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Playing God

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Abstract
"Technically speaking, animals and plants that we have selectively bred are genetically modified organisms (GMOs)."

Posting about the benefits and dangers of genetic modification from *In All Things* - an online hub committed to the claim that the life, death, and resurrection of Jesus Christ has implications for the entire world.

http://inallthings.org/playing-god/

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▫ **inallthings.org**/playing-god/

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When we start altering the genetics of an organism, are we playing God? Well, of course we are. I would argue that we are playing God all the time. When we treat cancer, when we dam a river, when we shape the landscape, when we give antibiotics to a sick child… In the broad sense, it is a part of what we are here to do. We are here as representatives of God to his creation, as Christ's witnesses to his people. The question really isn't whether we are playing God, it is whether we are doing it well: whether we are acting, to the best of our ability, in accordance with the purposes God has for his creation.

A spectrum of change

That being said, some genetic changes are relatively minor and others are more profound. Some affect a very small population of organisms and are in highly controlled environments, while others are used on a scale that is truly astounding. The degree of change and the scope over which a change is applied represent degrees of risk which should be carefully considered and balanced against the potential benefits.

If we look first at the degree of change, we should really consider a continuum where, technically speaking, animals and plants that we have selectively bred *are* genetically modified organisms (GMOs). We are selecting for particular desirable traits to enhance or "fix" them in a population over time. The various breeds of dog are good examples. There are breeds specifically adapted for hunting rats (rat terrier), racing (greyhounds), or companionship (maltese).

One degree further along the continuum, we sometimes generate random mutations in plants that could theoretically exist in natural populations, but we simply want to speed the process up. This process has been used to improve the disease resistance, yield, appearance, and flavor of many crops. Rio Red grapefruits are a product of this kind of process; historically grapefruits were all pink to off-white.

One step further, we start using molecular tools. We knock out specific genes intentionally. There really isn't anything new in the organism. We simply turned something off. A good example of this is the "Arctic apple" that doesn't turn brown. The browning in apples is actually caused by the activity of an enzyme called Polyphenol Oxidase. When we turn this gene off in the apple, the apple stays white after being cut.

At the other end of the continuum, we actually insert genes from other organisms. These organisms are then termed "transgenic." A variety of therapeutic interventions routinely used in medicine are from transgenic organisms. Insulin and clotting factor are good examples. In these cases, the gene for the human protein has been inserted into a bacterial or eukaryotic cell line to increase the ease of production and safety of these therapies. There is essentially no hesitation in the use of these GMOs because the benefit for those affected by these disorders is profound. Hemophilia runs in my sister-in-law's family. Both her father and uncle contracted HIV and later died of AIDS after using clotting factor extracted from contaminated human blood. Her son, however, has no risk of ever contracting HIV or other bloodborne illnesses from the clotting factor he uses because it is produced by hamster cells in cell culture.

People tend to think that this creation of transgenic organisms is a "crossing of the line" or is somehow "un-natural." However, genes are naturally transferred between organisms. Horizontal gene transfer is a well-documented phenomenon. It is most common among bacteria, but examples are found between plants and bacteria, protists and insects, and plants and insects. Often this occurs in situations where the two organisms live together in a close symbiotic relationship.[1] In many respects, these organisms together represent a genetic system, and it doesn't matter which organism has the genes. There is a whole discussion to be had about the nature and frequency of human-derived transgenics versus those produced naturally, but the transfer of genes between organisms does happen naturally.

An altered frame of reference for genetic change

Some instances of inserting genes from one organism into another (transgenics) generate greater concern than others. BT corn and Roundup Ready technology have continued to generate a lot of controversy because they include major changes to the organism (introducing bacterial genes into a plant) **and** the scope of implementation is huge. The scope bothers me far more than the degree of change. The degree of implementation is extreme. The diversity of species and the diversity within species has declined profoundly as a result of genetic modifications to our crops. The improvement in ease of use for these modified crop plants means they have been adopted by almost every farmer and other crops and varieties of crops have fallen by the wayside. In a way, the genetic modification is not restricted to the change that was made to the crop plant, but on a more global scale, to the entire landscape. Entire genomes have essentially disappeared as varieties and species have been displaced.

In the big picture, this is what I find truly ironic: modifications related to a handful of genes in a plant can generate so much controversy, while a much larger modification of genetic systems is occurring globally. The genetic system of the planet is being profoundly altered by the current mass extinction of entire species across huge areas of the planet. The real genetic modification of concern to me is not the introduction of a bacterial gene into a plant; it is the complete loss of thousands of unique genomes caused by the widespread adoption of one particular species (e.g., of corn) at the expense of all others.

There are other dangers of this widespread implementation as well. The ubiquitous problem with research related to product testing is that you generally find what you are looking for. If an unanticipated problem arises after implementation, it is now a problem across millions and millions of acres. A clear example of this has been the development of resistance. We now have insects resistant to BT and weeds that are resistant to Roundup.

This implementation hasn't been all bad. In reality, BT technology and Roundup Ready technology substantially reduced the overall use of pesticides and herbicides, particularly those that clearly have much greater negative impacts on human and ecosystem health. Modern cropping systems have also provided an abundance of food that has provided food security for billions of people and allowed for specialization within society – specialization that has led to the flourishing of art and innovation. However, we now produce so much food that it isn't just food anymore; it is now becoming fuel and plastics, among other things.

Avoiding idolatry

We are in the golden age of genetics/genomics. Genetic modification is a standard tool in biological research. In order to understand gene function, we routinely modify genes or their expression. Research in pharmaceuticals, agronomy, materials, chemistry, and medicine all rely heavily on GMOs, and GMO products are used directly in the associated industries on production scales.

As a society we need a much more nuanced view than GMO = bad. At every step, in every unique case, we should be asking ourselves if our goals are to love God, to love other people, and to steward the creation. We should be asking how new technologies will shape our behavior and the land. We should be asking if there will be equitable access to the benefits of new technologies, or if our use will disadvantage others while it benefits us. We should also ask whether our uses match our justifications. For example, it is interesting that we justify agricultural intensification on the basis of starving populations, yet we are converting vast amounts of our crops into fuel or feeding it up a very inefficient food chain here that provides a diet, the quality of which is ultimately causing health problems for the largely sedentary population that has access to it. Does our use of this technology match our rhetoric in this instance?

These questions are going to continue to become more important. With the advent of a new technology called CRISPR, we have the capacity to modify genomes much more easily and with much greater precision. And with ease comes use. To what purposes will we use it? Will we play God well and serve His purposes, or will we fashion a new idol to serve our own ends?

Footnotes

1. The concept of the “holobiont” is emerging as a new analytical framework within genomic research. The holobiont is the organism proper, plus all of the symbionts associated with it that substantially and intimately affect the metabolism and physiology of the host. We have come to realize that genetic systems actually transcend the boundary of the organism. In some cases it doesn’t actually matter whether a particular gene is found within the host or the symbiont because their lives are so intimately linked. It is becoming clear that consideration of genetic systems can be a fruitful way to consider the overall well-being of an organism, an ecological community, or an ecosystem. ↩