dominated by US companies. Each of them produce a variety of products that are marketed under a number of different names for a wide range of corn, soybean, cotton, wheat, canola, sorghum and sugar cane seeds tailored to various regions around the world.

Are GMO's Safe to Consume?

Depending upon whom you are consulting, there are varying opinions as to whether GMO's are safe to consume. The International Council for Science (ICSU) and the World Health Organization (WHO) have judged GMO's to be safe for consumption and have endorsed the methods used to test them as being appropriate.

Other groups however cite that the lack of evidence of negative effects does not necessarily mean that new genetically modified foods are without risk. They are concerned that the possibility of long-term effects from genetically

modified plants cannot be excluded and must be examined on a case-by-case basis. They are concerned that the unintended transfer of antibiotic resistant genes will increase bacterial infections in the human population.

According to some sources, most developed nations do not consider GMO's to be safe. More than 60 countries around the world, including Australia, Japan, and all of the countries in the European Union, significant restrictions or outright bans on the production and sale of GMO's have been implemented. In the U.S., the government has approved GMO's, largely based upon studies conducted by the same corporations that created them and profit from their sale.

In Europe, Spain produces the most GMO's with smaller amounts from the Czech Republic, Slovakia, Portugal, Romania and Poland. Germany and France are to date the major opponents of GMO's. Members of the European Union may temporarily restrict or prohibit the use of GMO's if they have justifiable reasons to do so. Regardless, all products that contain greater than 0.9% GMO's must be labeled.

GMO's have been on the scene since the 1990's and as with any science experiment, is just that, an experiment. Experiments test whether the compound being examined does what it is designed to do or cause an unintended or adverse effect. On one side of the debate it is felt that Genetic Engineering of plants could also offer some direct and indirect health benefits to consumers, such as improving nutritional quality or reducing pesticide use. Opponents however take a dim view about experimenting on the population without adequate and impartial studies.

Hybridization of plants, in particular wheat, has not been without its own controversy as well. While this method has increased the yield of wheat due to longer growing seasons, the changes in protein/lectin content is felt to have led to the increase in food allergies and gluten sensitivity resulting in higher rates of IBS and Crohn's Disease.

How Common are GMO's?

Currently GMO's are mostly found as ingredients in prepared food in about 85% of three major food crops grown in the US such as corn, soy, and cotton. Most of the produce we buy (corn and soybeans being the only notable exceptions) currently do not have GMO's. An exception is papaya

from Hawaii. In 1998, scientists found a way to insert a single ringspot gene into the papaya, thus conferring natural immunization to this virus allowing the Hawaiian papaya to be free of the disease.

Beyond those examples from the produce aisle, it's pretty hard to find a prepared food product that contains no corn, soy, or cottonseed products. Therefore we have been eating a lot of GMO food from the supermarket for the past several decades.

High Risk Crops are:

- **Alfalfa** (first planting 2011)
- **Canola** (approx. 90% of U.S. crop)
- **Corn** (approx. 88% of U.S. crop in 2011)
- **Cotton** (approx. 90% of U.S. crop in 2011)
- **Papaya** (most of Hawaiian crop; approximately 988 acres)
- **Soy** (approx. 94% of U.S. crop in 2011)
- **Sugar Beets** (approx. 95% of U.S. crop in 2010)
- **Zucchini and Yellow Summer Squash** (approx. 25,000 acres)

Common Ingredients Derived from GMO Risk Crops: Amino Acids, Aspartame, Ascorbic Acid, Sodium Ascorbate, Vitamin C, Citric Acid, Sodium Citrate, Ethanol, Flavorings ("natural" and "artificial"), High-Fructose Corn Syrup, Hydrolyzed Vegetable Protein, Lactic Acid, Maltodextrins, Molasses, Monosodium Glutamate, Sucrose, Textured Vegetable Protein (TVP), Xanthan Gum, Vitamins, Yeast Products.

Source: the *Non-GMO Project Standard*.

Why is the Debate About GMO's So Controversial?

In addition to the debate as to whether GMO's are safe for consumption, and because GMO's are novel life forms, biotechnology companies have been able to obtain patents with which to restrict their use. As a result, the companies that make GMO's now have the power to sue farmers whose fields become contaminated when it is the result of inevitable drift from neighboring fields with GMO's. Therefore it is felt that GMO's pose a serious threat to farmer sovereignty and to the national food security of any country where they are grown, including the United States. In Europe, non-GMO zones are required to buffer GMO crops from non-GMO crops to avoid contamination.

