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Are We Guinea Pigs?

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ABOUT THE AUTHOR

I am Susan R. Garcia, a thirty-eight-year-old nontraditional student. I am a fiercely driven, God-fearing mother of four teenagers, who will stop at nothing to secure a better place in life for my children and myself. I am endlessly motivated, I have a well-defined set of personal beliefs and values that I walk through daily. I considered myself to be friendly and try to make the lives of the people who know me brighter. I have most priorities and obligations in order. I am very structured, reliable, and sometimes independent to a fault. Some words to describe me would be loyal, strong, determined, trustworthy, giving, and selfless. I have a love and appreciation of life, no matter what it throws at me.

I am from a small town, which is very convenient between maneuvering to and from work, college, my children's schools, doctor appointments, grocery stores, etc. I have been working in the healthcare facility for a quite a few years. After my youngest child started going to school full time and while working full-time, I have continued to pursue a higher education. As a young child, my interests were helping others, excitement of seeing the world, and education. I earned my G.E.D. in 2001, with my oldest child on my hip at fifteen months old. I have always had an interest in school, with math and science being my favorite subjects, although I have grown to appreciate history and astronomy, as I have grown older.

My Educational accomplishments, Bachelor's Degree in Healthcare Administration Management, through Murray State University, my associates in business management at Madisonville Community College, as well as an Associates of Applied Science in Medical Administration. I have also earned many certificates in the healthcare and business field. While being a President of Chapter 396 over three counties through Woodmen Life.

ABSTRACT

This paper explores published articles that report on results from GMOs (Internet) and offline (non-Internet) and how it affects human body. The articles, however, definitions vary in their uses of genetically modified organisms (GMO) and the products used to tend to the organisms. I have researched some information from Dr. Edwards and from Global Healing Center, which was published in August of 2014. The information was and updated on June of 2016. Dr. Edwards, (2016) Dr. Edwards, urges that to have an understanding of the connections between GMOs and gut health you must first understand what is being done to our food supply. The effects it has on digestion tracts for of humans.

According to (glyphosate, 2013)**,** this article in, highlights the effects of Glyphosate based herbicide, which is sprayed on our crops prior to individuals purchasing them to eat. According to (Woosley, 2012) the first patent issued for GMO in 1980, GMO has slowly been arising more popular, a bacterium with an appetite for crude oil, ready to gobble up spills.

Genetic Engineering in non-human life is on the rise, governments around the world are grappling with how far should GE reach inside human domain and what are the ramifications.

Keywords: Genetically modified organisms (GMO), glyphosate based herbicide, governments, product, genetically engineered (GE), organic, modified

Literature Review

Around the globe, nations are in the grips of trying to find ways to feed the massive numbers of citizens that reside within their borders. This task is daunting to say the least. One way to help ease the burden is the use GMO produced products. This may sound easy enough, but, researchers are all over the board on the long-term safety of using genetically engineered (GE) foods.

Since the introduction of GE, scientist and food specialist have written and debated the need or lack thereof of modified foods. Several Harvard University researchers writes, there appears to be no significant health issues between GMOs and organic grown foods (Norris, 2015). Jeffrey Smith from the Institute for Responsible Technology is a GMO expert. Smith research and expertise go against many in the industry's position that GMO foods are safe (Smith, 2015).

Another guru in the GE field is Dr. Edward Group, his studies are in-line with Smith's research. Group believes that GMOs can cause irreversible harm to the body (Group, 2014). The United States and several European countries stepped into the GE waters with research. In the U.S., several studies have found there not to be sufficient evidence for not to allowing GMO production. "GMO cultivation in the EU is limited" (Papademetriou, 2014). On the continent of Africa GMO production is strictly monitored and a multitude of nations do not allow the growing or harvesting of GE plant life (Wu, Atkinson, Giddings, 2016).

This research is compiled from information in scholarly journals, government publications, research from institutions of higher learning, interviews with food and healthcare professionals.

GMOS HISTORY

“Is it real or is it Memorex?” ("Memorex |," 1971). This was the slogan that help change the fortunes of an industry. Music aficionados were challenged to listen to a recorded presentation and determine if what they were hearing was live or recorded audio. The company banked on the fact, listeners couldn’t tell the difference. Not being able to distinguish between live and recorded would cause consumers to buy their product in droves.

Since that genius marketing plan, other corporations have leaped into strategic marketing by giving their customers a choice. Consumers are now bombarded with having to have their five senses decipher if a product is 100% pure beef, butter, syrup, bread, leather, water, etc. But do the public really care if something is pure or altered if the price is right and it satisfies the need?

Consumers could be called guinea pigs in multiple industries where GE products are being peddled in food; beverage, health, beauty, human and animal modifications. These industries have mass produced products that are by-in-large considered to be must have by the population. Within these manufactures are strategic designs to improve the experience of individuals have while partaking in using the products.

When did food manipulation begin? Studies performed by Harvard researchers suggest that gene manipulation has been taking place for thousands of years. “The earliest evidence of artificial selection of plants dates to 7800 BCE in archaeological sites found in southwest Asia” (Rangel & Maurer, 2016). Their study indicates that humans had a grasp on creating different forms of plants and animals. This was a remarkable find, humans were considered primitive. The researchers from Harvard also documented the first known genetically engineered organism.

"…in 1973, when Herbert Boyer and Stanley Cohen worked together to engineer the first successful genetically engineered (GE) organism" (Rangel & Maurer, 2016). This research would appear to suggest that in 1973 modern scientist were the designers of gene alteration. Gene alteration whether done in 7800 BCE or 1973 has proven to be a topic that will not be settled any time soon. Continued studies on genetically engineered products has provided a wealth of information on how the transformation of genes in organisms is possible.

> GMOs are produced through genetic engineering, a process in which genes that yield desirable traits are transferred from one organism to another. Genetic engineering begins with the identification of the gene responsible for the desired trait. After the gene has been identified and isolated, it is inserted into the cell of another organism using one of several techniques. The most widely known technique involves a "gene gun," a device that uses bursts of helium to propel microscopic particles, coated with copies of the gene, directly into the receptor cell. A second common technique uses a bacterium to invade the receptor cell and "plant" some of its DNA along with the foreign gene that carries the desired trait. In either method, the foreign gene is not inserted into every potential receptor cell, so it is necessary to identify cells that have been successfully modified (Feldmann, Morris, & Hoisington, 2000).

Before any of these transformations can take place, government approval is necessary. Studies in this area has shown government's approval varies. Some governments around the world understand the complexity of GE and have no resistance to its application. Others take a cautionary approach to allowing its citizens to digest what are perceived to be harmful products.

GOVERNMENTAL INVOLVEMENT

> In 1990, China became the first country to introduce a genetically modified crop, a virus-resistant tobacco variety. In 1994, a delayed-ripening tomato became the first genetically modified food crop to be grown commercially in the United States. Since then, genetically modified crops have found their way into farmers' fields with increasing frequency. By 1999, transgenic crops covered nearly 100 million acres in the United States, Argentina, Canada, China, Australia, South Africa, Mexico, Spain, France, Portugal, Romania, and Ukraine (Feldmann, Morris, & Hoisington, 2000).

The issue of genetically modified organisms found its way into the hallways and courtroom of the United States Supreme Court. US Supreme Court's 1980 decision in Diamond v. Chakrabarty, was the case that forever changed the mechanisms that farmers could use to bring their crops to the marketplace. "…genetically engineered microorganisms can be patented" (Library of Congress, 2015). This decision flung the doors wide-open for other food options and industries quickly filled the markets with alternative options. Although GMOs were being mass produced, Americans still doubted if the altered food was safe for consumption. "Public opinions on GMOs in the US is mixed" (Library of Congress, 2015).

In the United States and other countries, GMOs reception was lukewarm. Government agencies in charge of protecting the health of its citizens hadn't completely bought into the safety of modified foods. The argument was still being made as to the health benefits of GMOs. The public wanted to know if the food being ingested would cause any short or long-term effects on their health. "In 1992, the Food and Drug Administration claimed they had no information

showing that GM foods were substantially different from conventionally grown foods" (Smith, 2015).

State officials were at a lost attempting to put forth any efforts to overrule the federal government guidelines. State agencies rely on federal government and credible outside research departments to advise on the safety of goods and services. It's this handicap position, lack of funding for research, and the cost of a potential expensive court battles has given way to states following the lead of the feds and private agencies. "State law generally plays little role in the regulation of GMOs in the US" (Library of Congress, 2015).

GMOs are becoming commonplace in nations around the world. On the continent of Africa, GMOs are looked upon with skepticism. The continent has vast riches in mineral and oil but like so many other countries find itself in a food shortage. GMOs could be the answer and help bring relief but most of the countries have not embraced the idea of utilizing modified food sources. "...only 3 of the 54 countries in Africa grow any biotech-improved crops" (Wu, Atkinson, Giddings, 2016). Numerous African nations are not accepting of the explosion of GMOs as the United States, however, countries that are engage with the welfare of its constituents are sounding the alarm for a need to increase food production.

Many European countries realize the dangers in allowing GMOs in environments that will cause harm and cause financial hardships to individuals and businesses. In a landmark case in 2011, "The Court of Justice of the EU... held accountable for GMOs released into the environment" (Papademetriou, 2014). This court case has created an opportunity for individuals or companies to recoup financial damages caused by careless GMO production.

Men and women in the beauty industry have expressed concern about the chemical attaching to their human cells. The United States government stepped in the fray inside the beauty manufacturing business and instituted regulations that will help guide the public when considering buying a product. Federal Food, Drug, and Cosmetic Act of 1938.

Consumer's health is a constant battle when manufactures introduce a new product. Most advertise as a must have product and guarantee its safety for use. "To protect consumers from unsafe or deceptively labeled or packaged products by prohibiting the movement in interstate commerce of adulterated or misbranded food, drugs, devices, and cosmetics" (U.S. Food and Drug Administration, 2017).

"The Codex Alimentarius Commission (CAC), an intergovernmental body with 185 current members, has established the Codex Standards15 for risk analysis to protect the health of the consumers and to facilitate the trade of food by setting international standards" (Arya & Massachusetts Medical Society, 2015).

The CAC and government regulations are the best protection for the public. Government agencies have a moral and ethical obligation to protect its citizens. Devising written and agreeable practices are guide posts for GE producers. CAC's criteria are high manageable standards for food safety. This commission address several vital food safety protocols.

"International food trade is a 200 billion dollar a year industry" (CODEXALIMENTARIUS, 2018). These international members want to ensure the safe transfer of edible goods that will travers boundaries. Unifying how foods are produced and cared for can create platforms for nations that are bound with limited technology.

The vastness of Earth's solar system is considered unconquerable. Scientist suggest Earth solar system may never be fully known or understood. Scientist and researchers have concord territory in many vital areas of human concern. Manufactures have the ability to create products that are seedless, bitter or sweet, the color and height of plants and trees can be changed with relative ease. Reproduction of humans and animals can be dictated with medicines, animals and humans' body mass can be increased in days, are among the many manipulations.

One area researchers have a greater knowledge of is gene modification in humans. This is a controversial field of study, is not outlawed in United States or China, but and other countries see this as dangerous and controversial. The thought of creating technology that would alleviate human suffering is not a new concept. "…DNA research began in the 1960s" (Sade & Khushf, 1998, p. 3). The two research professional write about the difficulties in gene therapy.

The prospect of altering what many view as the blueprint of human life raises questions about playing God. Scientist will counter with a different view of their work. Many in the gene field are working to change the lives of individual born with gene defects. "…has not yet had the success anticipated by many scientists: effectiveness of treatment for most diseases has been disappointing" (Sade & Khushf, 1998, p. 4).

Significant questions were raised in a report issued by the U.S. government concerning gene therapy. Gene therapy is a transfer and removal of human genes. "Gene therapy could be targeted to egg and sperm cells (germ cells), however, which would allow the inserted gene to be passed to future generations. This approach is known as germline gene therapy" (National Institute of Health, 2018). The human population trust those in leadership to make ethical and

moral decisions to protect the purity of life. Sade & Khushf (1998, p. 5) state that using gene modification to build a super-race is not a goal of world leaders.

In 2015, China announced to the world they had modified embryos to fight a blood disorder. Calls have been made to the nation with the largest population to refrain from moving their research in the direction of human gene cloning. The United States government and scientists are asking fundamental questions on the subject that must be considered.

> Because gene therapy involves making changes to the body's set of basic instructions, it raises many unique ethical concerns. The ethical questions surrounding gene therapy include:
>
> - How can "good" and "bad" uses of gene therapy be distinguished?
> - Who decides which traits are normal and which constitute a disability or disorder?
> - Will the high costs of gene therapy make it available only to the wealthy?
> - Could the widespread use of gene therapy make society less accepting of people who are different?
> - Should people be allowed to use gene therapy to enhance basic human traits such as height, intelligence, or athletic ability? (National Institute of Health, 2018).

There's an overwhelming belief that the U.S. Government should not be involve in the genetic modification business. Surveys have shown Americans are not comfortable with the idea of creating designer children or the thought of a superior breed of people. The common consensus among the for and against group, technology is a vehicle to improve human sustainability on the planet.

"…four in ten Americans (44%) think that the federal government should fund scientific research on changing the genes of unborn babies to reduce their risk of developing certain serious diseases…eight in ten adults (82%) think the federal government should not fund this type of research" (Harvard T.H. Chan School of Public Health, 2016).

The modification of human DNA could rejuvenate cells, thereby, causing the possible elimination of the sectors that depend on the sick. In time, there would be no need for facilities to house the frail and dying. Gene manipulation could become the mythical fountain of youth. But at what cost? Governments will have to allow their citizenry to be tested, poked, and prodded. They must become guinea pigs.

