

The Future of Genetic Manipulation of Food

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When many people think about the food they eat, the furthest their thought goes is "What do I want to eat?". However, with the evolution of food throughout the world, it might be important to ask other questions about what we are putting in our bodies. The food industry is the most advertised aspect of living in America, and grosses sales of over \$30 billion dollars a year on advertisements (Albritton 2009). To have this much money spent on advertising you would think many people would be capable of making more informed decisions on the food they consume to better affect their long-term and short term health, however, in America today about 40% of Americans are considered obese. It is hard to attest where this growing percentage is attributed to, but some argue the manipulation or evolution of organisms for food and drink might be an impactful factor to this. Some of the biggest manipulation of organisms for food and drink in America that come to mind is the introduction and use of genetically modified organisms, the ever growing brewing popularity in America, and the new growth of the use of supplemental products throughout the nation.

The introduction of GMO's was a revolutionary time in the production and distribution of food not only in America, but throughout the world. A Genetically Modified Organism is defined as any organism that has had its DNA altered or modified with genetic engineering. Genetically modified foods are modified to enhance certain aspects of the food such as creating a consistent taste, be resistant to disease, or enhance growth speed (Lallanilla 2019). One of the largest areas of modified organisms exists in the agriculture market. Over 90% of all soy, cotton, canola, corn, and sugar beets sold have been modified in some form.

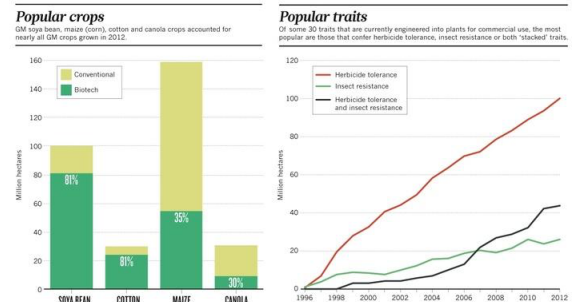


Figure 1: Visual representation of the percentages of extremely popular GMO products, and what they are genetically altered to combat. From *The Washington Post*.

When looking at the what GMO's are and how much of the market is affected by GMO's both the common public and scientist have begun to argue about GMO's. The arguments include things such as are GMO's safe for the body, the environment? What are the long term effects of these GMO's? What are the positive effects of the use of the GMO's? These are all questions that have been discussed and solutions have tried to be found. When looking at the positive effects of GMO's many different impacts to both the United States and the world have been observed. One big impact of GMO's has been the yield return of farmers. This result has a two-fold impact, it positively effects farmers because it creates a better profit margin and likely prevents the possibility to lose money, and it also creates a higher yield of food for distribution. With more food available for distribution, the lower the price the product can be sold at because there is a lower demand with a higher supply (Carter 2019).

However, there are many different, negative, arguments presented by the public and scientist in regards to GMO's and the impact they are having. The basis of many of these negative arguments are based off three main points: environmental impact, human health impact, and social and cultural impacts (*Soylent*). However, as the implementation of GMO's has advanced more and more studies have been carried out, and produce evidence that GMO's don't have extremely detrimental effects to the environment and to the human body. So the biggest negative impact that GMO's have had have been social

and cultural impacts. In a country and world where there are socioeconomic division, it is obvious that there is a certain group of the population that is more likely to rely on GMO's as a food source compared to others. Some would argue that this is unfair and that the organically and naturally produced food that is available, but more expensive, should be the only produced food available to all the population. However, an argument to this is that GMO's, such as rice and corn can be produced at such high levels that they can be used as products to be given away for free as aid to countries that aren't as economically or socially developed as many of the world powers.

Another growing aspect of the manipulation of organisms for the enhancement of food and drink has been the booming growth of the brewing of beer in America. Specialty breweries can be seen popping up throughout the country. Beer has always been a staple alcoholic beverage throughout history, accompanying sporting events, meals, and social events. However, the evolution of beer in the past 5 to 10 years has been extremely fast. Beer is brewed using a combination of malt, water, and hops. This mixture is then mashed and allowed to sit to create the desired flavor. Then yeast is added