Another issue found is the presence of “terminator genes”. A terminator gene basically ensures that seeds from the crop will not be able to germinate the next year, thus guaranteeing that farmers will have to buy from agribusiness companies the following season. While companies that produce seeds have also secured patents for them, they have “pledged” to never put them into commercial crops. The companies cite national and international security issues as being part of the decision.

What is the Environmental Impact of GMO’s?

Farming practices regardless of whether they are organic, low impact such as in Amish communities, or commercial, will have an impact of some sort on the environment. It has long been recognized that hybridization of crops will alter the environment to some extent but it is only recently that the impact of genetic engineering has been called into question. Here too depending upon who is addressing this issue, the effects of GMO’s range from having a damaging effect and altering the ecosystem to contributing to more sustainable and higher yield agricultural practices.

Growing genetically modified rather than traditional seed plants in the field has raised concern for the potential transfer of genes from GMO species to the native plants wild relatives. Defenders of GMO’s point out that many food plants are not native to the areas in which they are grown, have no wild relatives to which genes could flow and thus the likelihood of this occurring is minimal.

Critics are concerned that GMO crops may have an indirect environmental effect as a result of changing agricultural or environmental practices. They cite statistics that show that the amounts of pesticide use has not decreased despite assurances from GMO proponents that this would occur. They are also concerned that other species such as bugs, butterflies and bees will be adversely affected. However, defenders of GMO’s cite changes in farming practices over the centuries that have allowed greater yields with little impact on the environment. It remains controversial however whether the net effect of these changes from GMO’s will be positive or negative for the environment.

Certainly one of the most controversial issues is the use of glyphosate, the active ingredient in Roundup. This chemical inhibits an enzyme that the

plant produces needed for the synthesis if amino acids. GMO plants have a gene that blocks the action of glyphosate while other plants such as weeds do not. Thus in theory, a field sprayed with Roundup will have no contaminating weeds, only GMO plants.

Proponents of GMO's cite Environmental Protection Agency (EPA) studies that say Glyphosate is only 1/25th as toxic to humans as caffeine, and therefore is safe for human consumption. One group goes so far as to state that " humans aren't plants and so it doesn't affect us the same way". Critics on the other hand cite a growing body of evidence that increasing use of this chemical coincides with increases in health problems and environmental damage. They also feel that GMO crops are responsible for the emergence of "super weeds" and "super bugs" which can only be killed with ever more toxic poisons like 2,4-D (a major ingredient in Agent Orange).

Their bottom line is that weeds are genetically driven organisms that adapt to their environments, and that evolution eventually finds a way for them to survive. Apparently, weeds that have naturally evolved to be Roundup Ready have started to appear. The long-term impacts of GMO's are unknown, and once released into the environment these organisms cannot be recalled.

Over all, the consensus seems to be that the environmental effects of genetically modified plants should be evaluated using science-based assessment procedures, while considering each crop individually in comparison to its conventional counterparts. This should be done by an independent agency devoid of special or financial interests.

What Rights Do Consumers Have With Regard to GMO's?

Until recently, consumers have had the opportunity to select foods on the basis of how they are produced usually because of religious, environmental, or health concerns. Unfortunately the issue of information available to consumers about foods and other products and consumer choice has more recently become a battleground. Where once it was a given that information regarding any product would allow consumers to decide with their dollars, now special interests seem to be influencing policy makers to narrow the playing field by denying information. Despite polls consistently showing that a significant majority of Americans want to know if the food they're purchasing contains GMO's, the powerful biotech lobby has succeeded in

keeping much of this information from the public either through legislation or restrictions on labelling.

On the one hand, indicating whether a product is GMO or not says little about its content or the risks or benefits of it without additional information. Proponents of food and GMO labeling in particular want this information available so that consumers can decide what is the best option for them and their families.

Proponents of GMO's feel that labeling doesn't protect the public but misinforms them by suggesting that some foods are safer than others. They cite FDA tests that prove that GMO's are safe and make the claim that " In the twenty years that GMO foods have been commercially available, there has been not a single observable consequence to anyone's health". Both sides in the debate can and do make strong and convincing arguments, and it is essentially up to consumers to examine the evidence so they can make informed choices.

Our position in this debate is not to choose whether GMO's are good or bad, but to be able to have the information available to make an informed choice. Consumers choose with their dollars and support those products that they deem most beneficial for them and their families. In our society, a free market based upon available knowledge and informed choice is the stated goal. Limiting consumer choice through legislation is something that should never happen in a free society, and thus our position is that there should be no laws passed by congress that take away ones right to examine all of the evidence in order to make informed choices for themselves and their families.

Thomas A Kruzel, ND