White House officials are being sued by environmental groups who see this current administration as being hostile on conservation issues. The Trump administration is rolling back environmental regulations from his predecessor. '"The Trump administration is letting the oil industry turn our oceans into toxic-waste dumps…It's time for the courts to remind this agency that its mission is to safeguard the environment and public health"' (Center for Biological Diversity, 2017).

Companies who have toxic waste are embolden by the Trump administration to dump waste without considering the public's health. EPA regulations are in fluidity to support businesses. "…permit allows oil companies to dump unlimited amounts of waste fluid" (Center for Biological Diversity, 2017). This move endangers humans and sea life. The fishing industry has issued complaints about the move coming out of Washington. Polluting the waters could drive down the price of the catch of the day.

Fishermen located in the Gulf of Mexico have a history of polluted waters and the financial cost it inflicts on the industry. Sea life is still being tested for changes in their DNA and the safety for eating. It is inconceivable a government willingly chooses the profit margins of corporations and endangers the planet.

GMO PRODUCTS

One long standing creed in any business where the public interest is the reason for creation of the industry is to do no harm. Products produced should not promote undue burdens on the public. Doing no harm could be viewed as providing goods or services designed for a specific purpose without the guarantee of satisfaction.

There are very few products made without some outside help. Cosmetics is a multibillion dollar industry that has dealt with the organic versus chemical dilemma is the healthcare industry. Birnur Aral, Ph.D., Director of the Good Housekeeping Institute's Health, Beauty and Environmental Sciences Lab, has performed extensive research in the field of modified healthcare products. Aral suggest all hair products cannot perform as designed without help. "…most likely still employing synthetic ingredients for it to work" (Aral, 2017).

The public offering given by manufactures, has created billions of dollars in revenue streams for producer who can manipulate genes and convince the public that modification will serve the same and in some case, give a better outcome than naturally produce products. The beauty industry is filled with advertising that suggest enhanced products are easier, cheaper, and last longer. Cheaper is not always good or safe.

According to McGroarty, (2016) "Beauty & Anti-Aging ($999 bil.) Healthy Eating, Nutrition & Weight Loss ($648 bil.)." Industry observers place both the health and beauty, and GMO

products in the trillions of dollars annually. The return income is well worth the investment. Product makers have no issues making the money, numerous individuals in the public are questioning what chemicals are in goods they are placing on their skin and in their bellies. The health and beauty industries have increased their portfolio because of GE manufacturing.

Too many incidents are occurring involving GE products. "…cosmetics need to be regulated as tightly as pharmaceuticals and food. (Aral, 2017). Accusations against the cosmetic industry are just the latest being heralded because of alleged dangerous chemical in children's makeup. While this issue is being sorted out, the public's health and happiness can be measured in dollars and cents.

The health side is accused of producing medication with GMOs and animal body parts. "GM microbes, plants, and animals also revolutionized the production of complex pharmaceuticals by enabling the generation of safer and cheaper vaccines and therapeutics" (Encyclopædia Britannica, Inc., 2018). Producers are taking full advantage of technologies available for the advancement of applications that will make living easier

Health providers are on the cutting edge of bringing to the market better medication for treating various ailments. "…produce more diverse and complex pharmaceutical" (Shama & Peterson, 2005). Healthcare professionals write prescriptions for patients, some individuals aren't concerned with the side effects caused by some pharmaceuticals goods. For many, being inconvenienced is a small price to pay for living longer.

Governments around the world try to regulate what medicine can be dissimilating among the public. The health industry is constantly pushing the boundaries to get a product in the hands of

seekers of a better quality of life. GE pharmaceutical has a stronghold in the marketplace with billions of dollars being added to manufacturer's ledgers.

In a few years it is projected that the pharmaceutical industry will top 1.2 trillion dollars globally. This continued growth is connected to health issues. It is surmised the biggest contributor is individual's diet. Eating process foods can counteract the body's ability to breakdown foods which leads to use of pharmaceutical merchandise. These GE medicines are a fixer for all medical issues that the body cannot correct on its own.

A critical asset all industries need is water. Water is the life blood in most manufacturing fields. "In 1902, Belgium was the first country to use chlorine to clean or treat water in a public water supply" (American Water Works Association, 2002). From that point forward, drinking water remains GE. It's impossible to partake in the refreshing drink without reading some chemical was added.

Water is one of the most essential needs of all life forms. Unlike the animal kingdom, humans' bodies cannot easily breakdown alien particles introduced to the digestive tract. "The pathogens that cause diarrhea are commonly spread by food or water that has been contaminated with human or animal feces" (Center for Disease Control and Prevention, 2014). It is necessary to add enhancers in water to prevent illness and the spread of waterborne disease.

And few would've believed individuals would pay for a bottled resource that is accessible for free. "…bottled water market was valued at approximately USD 170.0 billion in 2014 and is expected to reach approximately USD 280.0 billion by 2020…rapid growth fueled by strong demand for clean, flavored and hygienic drinking water" (Zion Market Research, 2017).

Companies market various types of improved drinking waters. Ingredients are added to provide a healthier choice than carbonated drinks. "American drank an average of 28.3 gallons of bottled water, accumulating to 8.75 billion gallons of water" (Bottled Water, 2011). All these flavored waters add synthetic enhancers and colors. Companies are reaping major profits from their marketing promotions.

Water is a valued commodity around the world. Scientist have unveiled procedures that could save the vital liquid and create platforms of sustainability in the future. By adding chemicals can save farmers, industries income and production levels high. "…genetic modification can decrease the water requirement" (Massachusetts Institute of Technology, 2017). This technology is much needed, the lack of clean water is problematic for in developing countries and nations that do not have the same high outputs.

"…water supplies dwindle" (Massachusetts Institute of Technology, 2017). Shifting in the global climate contributes to droughts but the biggest user of the liquid gold is farmers. Farmers are scrambling to find ways to keep water flowing to their cash crops. Studies have shown "…the agricultural sector uses 75 percent of global water" (Wallace, 2000). In the state of California, the dry atmosphere has placed a premium on water supplies. Farmers have looked to the oil fields to keep up with the demands of the much-needed liquid.

Protests have taken place against farmers and oil companies who sell contaminated water to be used on crops. Consumers in the state are rightfully concerned about the produce grown with water that has high contaminates. "Oil companies that provide water for irrigation should be required to provide a list of all chemicals" (Heberger & Donnelly, 2015, p. 6).

Consumers complain that too many unknown chemicals in the oil fields and other contributing factors are causing the uneasiness among customers. Crops watered with dirty water has a high probability of being negatively impacted. Farmers also are culprits in the genetic change in other environments. "…Agriculture is a huge contributor to water pollution, from fertilizers used for row crops to the manure created by large-scale animal agriculture" (Geiling, 2016).

Humans consume vast amounts of water. Municipalities have built water cleaning stations to provide drinkable water to its citizens. "…land owners in source watersheds do not consider the effects of their land use on downstream water users" (McDonald, Weber, Padowski, Boucher, & Shemie, 2016).

Clean water requires modifications for human consumption. Bowel waste from animals in rivers and streams increase the need for water to be cleaned of particles that will endanger the health of humans. Farmers use sprays during the growth process of crops, those chemicals are introduced in the soil, air, and water.

Walmart on of the largest retailers in the U.S., pled guilty to several environmental violations. Walmart was fined and has paid over 82 million dollars in fines for violating the Clean Water Act. The cooperation admitted its employees mishandled hazardous materials by pouring unsafe liquids down in-store drains.

Modified products made from water, pharmaceuticals, and food are still forging ahead to with innovative ideas in their fields. These industries have captured the minds of consumers and created mental pictures of a constant need to have products that will keep them with vitality and sustainable lifestyles, these must have products are here to stay.

Industries have unleashed what is thought to be better options for individuals and families that can't afford a pricey mink coat, designer leather furniture, or organic foods. The food industry has been at the forefront of a debate launch in the direction of companies who are making high profits by producing and selling GMO products.

The public can now place their hands on unnatural healthcare products, water with laboratory made vitamins and flavors, and food that has been watered with chemicals and animal droppings. These creations are on the rise, the demand is fueling more fabrications and lining the pockets of the designers and sellers. The public also can read the ingredients and make an educated decision to purchase organic or GE.

Labeling is mandatory in many states in America and international countries. Most labels list the components and measurements, describe the side effects that a consumer may encounter. Labels should have medical or corporate contact numbers. Beyond the basic information, GMO producer are required to confirm the labels can be clearly read, it's the public responsibility to gain knowledge about the mixtures inside the product.

"…more than one-third of women over age 18 and about 10% of men over age 40 use some type of hair dye…Over 5,000 different chemicals are used in hair dye products, some of which are reported to be carcinogenic (cancer-causing) in animals" (National Cancer Institute, 2016). Scientists have performed several studies on the effects of hair dye. There's no definitive yes or no if the chemicals in hair dye cause cancer to humans. We do know the chemical attach to hair strands and change the color over a period of time. With that amount of chemicals, researchers are looking for the connection to the dreaded disease. "…studies have found an increased risk of bladder cancer in hairdressers and barbers" (National Cancer Institute, 2016).

Image provided by inspiredrd.com. Appendix A

"In the early 1990s, GMOs were being sold in stores" (Woosley, 2012). The new world of GMO consumption put American citizens on a path that at this point could not be turned from traveling. GE foods were designed to help bring products to market at a faster pace than the time it takes for organic crops to mature. The expedition of modified food production would add a cost saving component for consumers.

Constituents in North America, were offered a decision between choosing higher priced organic food or what some believed to be inexpensive and better GE modified produce. The catch was,

could the consumer tell the difference between organic and GE without labels. Politicians in the U.S. have avoided issuing tough laws that mandate GMO foods be labeled. In other countries not, labeling products is a crime. According to Feldmann, Morris, & Hoisington, (2000) European retailers are required to label products containing GMOs.

The federal government has been slow to enact GE legislation, states and municipalities have taken it upon themselves to protect their citizenry. States have put the GMO debate at the feet of voters. The public has a voice in the direction this issue will flows. This has taken place in California, Hawaii, and other states have raised their voice in opposition to GMOs. California and Hawaii have counties that have banned growing GMO foods.

“Vermont passed a GMO labeling law last April....to list GMO ingredients on their product labels was put to voters in Colorado and Oregon” ("GMO Foods: What You Need to Know - Consumer Reports Magazine," 2015). The public is gaining the power to force manufactures to make known what chemicals they are ingesting.

This could be a shift in the minds of food consumers in America. Inaction by the federal government to legislate better protection has made the decisions by local municipalities to create laws governing GE manufacturing. The USDA finds no reason for any health concerns but local officials do not agree with this assessment and is promoting healthier food growth. It remains to be seen if more states and local governments will follow in the directions of those voters who have disagreed with GMO production.

Figure 1: Global Area of Biotech Crops (1996-2014).[11]

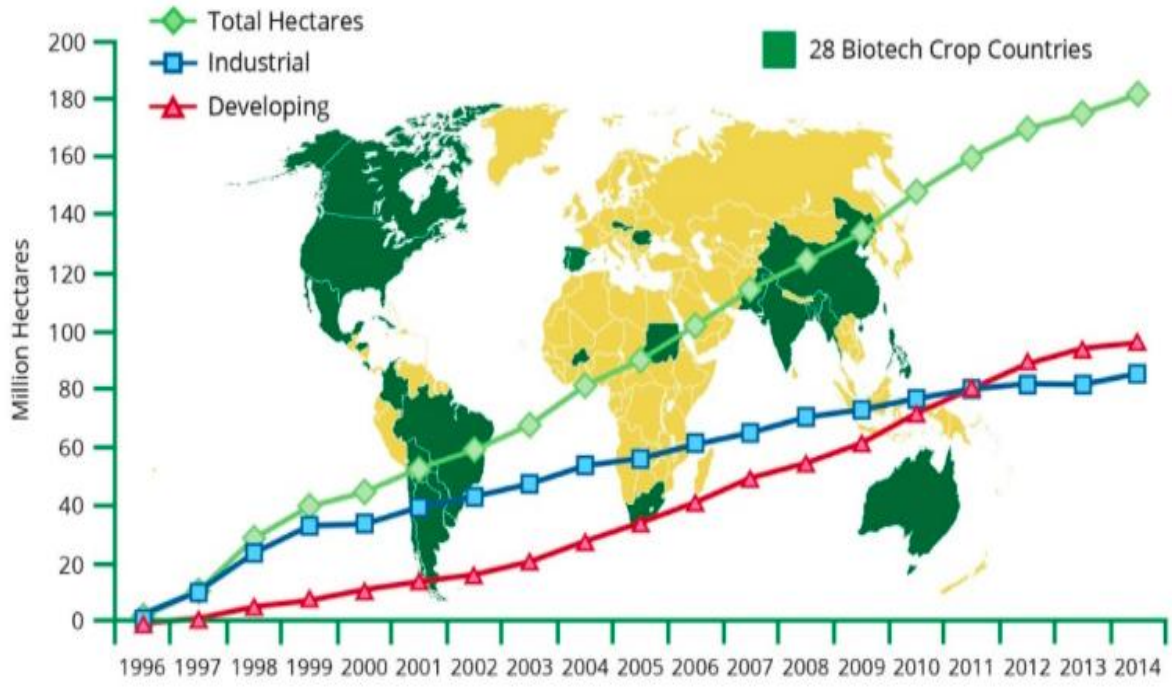


Image provided by (Genetic Literacy Project, 2016). Appendix B

Major commodity crops raised from GMO seed include: corn (92%*), soybeans (94%*), and cotton (94%*). Almost 98% of Canadian grown canola is genetically engineered for herbicide resistance. U.S. sugar beet production is estimated to be over 95% genetically modified for herbicide resistance. GMO sweet corn, papaya, zucchini, and yellow summer squash are also for sale in grocery stores, but in lesser amounts. Genetically modified alfalfa is grown for use as hay and forage for animals (Smith, 2015).