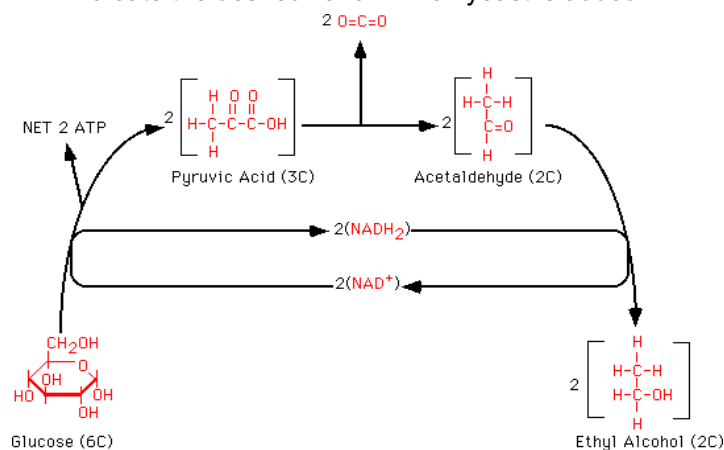


Figure 2: Visual schematic of the process of alcoholic formation of sugars.

with sugar in order to allow the fermentation process to occur which produces the alcohol of the beverage (*Beer Store*). The critical step of the process of brewing is the fermentation by the yeast, and with the introduction of craft brewing is where brewers have seen a great influx of manipulation of many different brewing yeasts, to create different affects during the brewing process.

The yeasts' main responsibility is to create the alcohol, however, during the fermentation process many other different microorganisms can be produced during the reaction that are influential in affecting the flavor of the final product. Studies have shown that some of the study of yeast that have been done include UV-treatment of yeasts colonies in order to produce genomic alterations, and many maltotriose studies, which is a sugar instrumental in the brewing process. These studies cultivated results that suggest that these alterations could have a serious impact on brewing success based on flavor, brewing speed, and ability to prevent brewing spoil could be very useful (Lattici 2020). To alter yeasts to be able to have different flavor profiles from their productions during fermentations, brewers are trying to manipulate these yeast organically. With the manipulation of the yeasts, there is a large amount of trial and error to determine what the genomic alterations affect during the brewing process, and the affects can't be determined until a product is creating brewing with these altered yeast.



Figure 3a: Evidence of the growth of craft brewing in America. From *BrewersAssociation.org*



Figure 3b: Evidence of the growth of craft brewing in America. From BrewersAssociation.org.

With the ever changing diet scene across the world, there has been a new introduction of products that are designed to be used alongside these diets to ensure the necessary nutrients are present in a diet. These products are referred to as food supplements, or are more specifically described as dietary or nutritional supplements. These supplements range from nutrients such as antioxidants, vitamins, amino acids, or even fatty acids. The design of these dietary supplements was to assist in rounding out a wholesome diet, or to be used by certain populations that don't have access to certain essential nutrients. However, as their popularity has grown, so has the misuse of these supplements. The body can only handle a certain concentration of many of the supplement types, and if these useful concentrations are exceeded, many negative adverse effects of these supplements have been seen. Researchers still argue, that the most useful way of being healthy, is to have a fully balanced diet, and to not really on supplemental access to nutrients ("What are Food Supplements").

Another massive aspect of these supplements in America is the idea of influencers. With the introduction of social media, popular idols in America are able to help endorse

products through their social media for money. Supplements are some of these products that fit into this category of social media advertising. Due to this method of advertising, a large population of users includes young athletes. Many people of the younger generations aren't educated on the true purpose and design of these supplements and are eventually misused. These supplements also fit into a category between drugs and food, and because they are not seen as a "drug", they are not regulated by the FDA, and being unregulated many of these different supplements don't follow regulations (Hooton).

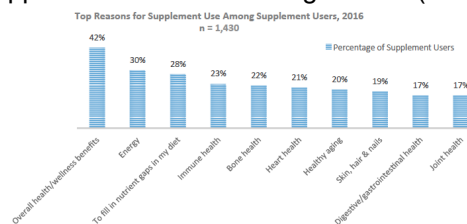


Figure 4: Percentages of the purpose of use of supplements among adults in America. From CRNUSA.

When looking at how organisms have been manipulated with things such as genetic modification, or with the introduction of dietary supplements, it is extremely important to understand that it is necessary to conduct personal research to understand the true impact of these products. The media and social media make it extremely difficult to have a true understanding of many things, and the products talked about in this article are just a few of the products that have a skewed presentation in the media. Each of these products design were made with the purpose of a positive outcome, and likely if used correctly by someone with a correct understanding of their purpose, than they have had a positive impact.

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