TerranearPMC Safety Share

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In recent years, genetically modified organisms or GMOs, have become a term that has entered the American lexicon. We can go to our supermarkets and see certain foods that are labelled "No GMOs" as an indication that the product inside the package is assured to be something for which our health shall not be compromised. Through brief conversations with various people, it seems that most of us think that products that do not contain GMOs are foods that have no chemicals or hormone additives. This is not exactly a correct description of GMOs. And that means that so many of us do not have a complete understanding of this term.

A GMO, is a plant, animal, microorganism or other organism whose genetic makeup has been modified in a laboratory using genetic engineering or transgenic technology. This creates combinations of plant, animal, bacterial and virus genes that do not occur in nature or through traditional crossbreeding methods. Thus, a GMO is the result of a laboratory process where genes from the DNA of one species are extracted and artificially forced into the genes of an unrelated plant or animal. Sounds interesting enough. But what's all the brouhaha concerning health and GMO foods?

The fact is, the history of GMOs has its roots in prehistoric times when farmers began selecting the most productive plants and seeds from their domesticated crops. What changed in recent times is that scientists are now selecting productive traits at the individual gene level and controlling the placement of genes in new crops.

It was in the 1860s when the Austrian monk, Gregor Mendel, crossed varieties of garden peas, resulting in the concept of a "gene" as a unit of heredity. In 1868, German chemist, Friedrich Meischer, discovered the substance we now call DNA, Deoxyribose Nucleic Acid. But scientists thought it was too simple chemically to carry the vast amount of genetic information required to produce the enormous diversity of nature. Proteins, they thought, were the basis of genetics. In 1944, Oswald Avery tentatively identified DNA as the true carrier of molecular information, and his findings were confirmed in 1952. Less than a year later, in 1953, James Watson and Francis Crick described DNA's molecular shape as a double helix. That opened the door to genetic engineering.

The art of gene splicing dates from 1972. In that year, certain techniques were developed that made it possible to chemically cut and splice strands of DNA at specific places in the sequence. In 1976, the company, Genentech, introduced human genes that produce insulin into strains of bacteria. Those bacteria started manufacturing insulin. This led to the manufacture of human growth hormone (HGH) which was used to enable dwarf children to grow to normal size (Before genetic modification techniques, the only source for the drug had been human cadavers).

Gene-splicing technology entered the food industry in 1990 when the FDA approved the safety of a new strain of GMO, rennet. Rennet is used to curdle milk to form curds and whey; the raw material of cheese and other dairy products. Soon after, the gene for making rennet from the stomach of a calf was isolated – the previous source of the enzyme – and inserted it into bacteria. By 1995, 67% of the cheese produced in the U.S. was being made with rennet from genetically modified organisms.

In 1976, agricultural researchers at the University of Washington discovered that a small, circular DNA molecule called a plasmid could insert itself into the nucleus of a plant cell and cause tumors. They had discovered what amounted to a natural form of gene splicing. Enzymes were also developed to make the walls of plant cells porous. By 1983, scientists had figured out how to take out harmful genes from plasmids, insert the desired gene and get the plasmid into the plant cell where it would introduce the gene into the nucleus of the plant itself.

In the same year, the now popular herbicide, Roundup, was created and when the farmers sprayed this herbicide on their crops, not only would it kill the weeds, but it would also kill the crops (see the 10/15/2018 SafetyShare on *Glysophate*). This led to researchers to develop genetically modified crops after finding bacteria in a chemical waste dump that were not dying in the presence of the herbicide. The result was a bacterial gene that produced the protein which is resistant to the herbicide and was then inserted into soy, corn, cotton and canola.

In the early 1990s, the tomato was one of the first agricultural products where GMO processing was used. Anti-freeze genes from an Arctic fish were forced into tomato DNA, allowing the plants to survive frost. However, this product never made it into the marketplace.

Genetically modified crops have taken over in most of the major agricultural states. According to the USDA, by 2008, 92 percent of the soybeans planted in the U.S. were GMO varieties. Nebraska and South Dakota were the two highest percentage states at 97 percent each. Meanwhile genetically modified corn was planted in 80 percent of the fields. Nebraska farmers planted 86 percent GMO corn while South Dakota topped the list of states at 95 percent GMO corn.

So, GMO-technology appears to help us ensure our foods have a high resistance to insects while having a tolerance to herbicides and heat cold and drought, while increasing shelf-life: all beneficial properties that can help provide our world's population with an abundance of food and, if used altruistically - has the potential to end mass starvation. Sounds good! So, what's the problem?

Food produced from the GMO process is relatively new and therefore, as opponents argue, research pertaining to long-term health effects is quite limited. It has been argued that allergies, antibiotic resistance as well as diseases may be associated with the use of GMOs. For instance, in the 1990s, soybeans were modified with the protein found in brazil nuts. According to the New England Journal of Medicine, these soybeans triggered allergic reactions in people with Brazil nut allergy. As the Centers for Disease Control and Prevention has reported, allergies among our youth is continuously increasing. As a result, there have been concerns that sources such as GMOs are, at least, significant factors for this increase; however, studies by reputable organizations (e.g. Harvard University) have not been able to substantiate such claims.

Are GMOs a benefit, helping our world to produce more food and thereby – if used properly – address the world's food shortage? Or if we do not give these products a second look and properly evaluate the data, are we placing our health at risk?

We are healthy only to the extent that our ideas are humane
Kurt Vonnegut (Breakfast of Champions)