Increasing numbers of vegetables are GMO enhanced. Farmers are using alternative ways to protect their crops from lose by insect contamination. North and South America has the highest rate of GMO crop production. These countries have bought into the benefits and financial

prosperity of modified crops. Since the mid1990s, crop production is on a steady climb with no end in sight.

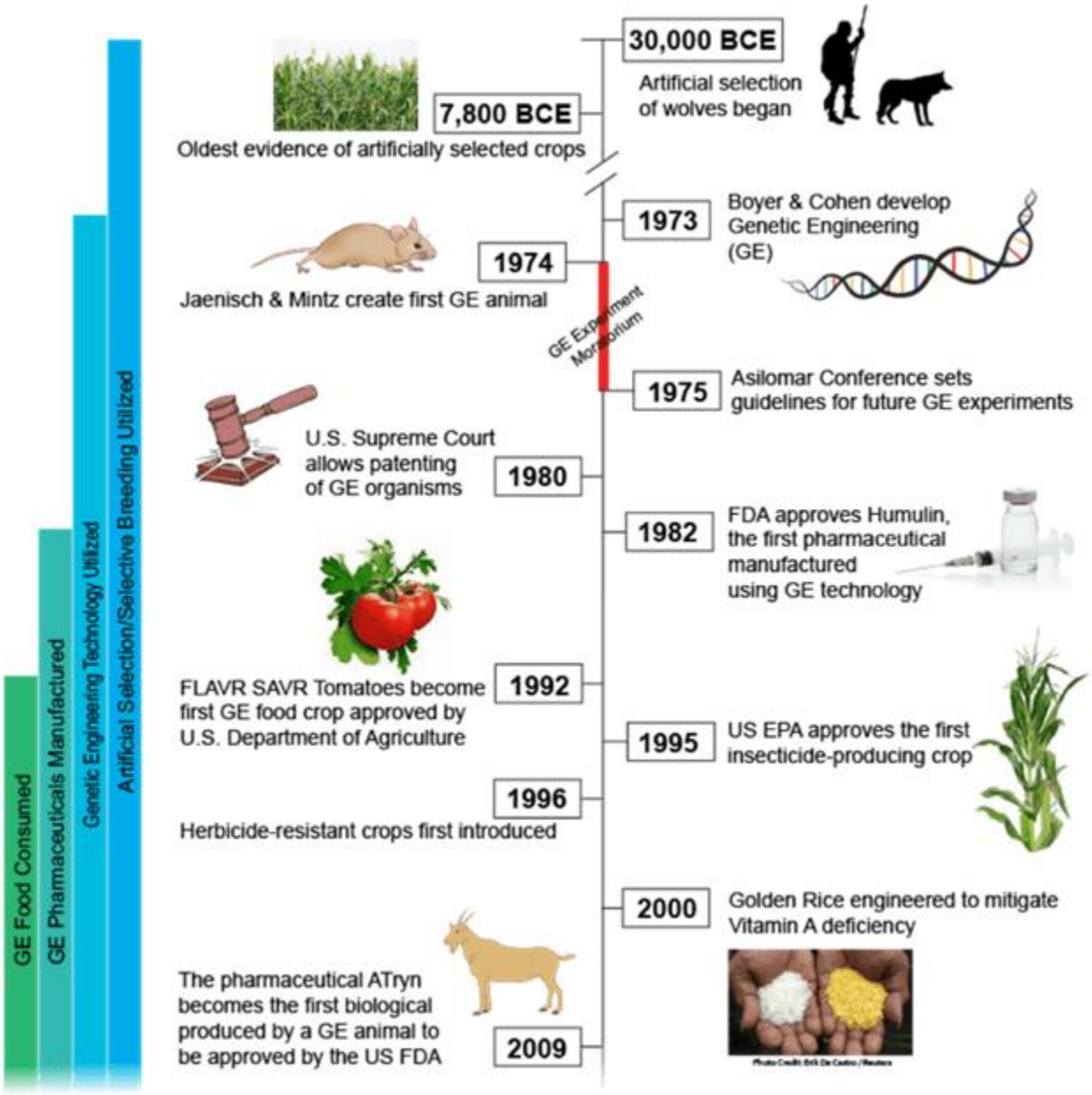


Image provided by (Rangel & Maurer, 2016). Appendix C

PRODUCTION COST

A constant area of negotiation is between a manufacturer and a buyer. This choreographed dance is a way for both parties determine what a product is worth. Since the creation of GMO products, manufactures had and continue to work towards goals of cost saving and providing nutritious meals to the public. The compensation available for industries who can produce products that the public will be willing to pay for will drive up the income level the company and stakeholders. Companies can generate revenue from providing cost efficient GMOs that rival organic foods.

Farmers have been slow in taking the necessary steps to prepare their lands for the introduction of modified plants. "…organic agriculture may have lower yields and would therefore need more land to produce the same amount of food as conventional farms…organic yields are typically lower than conventional yields. (Seufert, Ramankutty, & Foley, 2012, p. 222).

> "One reason is the time it takes to convert a conventional farm to an organic one: farms must lie fallow for three years before being considered organic, and any product grown on the grounds during that time must be sold as conventional.3 Additionally, organic farm operations are subject to added fees and regulations" (USDA, 2014).

The money involved in transitioning to GMOs is small in comparison to potential return on their investment. "...These smallholders enjoyed increased income amounting to $16.7 and $16.2 billion" (Wu, Atkinson, Giddings, 2016). The genetically engineered (GE) platform has raised the bar and driving money into the pockets of the on both sides of the food industry. The belief

that food can have the same nutritious value for a lower cost has added to the increased numbers of food processors looking to become distributors while making significant profits.

Elitzack, (2017) research indicates "The food industry supplied about $1.46 trillion worth of food in 2014." If humans are consuming modified foods, the industry will continue to grow its profits. These profit margins are not just being celebrated in North America, African nations are aware of the profits that are being made from altered products.

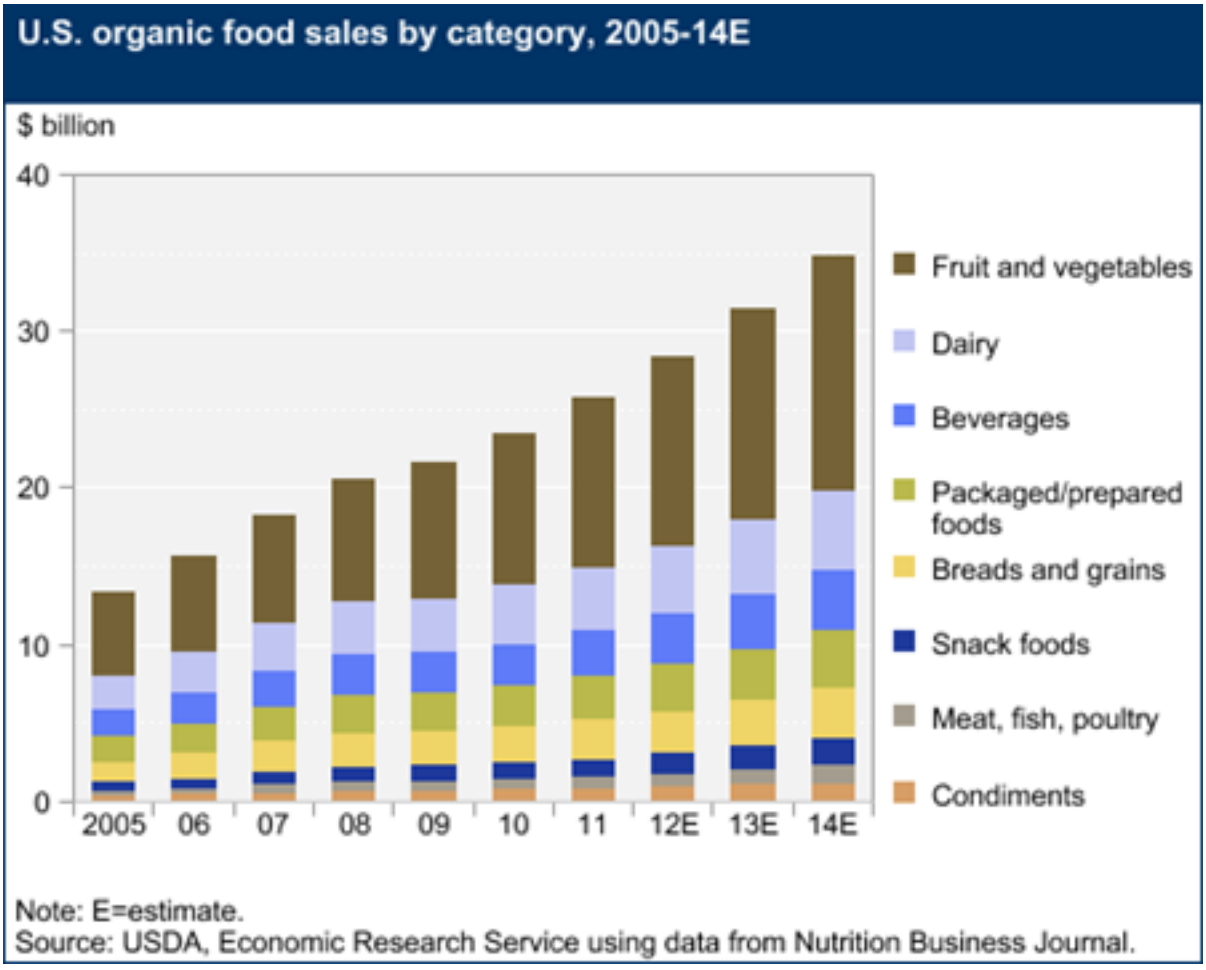
Billions of dollars are at stake and industrial innovations created from modified products solidifies the strong desire to forge ahead in manufacturing stable crops with blessing from government officials. "Roundup Ready soybeans increase farmers' profits by an average of $5 .65 per acre" (Carlson, Mara, & Hubbell, 1997). The money factor is the link between organic and genetically altered foods. Researchers disagree on the effects of altered foods but what is certain is the money both sides are raking in.

> African nations produced roughly $1.01 billion worth of cotton. If 70 percent were of biotech-improved stock, higher yields would increase harvest value by $156 million.
> African nations produced roughly $482 million worth of soybeans. If 79 percent were of biotech-improved stock, the total value would increase by $84 million.
> For maize, African nations produced roughly $10.6 billion worth of the crop. If 32 percent were of biotech-improved stock, the total value would increase by $744 million (Wu, Atkinson, Giddings, 2016).

The money that farmers are making from the GE food industry is staggering. These producers have tapped into what appears to be a bottomless pit of income driven by foods deemed by some to be unsafe. Asking farmers to give of income in the millions of dollars will be impossible.

These farmers have seen the research that supports their view and belief that the products they are delivering to the marketplace is safe and they are providing a service to families with lower priced foods that can rival organic.

For those planters who are willing to put in the time and effort to develop soil that can sustain GE crops, the pay appears to be worth it. In America, farmers have mastered the art of modified crops. Whereas in Europe and other countries, those governments are not concerned with the financial windfall of GE producers. Modified crops are not allowed or crops are monitored and labeled before being placed on store's shelves.



Appendix D

"Organic products are now available in nearly 20,000 natural food stores and nearly 3 out of 4 conventional grocery stores. Organic sales account for over 4 percent of total U.S. food sales, according to recent industry statistics" (Greene, 2017). The organic industry has held onto its position among those who are looking to eat natural foods. Because of the varying opinions related to GMOs and organic, many in the public will continue to pour money into products that have been tested and proving to be free of outside infusions. "The US organic sales growth rate has increased from a recession-induced low of 5.1% in 2009 to 11.5% in 2013" (Cronin, 2015). Although GE foods appear to have a stronghold in America's food market, food buyers craving for naturally produced foods remain strong. Organic foods carry an expensive price tag that many can't afford. "...organic foods were 47 percent more expensive" (Marks, 2015). Unfortunately, most in the public will choose a full belly over healthy foods when the price is beyond their financial budget.

This belief has emboldened producers to continue bringing GE goods to the market. Adults can make a conscious decision concerning their food choices, many youths in schools do not have an option. School administrators purchase foods from vendors at a discounted price. Meals are planned with daily nutritional values as a guide.

There appears to be hypocrisy in the U.S. government. Past administrations pushed for healthy foods to be served to students. The Obamas' believed children would benefit from removing additives that would cause obesity among the youth. The current administration disagreed with that assessment and recalled the previous administration's edicts on that matter.

One school district has moved away from varying opinions from the current and former administration and has acted to provide healthier offering to their students. Sausalito Marin City

School District will be the first in the nation to serve 100 percent organic, non-GMO school lunches. The school district has set a precedent for others to follow. Serving kids processed foods and expecting them to be healthy is not an option.

The school district is willing to invest resources into welfare of those they educate. According to some researchers, eating right is a vital in the development of organs in the body. Providing students with organic meals is not cheap and cuts into the financial budgets of those districts who favor eliminating GE foods. "On average, organic foods were 47 percent more expensive…" (Marks, 2015).

The food industry has the dilemma between profits and the health of its partakers. Countries around the world has made this decision, no GMO foods. "This robust increase in sales has induced more food retailers to enter the organic food industry" (Cronin, 2015). These sales numbers reflect Americans desire to make healthy choices when it comes to food purchases. Those in the GE industry can point to the numerous sales of modified products.

Table 1	**Amazon Fresh**	**Fresh Direct**	**Harris Teeter**	**Peapod**
Apples (lb.)				
Regular	$1.66	$1.66	$1.66	$1.66
Organic	$2.00	$2.66	$2.33	$2.00
% difference	**+20%**	**+60%**	**+40%**	**+20%**

Bananas (lb.)				
Regular	89 cents	88 cents	65 cents	39 cents
Organic	99 cents	99 cents	89 cents	53 cents
% difference	**+11%**	**+13%**	**+37%**	**+36%**
Beef (85% lean ground, lb.)				
Regular	$4.99	$6.49	$6.29	$4.99
Organic	$8.63	$9.99	$9.99	$6.99
% difference	**+73%**	**+54%**	**+59%**	**+40%**
Butter (lb.)				
Regular	$3.98/lb.	$5.59/lb.		$2.50/lb.
Organic	$5.17/lb.	$6.69/lb.		$5.69/lb.
% difference	**+30%**	**+20%**		**+128%**
Carrots (baby, lb.)				
Regular	$1.99		$1.69	$1.66

Organic	$1.99		$1.69	$2.49
% difference	**0%**		**0%**	**+50%**
Chicken, whole/cut up (lb.)				
Regular	$2.48	$1.99	$1.69	
Organic	$4.42	$3.99	$4.49	
% difference	**+78%**	**+101%**	**+166%**	

(T. Marks, Consumer Report, 2015). Appendix E

School districts and parents are opting out of the traditional lunches. The belief among those willing to pay higher prices for providing healthier choices have the potential health consequences in mind. The price to produce and deliver staple foods to the table are major factors for providers and consumers differing views on GMO foods. GE foods are in the price range of organic foods and according to some is no different in taste and the same nutritional values to the body.

Although, governments around the world have concluded GMO foods are safe and have no lasting dietary effects on the body, researchers and parents are still at odds with the health implications of modified foods. Momentum is gaining across America to change from processed meals to foods that are proven to have no health risk.

This onward march to healthy living faces many hurdles from farmers, families, politicians, school boards, and some in the GMO research field. The common denominator for all involved is money. These groups and some not mentioned have in-mind ways to best deliver products to the table. Depending on what side of the aisle a person stands, delivering of these products will continue to raise concern or praise.

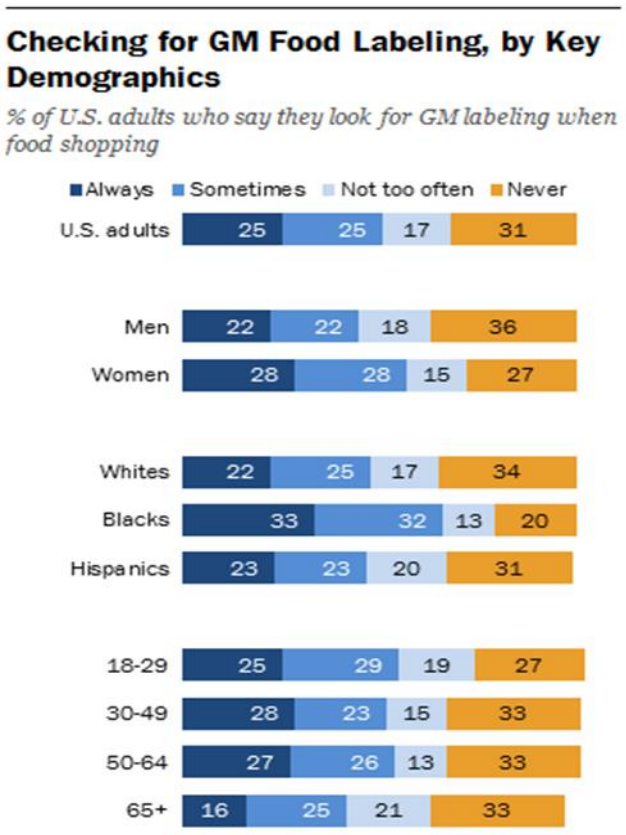
The public is the decider of the best option. Without their voices, producer may feel unfettered in their resolve to provided foods that raise the brow of researcher and nutrition experts. These onlookers are sounding the alarm of the dangerous foods they suggest are leading to the many healthy issues that are on the rise in several parts of the world.

California, Oregon, and countries across the globe, have decided to ban GMO altogether or have labels placed on the product for the consumer's viewing. But is labeling enough? Labeling may be one way to protect those who have no interest in eating GE foods but in many cases, need and hunger will tip the scales to purchasing products non-organic foods.

The consumer often is looking for food that will meet their essential needs. Most in the public decide to buy a product because of price, taste and their knowledge product. School districts are using known factors to say no to all manufactured GMOs. The decision by school district can be viewed as hypocritical. Parents who are shouting from the rooftops not to feed their kids modified foods are in many cases the same parents who will allow their kids to be injected with synthetic virus blockers.

Is there a difference in eating GMO foods and having medical professionals prescribing GE medication that will cause side effects? What is known for sure is certain medication list the side effects and suggest how the medication should be taken, modified do no such thing. Consumers

have been trained to trust the manufactures, with a strong belief that the consumer's wellbeing is protected by laws and consumer watchdog organizations.

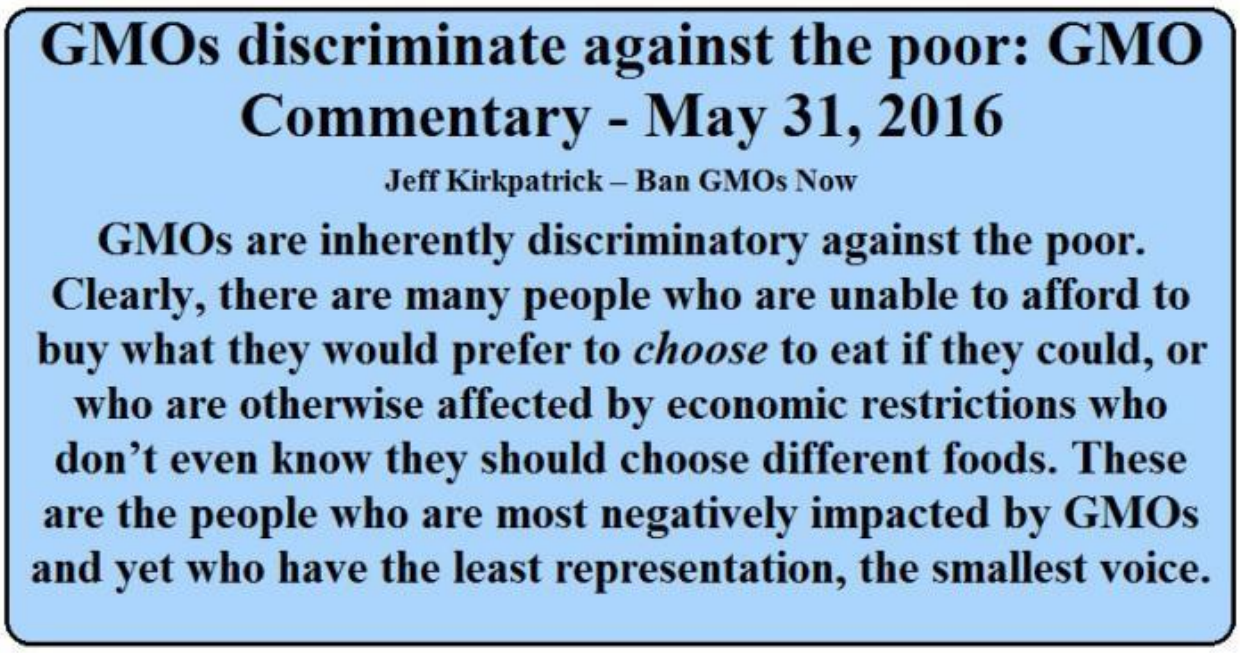


Appendix F

EFFECTS

The physical effects of GMO consumption on the human body is a work in progress. Researchers on both sides have data that will bolster any claims they levy at the opposition. Arguments over the intention of GE modified foods can be measured in the profits of corporations. Millions of dollars are in the hands of GE and organic producers. None of which any side is willing to part with.

The stakes are extremely high if the product is marketed to capture the attention of public. "…increase profits by promoting a technology that has few benefits and may pose some dangers" (Feldmann, Morris, & Hoisington, 2000).



Appendix G

Kirkpatrick opinion is shared among many. Corporations are using the less fortunate to push their products and make profits. "…long after we stop eating GM foods, we may still have their GM proteins produced continuously inside us" (Netherwood et al, 2004).

Some may consider the main debate about GMO foods is the aftermath of eating the foods. According to some scientist and researchers, using sprays to prevent weeds and insects on crops can have a lasting biological effect on a person's digestive tract. "…FDA scientists had repeatedly warned…biotech companies who have been found guilty of hiding toxic effects" (Smith, 2015). The two traits most commonly introduced into GE crops are herbicide tolerance and insect resistance. These traits enable crops to become resistant to certain pests and pesticides.

Image provided by (Feldmann, Morris, & Hoisington, 2000). Appendix H

Many believe foods should grow naturally without outside interference. Adding protective barriers can change the DNA of plants and animals, this change could then affect human' DNA. "GM plants, such as soybean, corn, cottonseed, and canola, have had foreign genes forced into their DNA" (Smith, 2015). Scientific studies on both sides have concluded damage and no damage to the body's construct. What is known, herbicides are doing what they have been developed for, to add a resistant protection to crops.

Those in the farming industry have no issues using pesticides that will help yield better crop production. Pesticides are used to reduce weeds and insects that are harmful and damage crops. The argument is still made that if herbicides kills insects and weeds then it's possible that it can damage human cells. "Pesticides can enter the human body through inhalation, ingestion, or by dermal penetration through the skin" (Hicks, 2016).

Along with Hicks, Smith (2015), is not convinced that herbicides and GE foods are not causing damage to the body. The researcher gives an example of potential irreversible harm done to the intestinal walls.

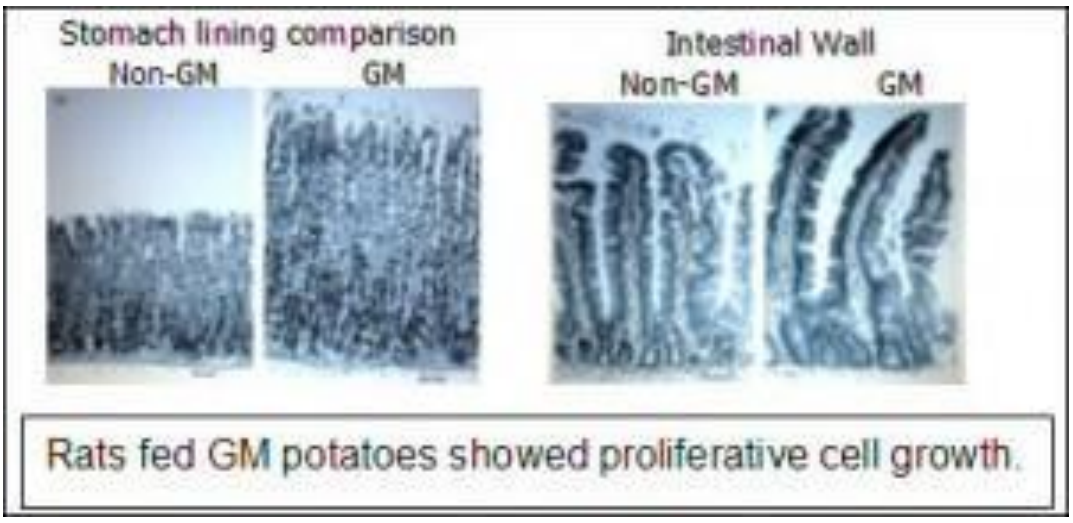


Image provided by (Smith, 2015). Appendix I

According to Hicks (2016), "Pesticides cause headaches, blurred vision, vomiting, abdominal pain, suppress the immune system, lead to blood and liver diseases, depression, asthma, and nerve damage" The USDA is not aligned with Smith or Hicks' research. Not enough information has been developed to give a bold answer if GMO foods will cause health issues. Early studies suggest GMOs are not harmful to humans.

Research has found dangerous chemicals children which proves chemicals are in the foods eaten by humans. Despite these findings chemicals are still used on crops. "…pesticides were five to seven times higher in children eating a conventional diet versus those eating an organic one" (Physicians for Social Responsibility, n.d.).

Smith believes the intestinal walls of humans who eat high amounts of GMO foods are breaking down and this could result in long term health issues. One researcher provides what he believes is proof of the harmful properties of modified foods, national governments are not sold and has not placed a ban or stronger regulations on the modified food industry.

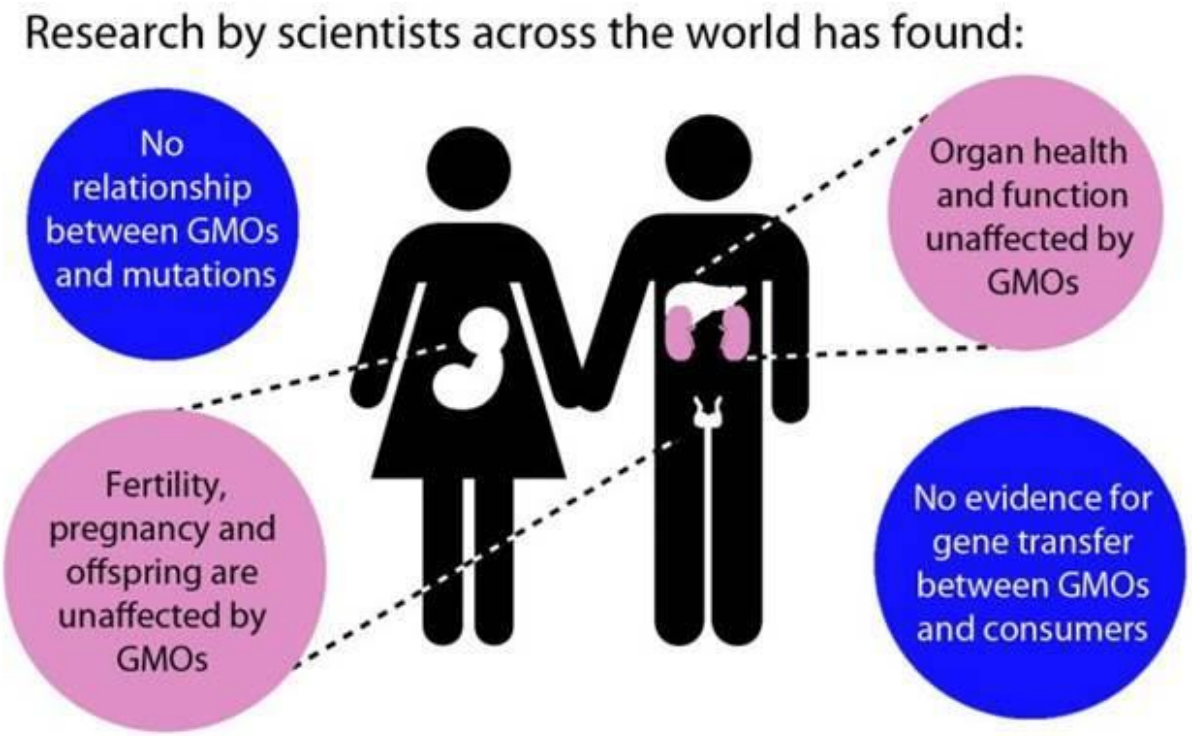


Figure 1. *Work from independent researchers has investigated various aspects of GMO safety, especially concerning consumer health and toxicity.* (Norris, 2017). Appendix J

"…it appears that GMOs as a class are no more likely to be harmful than traditionally bred and grown food sources" (Norris, 2017). The consumers will make the final decision on GE foods. Buyers can't rely solely on the assumptions of differing research opinions. What is true, GMO foods production will continue.

Research on the cost of GE products is the catalyst and a major component for some to remain in the checkout isles with foods that cost is within their budget. Public opinion varies depending on the environment. Many schools have made the choice to go against feeding children GE foods with the prospect of giving kids a better chance to be healthy and shaper in the classroom.

The enhancements of GMO foods emphasize flavors and taste on the packages which appeals adds to the mental perception that the nutrients will meet or accede stimulating the taste buds. Children will often judge a meal on looks and taste. Fresh vegetables are refused over indulging in a sugary and high carb meal. School administrators must remain cognizant in their meal planning of the fresh organic foods that can be wasted. "30 to 50 percent of food is wasted worldwide" (Ecology Global Network, 2014).

Toxic chemical	Sources of Exposure	Adverse Health Effects
Certain Pesticides & Fungicides	Food residues; contaminated soil; agricultural settings; water contamination	Damage to the developing brain; loss of IQ; respiratory disease; non-Hodgkins lymphoma, childhood leukemia; early breast cancer; asthma; autoimmune disease; thyroid disease
Preservatives: Propyl Gallate, BHA & BHT, Sodium Nitrite & Sodium Nitrate	Preservative-added food	Cancer
PCBs (banned substances)	Certain fish;	Damage to the developing brain; loss of IQ; behavioral disorders
BPA	Canned food; many plastic containers	Damage to the developing brain; behavioral disorders
Phthalates, adipates & organometals	Plastics; other forms of packaging	Behavioral disorders
Arsenic	Chicken, drinking water	Carcinogen; increased risk of cardiovascular disease and diabetes
Mercury	Fish; emissions from coal-powered electric plants	Damage to the developing brain; loss of IQ; behavioral disorders; lower overall

		function; visual & hearing impairment
Toxic chemical	**Sources of Exposure**	**Adverse Health Effects**
Certain Pesticides & Fungicides	Food residues; contaminated soil; agricultural settings; water contamination	Damage to the developing brain; loss of IQ; respiratory disease; non-Hodgkins lymphoma, childhood leukemia; early breast cancer; asthma; autoimmune disease; thyroid disease
Preservatives: Propyl Gallate, BHA & BHT, Sodium Nitrite & Sodium Nitrate	Preservative-added food	Cancer
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Phthalates, adipates & organometals	Plastics; other forms of packaging	Behavioral disorders
Arsenic	Chicken, drinking water	Carcinogen; increased risk of cardiovascular disease and diabetes
Mercury	Fish; emissions from coal-powered electric plants	Damage to the developing brain; loss of IQ; behavioral disorders; lower overall function; visual & hearing impairment

(Image provided by Physicians for Social Responsibility) Appendix K

No product made by human hands is without some chemical compound. It's those mixtures that researchers believe is causing the increase in medical issues. "Chemicals are used in every step of the process that puts food on our table" (Physicians for Social Responsibility, n.d.). Adding outside materials to the body's digestive system can over burden the process of disposing harmful chemical agents. The body can only rid itself of so much derivatives before becoming immune and accepting the materials.

Medical professionals prescribe various synthetic medicines to cure aliments, the results of medications can add more harm to the body. Medication labels gives an awareness to the user of the side effects a medication intended to fix one problem and could cause an adverse effect in another area of the body. Medicine is a great elixir for increasing the health and wellbeing of individuals but is made in laboratories with ingredients foreign to human genetic makeup.

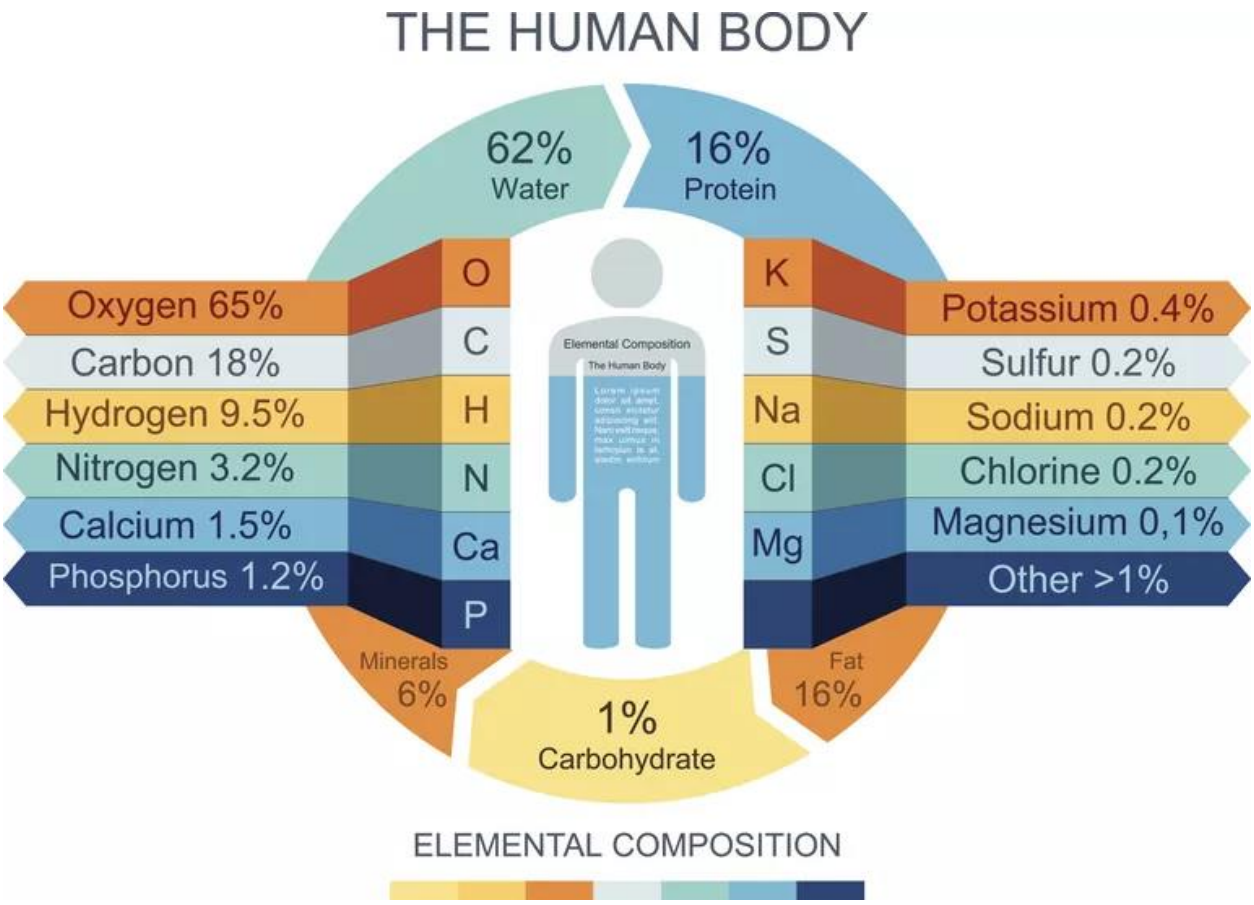
Bolstering the need for synthetic medicines drives up the profit margins and keep individuals tied to a pill bottle or equipment. Legal observers have filed lawsuits on the behalf of clients who suffer from side effects not listed on the bottle or equipment that underperformed.

Name	Drug	Treats	Complication
Invokana	Invokamet	Type 2 Diabetes	Amputation, Diabetic Ketoacidosis
Cipro	Fluoroquinolone	Urinary Tract Infections	Aortic Aneurysms
Zithromax	Azithromycin	Bacterial Infection	Arrhythmia, Torsades de Pointes
Lyrica	Pregabalin	Seizures, Fibromyalgia, Generalized Anxiety Disorder	Birth Defects
Zofran	Ondansetron	Nausea	Birth Defects, Cleft Palate
Actos	Pioglitazone	Type 2 Diabetes	Bladder Cancer
Xarelto	Rivaroxaban	Blood Thinner	Blood Clots, Cerebral Hemorrhage

(Information provided by Drug Lawsuit Source) Appendix L

Medications offered as a service to help the body maintain optimal performance but the cure can have irreversible health consequences. “The mission of FDA's Center for Drug Evaluation and Research (CDER) is to ensure that drugs marketed in this country are safe and effective” (U.S. Food and Drug Administration, 2015). Without government barriers, drug providers could flood the market with untested designer drugs and destabilize market value. Governments understand the do not harm creed, manufactures go through a lengthy process before a drug can be consumed by the public.

"It is the responsibility of the company seeking to market a drug to test it and submit evidence that it is safe and effective" (U.S. Food and Drug Administration, 2015). The FDA evaluates test results and studies submitted by manufactures and in some instances will perform in-house research. If a product is deemed unstable, the FDA will issue warning if the drug is too dangerous. The human body is a fascinating make up of many chemicals and moving parts, what an individual swallow, rub on, smell must be carefully considered.



(Image provided by ThoughtCo). Appendix M

COMMUNITY IMPACT

Creditable medical manufactures apply to have their medicine or equipment endorsed by FDA. An endorsement from the FDA will add legitimacy to the product but it doesn't recuse the manufacture from civil liability. Medical professionals will make claims about the performance and safety of a product only to be embroiled in a legal battle over the negative and deadly consequences resulting from the use of a product.

A community institution devoted to saving lives is the local hospital. Inside the walls of this public domain, community members walk through halls, wait in rooms for a doctor to come in and render a finding on their health matter. It's not out of the realm of belief to think hospitals would be on board with serving visitors and the sick healthy foods. Studies prove healthy foods served in hospitals is far from reality.

"Prevention is a principal focus of most hospitals' work" (Lesser & Lucan, 2013). Hospital administrator's care for patients is the highest duty members in that field can perform, asking administrators why patient and visitors are served processed and modified food that counteract heathy initiative is a conundrum. Hospitals are businesses, health and finances matter. Cutting cost involves lowering food bills.

"…hospital cafeteria achieves profitability by selling items that promote poor eating habits and poor health, there is a conflict between that business practice and the hospital's broader mission" (Lesser & Lucan, 2013). It will be impossible for hospitals to keep their doors open without turning a profit. Hospitals serve GMO foods to patients and to the public. Healthcare organizations have not endorsed the dangers of GMO unlike healthcare providers who rail against serving killer foods.

The federal government hasn't banned all GE products, studies indicates GE foods are harmless, nations around the world grow crops to feed their populations, and hospitals serve modified foods to the sick. At a glance, it would appear GMO foods and products are safe for the public to enjoy. It is the vision of some that sets the stage for later troubles.

Gallup Polls performed a survey on the quality of food and hospital services. "Evaluations of the *appearance* of the meals may be more important than the actual quality of the food" (Blizzard & Gallup, 2002). Some patients don't care what they eat as long as it looks good. Looks are deceptive and could slow down the recovery of a patient.

Medical professionals will instruct patients about the proper foods to eat in and out of the hospital. Hospital personnel are required to follow the meal plan of the doctor. Consultation between doctor, and dietitian provided a layer for the patient's health to improve. "…foods provided should be consistent with dietary advice of clinicians" (Lesser & Lucan, 2013).

Manufactures of GE products detail ingredients on a readable label. Hospitals don't label or tell purchasers if food is GMO or organic. Hospitals are a place for the healing process to begin but also a place the contradicts dietary recommendations.

Patients may want to see good looking food, hospitals commitment to provide quality healthcare to communities goes beyond looks. Food served to visitors and patients should not be a guessing game as to the dietary value in the products. "…it is a hospital's ethical responsibility to make the health-promoting choice the easy choice" (Lesser & Lucan, 2013). Hospitals have been slow to respond to criticism over the food selections. Across the country from Seattle to New York, hospitals are consulting with top chef to reinvent menus and use local organic foods.

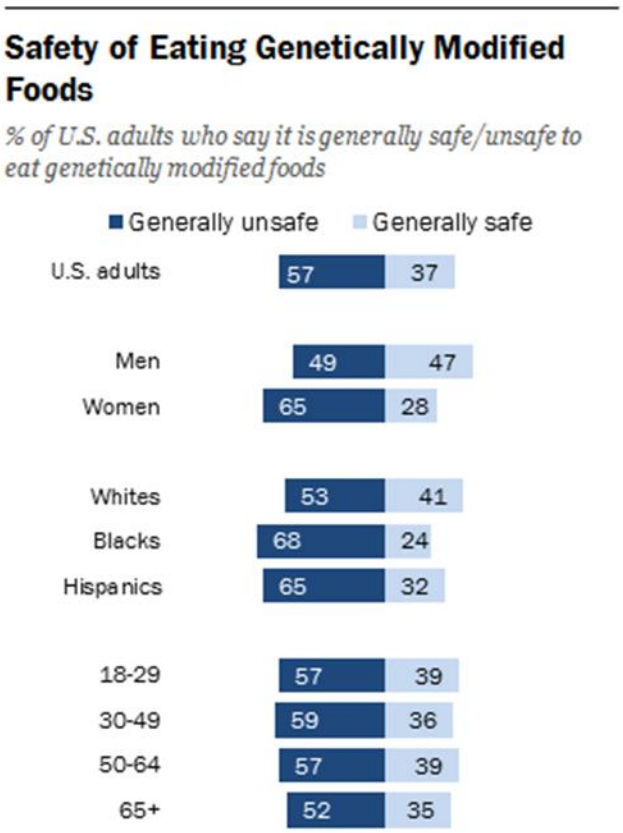
ANALYSIS

"Food from genetically engineered plants must meet the same safety requirements as traditionally bred plants" (Arya & Massachusetts Medical Society, 2015). Safety standards are in place to protect GMO users. The monitoring process falls apart when manufactures sell their goods lesser known vendors. Communities often will have famers and peddler's markets that do not hold up to the same scrutiny as major distributors.

Products are passed on to the public with little or no checks and balances. Whether the product is sold in a local shop or a brick and mortar vendor, the public trust is against GMO merchandises. In communities around the world the faithful flock to local farmers markets and the anticipated carnival to set up and start selling funny named foods. No one can truly know what is in the delicacies being handed out of a food truck or if the product was made in a warehouse with inferior materials.

Local health departments do the usual checks but beyond that a vendor call sell product labeled original, GMO free, or grown locally without meeting the guidelines recommended. Often municipalities do not have enough employees to monitor vendors and the products they distribute. Which can put the public in an unsafe position.

This lack of trust may only be symbolic, studies verify makers of modified goods are not going financially broke and organic goods is not being massively produced. Organic products is healthier for the body. The body can breakdown and disperse organic products easier than chemical laden products.



Appendix N

Notwithstanding the number of people surveyed still trust altered foods. Some researchers do not put a lot of stock in surveys. "Industry-funded GMO safety studies are too superficial to find most of the potential dangers, and their voluntary consultations with the FDA are widely criticized as a meaningless façade" (Smith, 2015). Studies found in the Library of Congress disagree with what is perceived to be hollow findings in favor of GE foods. Modified foods are not showed to have lasting effects on the body and it fills the gap where expensive organic foods have left an opening.

"Several scientific organizations in the US have issued studies or statements regarding the safety of GMOs indicating that there is no evidence that GMOs present unique safety risks compared to conventionally bred products" (Library of Congress, 2015). Americans in various demographics are becoming more conscious of modified foods. The survey compiled by the Pew Research demonstrates the unsafe view of GMO foods. More Americans may have an unfavorable perception of GMOs, that negative perception has not transformed the food industry.

"Obesity has been called an epidemic in the United States. Approximately 35% of adults and 17% of children in the United States are obese" (Arya & Massachusetts Medical Society, 2015). It is no coincidence that the increased number of obese citizens have a direct correlation to GE foods. Processed foods and fried foods have been linked to multiple physical ailments. Doctors will often suggest avoiding eating canned foods that have high counts of non-natural ingredients.

Citizens have become accustom to obtaining certain goods based on price alone. The high cost of medical care, diet infomercials, exercise equipment sale, and many other mental stimulants has not curved the huge number of people to change their eating habits. Individuals and families will still purchase GE items despite any perceived risk.

People who buy organic usually cite these reasons for their decision:

- They're safer. Fruits and vegetables labeled as organic are generally grown without chemical fertilizers and pesticides. Livestock raised under organic practices aren't fed antibiotics or growth hormones.
- They're kinder to the environment. Organic farming practices are designed to be more sustainable, emphasizing conservation and reducing pollutants.

- They're healthier. A few studies have suggested organic foods might be higher in nutrients than their traditional counterparts (Watson, 2012).

Nations around the world are facing a multitude of dire issues. A lack of water and food are at the top of list. Studies have enlightened world leaders of the estimated shortage of food that will take place in the future. "The United Nations predicts that by 2050, humans will need to produce 70% more food than we currently do to adequately feed the global population" (Rangel & Maurer, 2016).

One of the best ways to combat the issue is by developing technologies that will best serve in easing the potential crisis. Droughts in certain areas prevent growth and challenge farmer to change their growing habits. "GM technology offers a way to alleviate some of these problems by engineering plants to express additional products that can combat malnutrition" (Key, Ma, & Drake, 2008).

This potential crisis is not enough of a problem to feed modified foods to individuals (Smith, 2015). Smith also claims there are too many unknowns about GMOs. His research shows GMOs hide materials that are harmful to the human body. The conflicts between for and against enhanced foods may never be solved. Other researchers claim to have found a link between obesity and modified corn.

More analysis done in the field GE products is the weight gained from the consistent digestion of modified corn. "…obesity and adoption of GM corn were similar" (Shao & Chin, 2011). Modified products have side effects that will undoubtedly change the human body. Synthetic chemicals have properties to fight or restore organs back to functioning status but they also can cause damage to other cells and cause unwanted reactions.

CONCLUSION

"In the developing world, 840 million people are chronically undernourished" (Key, Ma, & Drake, 2008). This is the problem, not enough food to the growing world population. Governments have allowed manufactures to develop modified products that will cut down on harming the environment and will add sustainable resources to communities.

To feed the global population GMO resources will be needed. The change in weather patterns have made it impossible for agricultural producers to grow and harvest crops in some geographical areas. Farmers rely on technologies that will protect crops from insect damage and help produce a bountiful yield.

Scientists are researching GE seeds that will sprout without an abundance of water. In underdeveloped nations, modified seeds would provide much needed resources in drought stricken areas. Government agencies indicates the use of modified technology is beneficial for feeding the masses. For some GMO watchers, the verdict is in and clear about the dangers and health ramifications.

Farmers use of pesticides is two folds, the spray provides protection from weeds and insects. Farmers state the chemicals will help crops fully develop and produce sellable foods. The over spray has found its way into water tributaries. In developed countries add more chemical to kill the chemicals before water arrives at the homes of the public.

Secondly, the insecticides kill insects but the chemical residue has been discovered in children and in crops. Researchers have located unsafe elements in drinking water and in food crops. The body must rid its self of alien chemicals or individuals are at risk of developing medical issues.

From those medical issues, synthetic medication will be added to alleviate the chemicals from GE products.

Organic foods sales are on the rise around the world. More people more becoming cognizant of natural foods. Organic food is a big business with price points comparable to GMOs. Municipalities encourage local farmers to grow and sale organic foods to the public. Organic awareness is creatively advertised in various food market and restaurants. Advertiser highlight the benefits of natural foods.

Hospitals are coming on board with the organic movement. Medical institutions help the sick and wounded. Feeding patients and visitors food that is constantly rated not good for stabilizing health issues can be viewed as hypocritical. Medical administrators in Seattle, New York, and other cities are seeking food preparation advice from notable chefs. This move is a win-win for hospitals, patients, and visitors.

How can leaders in governments and homes feed a vast amount of people without being strategic? Clean water is a starting point, water must be freed of harmful bacteria before human consumption. Adding additives to water will accomplish the task of providing a drinkable liquid. Using dirty water and animal manure opens the door for damaging microorganism to enter the body of humans and animals.

Agriculturalist also use an abundant amount of water which has been proven to runoff in water basins. Results from the contaminated water is still being calculated. Government officials have contamination standards available. Consistent onsite checking is a deterrent to keep the public safe. Producers who remain adherent to regulations will continue to build the public’s trust in GE manufacturers.

Government officials have levied out monetary fines for illegal waste dumping in tributaries. Fines have not been enough to stop industries from polluting the valued resource. There's proof regulations are being laxed in favor of job creation. Conservationist believe laxed regulations equals destroying the environment.

The American government is allowing industries to dump toxic materials in waterways which has created hazardous environments and legal challenges. Conservationist are sounding a loud alarm, ecosystems may never bounce back and humans will pay a steep price. Water is a precious commodity that must be protected.

Manufacturers have created designer water that will taste better and increase energy. GE water is on the shelves in markets and is constantly being replaced. The billion-dollar water industry is increasing their profile by adding flavors and chemicals to make the drinking experience better. From that experience the purchasers will buy more of the modified drink.

The health and beauty industries are ripe with GE products. Combined together, these manufacturers are well over 2 trillion dollars. GE is the engine that drivers consumers to the markets. Products are designed for the purpose of sustaining quality of life. Marketing of these products can be seen on all media platforms.

Synthetic merchandises are sought after to remove what is not desired on or in the body. The chemicals connects with skin cells and the intestine walls. Synthetic chemicals can change mental moods and can relieve or add physical pain. Many of the added ingredients can be addictive. Individuals can find themselves in the grips of addiction.

Healthy and beauty devotees are willing to drink at the synthetic fountain of youth, paying whatever price to remain fresh and jubilant and offset the aging process. Lawsuits filed against

health and beauty manufactures, reveal the underlining dangers from using products that tamper with humans genetic makeup. Both industries are accused by product users of deceptive advertising.

Every product is not FDA approved. Lawsuits claim products don't work as advertised, skin irritation, bowel problems, and not fit for children to use. Consumers have to educate themselves to the dangers of products claiming to fix whatever condition they encounter. Products that are evaluated by industry professionals still can cause adverse reactions, even death.

Health and beauty products have been linked to companies outside the United States where regulations are almost nonexistent. Chemical composition in some of these products are known for negatively affecting the body's molecules. Users assume the risk even if the product is made in a reputable country. As long as people want to defy the death process, health and beauty will continue adding to the manufacturer's income.

Space fight was considered the cutting edge technology in the twentieth century. Applications used to control space ships and orbiting satellites are child's play compared to the technology smart phones can compute today. Humans are discovering and writing and rewriting the history of Earth and space. Researchers and scientists believe they have a better understanding of DNA of animals and humans.

Gene modification has raised the brow of scientists who are for the technology and against. Reassigning genes with the hopes of curing diseases is a grand task. There are many unknown factors that may result in unattended consequences. The development of this GE process may provide answers to the suffering humans have in their bodies.

China has taken the lead in genetic therapy at the dismay of nations who are resistant to playing god. China has made claims to have advance genetic therapy, scientist state they moved in the direction of reducing blood disease. This breakthrough, gives hope that more hereditary diseases can be eliminated. Researchers also suggest there are inherit dangers change genetic design in humans.

Studies done on animals provide insight to the failures in reassigning genes. Although, gene alteration is not new. Scientist have and currently experiment on animals in laboratories. One of the more famous case of gene manipulation was performed in Scotland. The subject was Dolly the lamb. Scientist at the Roslin Institute attempted 277 to clone the lamb from an adult gene.

Dolly lived for six years with debilitating physical issues. Scientist surmised her DNA did not develop fully. Dolly was not an exact copy of the gene donor; to give Dolly life, scientist experimented using technics and other sources. The gene manipulation is a blueprint for future creations.

GE has yield positive results in agriculture; the possibilities GE are limitless. Modifying genes can prevent the disappearing of various forms of life. Livestock can be manufactured to feed Earth's population. Producing GE animals could provide cures and be harmless to humans' digestive track.

This technology is not cheap, the price could be in the hundreds of thousands of dollars. The price for cloning will be affordable for the rich. The pricing will exclude the less fortunate, many may disagree that the poor will not be left out of the process. The potential to create a perfect race could begin with GE and views the poor shouldn't be considered from the transition. Government officials monitoring improvements in gene therapy voices matter. Data shows

public sentiments are against human GE. It remains to be seen if governing organizations will sign off on allowing humans to become guinea pigs.

It will be almost impossible and tiring to find merchandise that has not be manufactured without some outside influence. No scientist or researcher can definitively say certain modified products are harmful or not. The consumers must do research and make their best purchasing decision. Governments are going in the direction of feeding its constituents modified foods with the uncertain risk of harming the population.

Something must be done to end the malnourishment of millions of Earth's citizens. The suffering cannot afford the bureaucracy and endless debates that slow down the arrival of much needed help. GE producer have found implemented production designs that will put food on the table of the starving and those whose income will not allow for high-end purchases.

Doing no harm and meeting the needs of humanity is the hope of the designer and receiver. "The great fear that GMOs would cause catastrophic environmental or human health damages has not appeared. But neither have the great benefits" (Bourne, 2016).

APPENDICIES

Image provided by inspiredrd.com Appendix A

Figure 1: Global Area of Biotech Crops (1996-2014).[11]

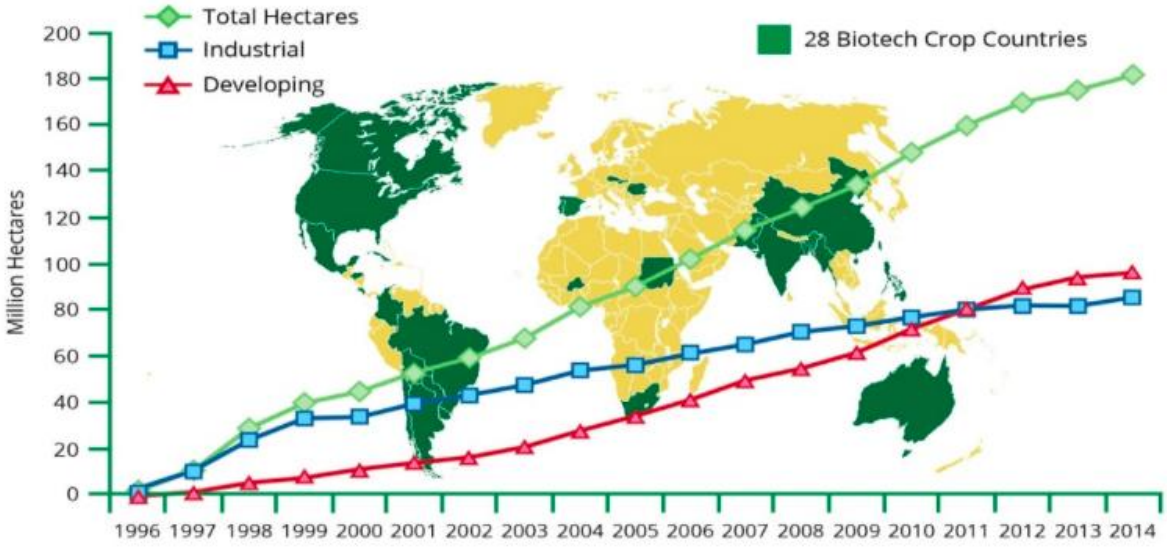


Image provided by (Genetic Literacy Project, 2016). Appendix B

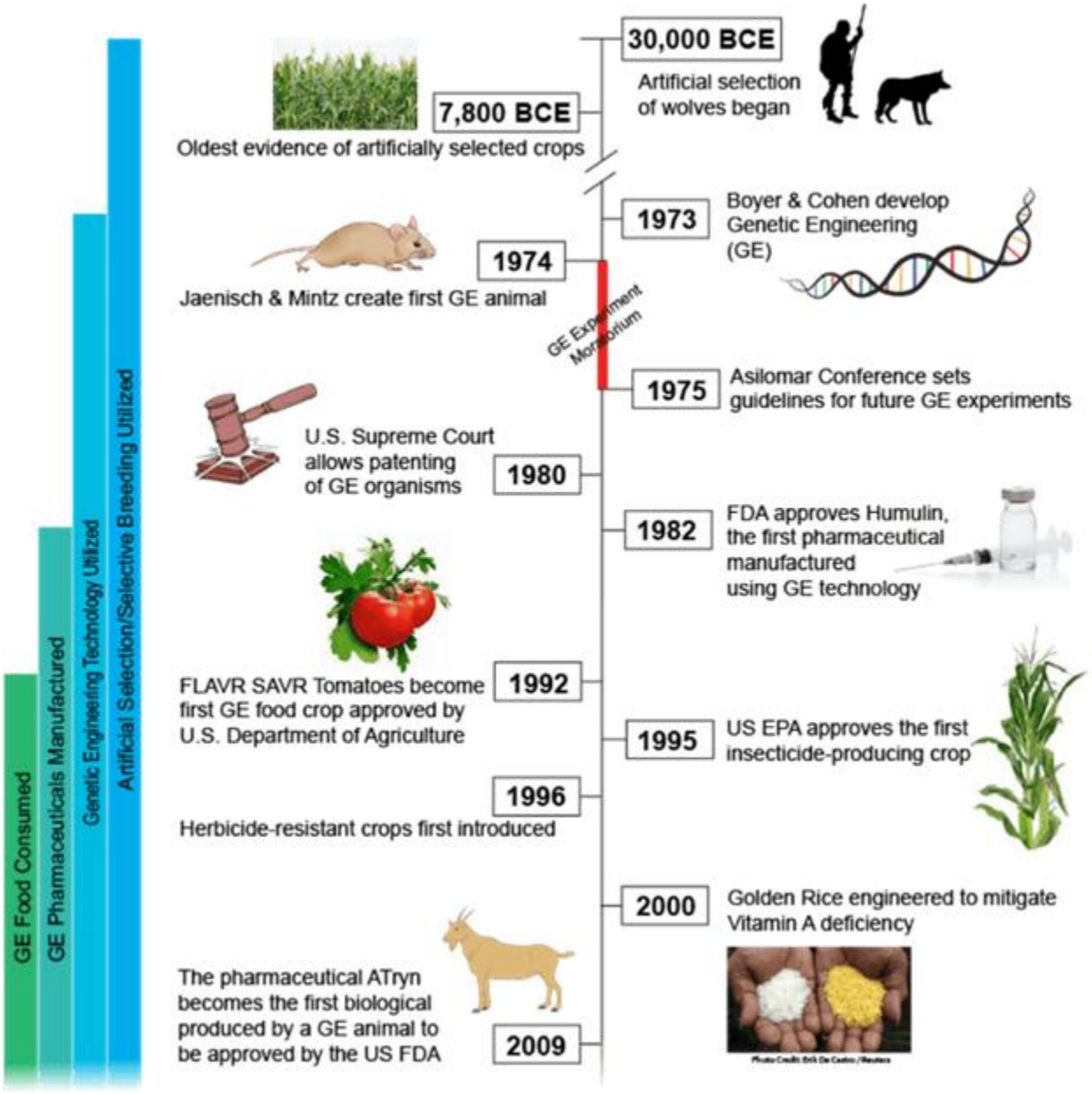
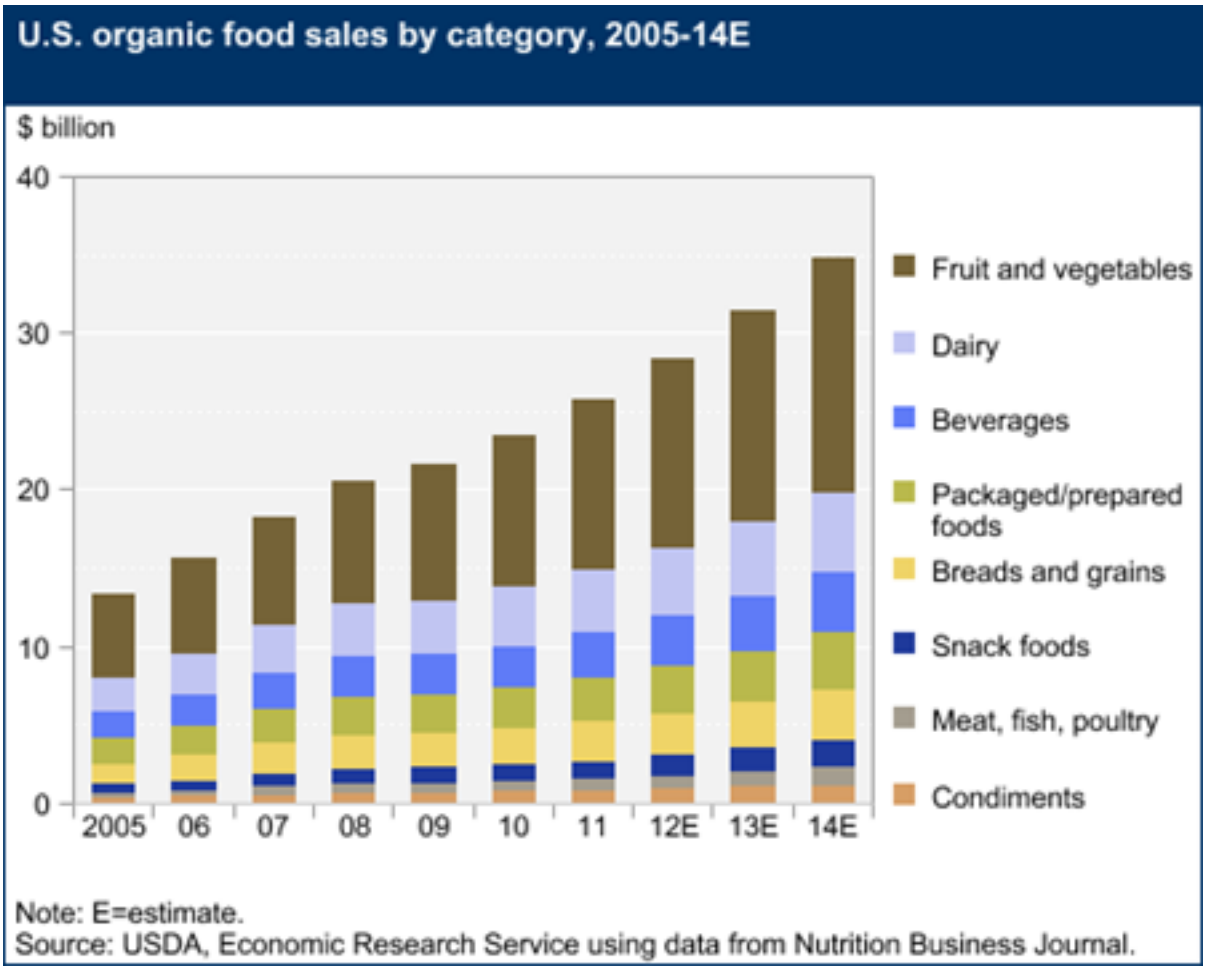


Image provided by (Rangel & Maurer, 2016). Appendix C


U.S. organic food sales by category, 2005-14E
$ billion
40
30
20
10
0
2005
06
07
08
09
10
11
12E
13E
14E
Fruit and vegetables
Dairy
Beverages
Packaged/prepared foods
Breads and grains
Snack foods
Meat, fish, poultry
Condiments
Note: E=estimate.
Source: USDA, Economic Research Service using data from Nutrition Business Journal.

Appendix D

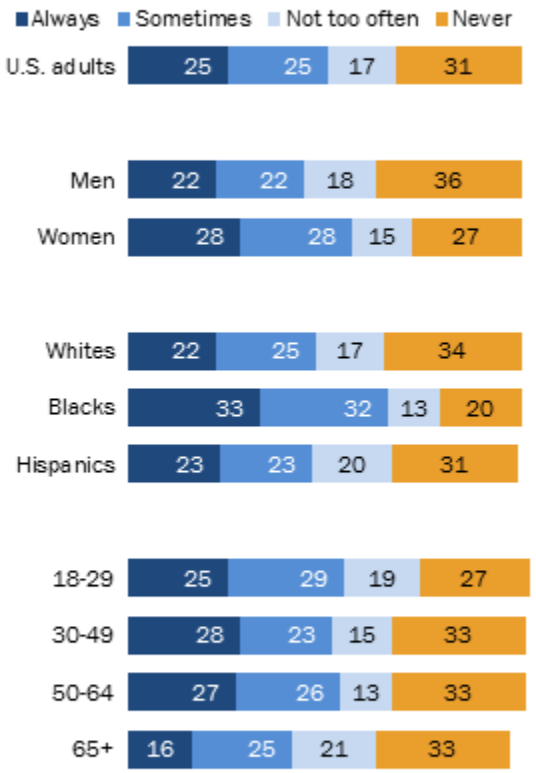
Table 1	Amazon Fresh	Fresh Direct	Harris Teeter	Peapod
Apples (lb.)				
Regular	**$1.66**	**$1.66**	**$1.66**	**$1.66**
Organic	**$2.00**	**$2.66**	**$2.33**	**$2.00**
% difference	**+20%**	**+60%**	**+40%**	**+20%**
Bananas (lb.)				
Regular	**89 cents**	**88 cents**	**65 cents**	**39 cents**
Organic	**99 cents**	**99 cents**	**89 cents**	**53 cents**
% difference	**+11%**	**+13%**	**+37%**	**+36%**
Beef (85% lean ground, lb.)				
Regular	**$4.99**	**$6.49**	**$6.29**	**$4.99**
Organic	**$8.63**	**$9.99**	**$9.99**	**$6.99**
% difference	**+73%**	**+54%**	**+59%**	**+40%**
Butter (lb.)				
Regular	**$3.98/lb.**	**$5.59/lb.**		**$2.50/lb.**
Organic	**$5.17/lb.**	**$6.69/lb.**		**$5.69/lb.**

% difference	**+30%**	**+20%**		**+128%**
Carrots (baby, lb.)				
Regular	**$1.99**		**$1.69**	**$1.66**
Organic	**$1.99**		**$1.69**	**$2.49**
% difference	**0%**		**0%**	**+50%**
Chicken, whole/cut up (lb.)				
Regular	**$2.48**	**$1.99**	**$1.69**	
Organic	**$4.42**	**$3.99**	**$4.49**	
% difference	**+78%**	**+101%**	**+166%**	

(T. Marks, Consumer Report, 2015). Appendix E

Checking for GM Food Labeling, by Key Demographics

% of U.S. adults who say they look for GM labeling when food shopping



Survey of U.S. adults Aug. 15-25, 2014. Q37. Those saying "don't know" or volunteering another response are not shown. Whites and blacks include only non-Hispanics; Hispanics are of any race.

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Appendix F

GMOs discriminate against the poor: GMO Commentary - May 31, 2016

Jeff Kirkpatrick – Ban GMOs Now

GMOs are inherently discriminatory against the poor. Clearly, there are many people who are unable to afford to buy what they would prefer to *choose* to eat if they could, or who are otherwise affected by economic restrictions who don't even know they should choose different foods. These are the people who are most negatively impacted by GMOs and yet who have the least representation, the smallest voice.

Appendix G

Image provided by (Feldmann, Morris, & Hoisington, 2000). Appendix H

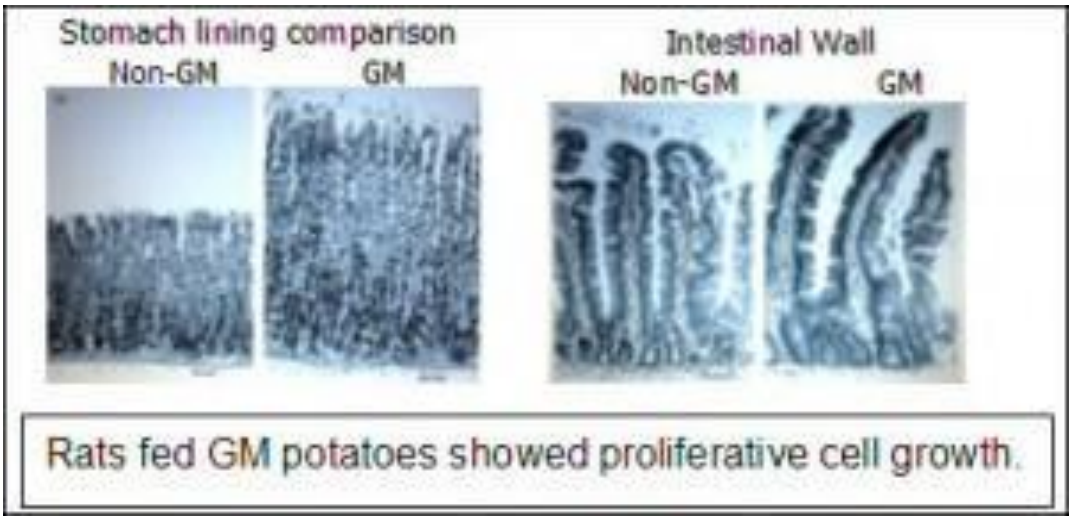


Image provided by (Smith, 2015). Appendix I

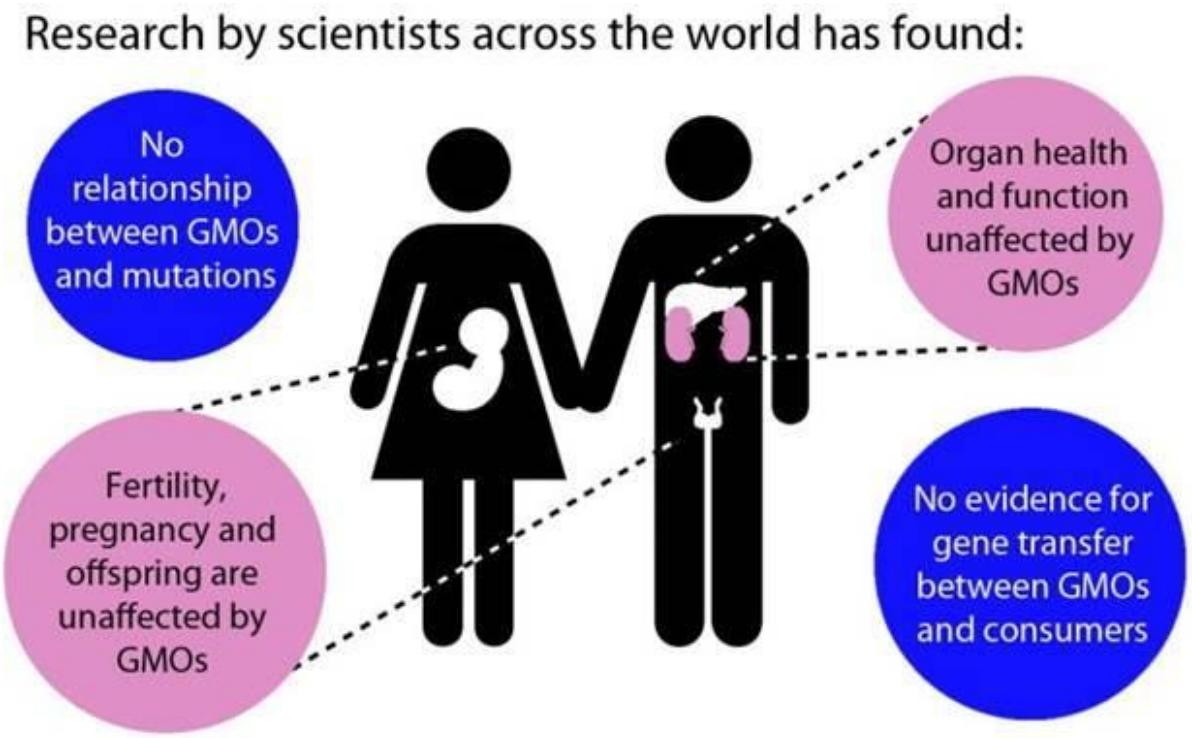


Figure 1. *Work from independent researchers has investigated various aspects of GMO safety, especially concerning consumer health and toxicity. Image provided by (Norris, 2017).*

Appendix J

Toxic chemical	Sources of Exposure	Adverse Health Effects
Certain Pesticides & Fungicides	Food residues; contaminated soil; agricultural settings; water contamination	Damage to the developing brain; loss of IQ; respiratory disease; non-Hodgkins lymphoma, childhood leukemia; early breast cancer; asthma; autoimmune disease; thyroid disease
Preservatives: Propyl Gallate, BHA & BHT, Sodium Nitrite & Sodium Nitrate	Preservative-added food	Cancer
PCBs (banned substances)	Certain fish;	Damage to the developing brain; loss of IQ; behavioral disorders
BPA	Canned food; many plastic containers	Damage to the developing brain; behavioral disorders
Phthalates, adipates & organometals	Plastics; other forms of packaging	Behavioral disorders
Arsenic	Chicken, drinking water	Carcinogen; increased risk of cardiovascular disease and diabetes
Mercury	Fish; emissions from coal-powered electric plants	Damage to the developing brain; loss of IQ; behavioral disorders; lower overall function; visual & hearing impairment
Toxic chemical	**Sources of Exposure**	**Adverse Health Effects**
Certain Pesticides & Fungicides	Food residues; contaminated soil; agricultural settings; water contamination	Damage to the developing brain; loss of IQ; respiratory disease; non-Hodgkins lymphoma, childhood leukemia; early breast cancer; asthma; autoimmune disease; thyroid disease
Preservatives: Propyl Gallate, BHA & BHT, Sodium Nitrite & Sodium Nitrate	Preservative-added food	Cancer
PCBs (banned substances)	Certain fish;	Damage to the developing brain; loss of IQ; behavioral disorders
BPA	Canned food; many plastic containers	Damage to the developing brain; behavioral disorders
Phthalates, adipates & organometals	Plastics; other forms of packaging	Behavioral disorders

Arsenic	Chicken, drinking water	Carcinogen; increased risk of cardiovascular disease and diabetes
Mercury	Fish; emissions from coal-powered electric plants	Damage to the developing brain; loss of IQ; behavioral disorders; lower overall function; visual & hearing impairment

Image provided by Physicians for Social Responsibility Appendix K

Name	Drug	Treats	Complication
Invokana	Invokamet	Type 2 Diabetes	Amputation, Diabetic Ketoacidosis
Cipro	Fluoroquinolone	Urinary Tract Infections	Aortic Aneurysms
Zithromax	Azithromycin	Bacterial Infection	Arrhythmia, Torsades de Pointes
Lyrica	Pregabalin	Seizures, Fibromyalgia, Generalized Anxiety Disorder	Birth Defects
Zofran	Ondansetron	Nausea	Birth Defects, Cleft Palate
Actos	Pioglitazone	Type 2 Diabetes	Bladder Cancer
Xarelto	Rivaroxaban	Blood Thinner	Blood Clots, Cerebral Hemorrhage

(Information provided by Drug Lawsuit Source) Appendix L

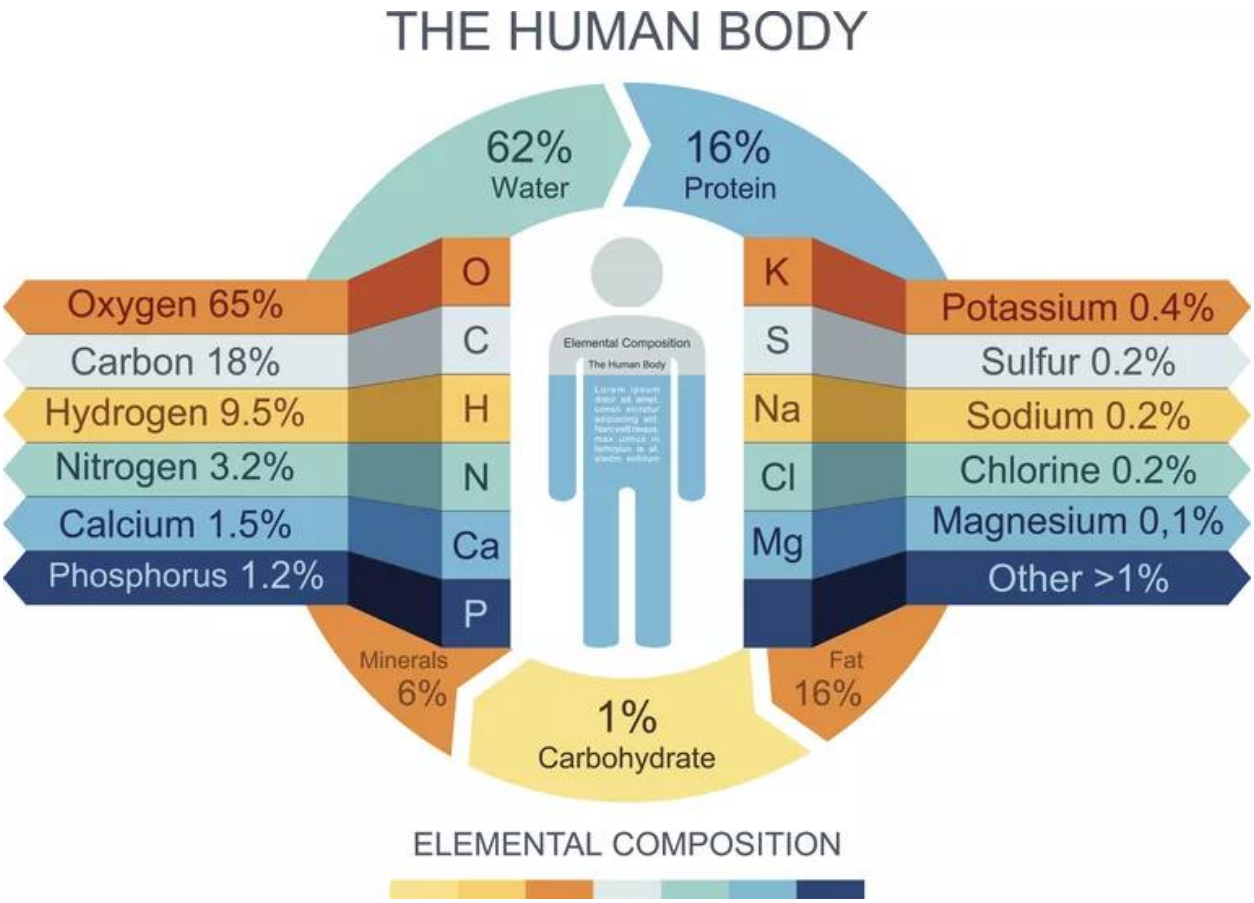
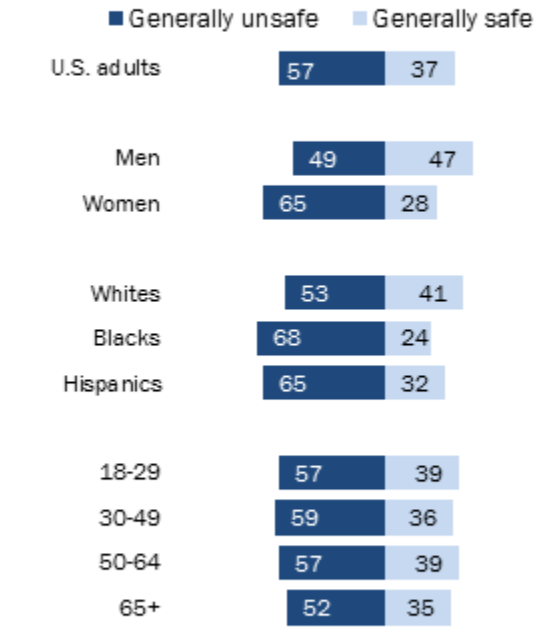


Image provided by ThoughtCo Appendix M

Safety of Eating Genetically Modified Foods

% of U.S. adults who say it is generally safe/unsafe to eat genetically modified foods



Survey of U.S adults Aug. 15-25, 2014. Q38. "Don't know" responses not shown. Whites and blacks include only non-Hispanics; Hispanics are of any race.

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Appendix N

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