

Ezra Educate

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English Composition II

April 29, 2023

### Sweet and Sour – The Truth About Sugars

Sugar has been a major export around the world for centuries and has been used in many foods and beverages since then. During the present day, most table sugar comes from sugar beets and sugar cane, but only within the past 50 years Americans have seen a rise in sugar concentrates such as high-fructose corn syrup, Maltose, and Dextrose. These are all made from the refining and processing of corn and are extremely bad for human health.

#### **The Birth and Life of Added Sugars**

The reason for the rise of high-fructose corn syrup is due to the corn subsidies created by the Roosevelt administration in 1933, which guaranteed a minimum price paid to farmers for their crops and excess crops would be bought by the government. This also covered farmers in case of natural disasters as the government would pay them for damaged crops as well, helping them regenerate for next year's crops. The Reagan administration boosted the farm subsidies by introducing many more billions of dollars to the program. This was so that we did not have to depend on other countries for food in case of war. Because of the abundance and the many uses of corn, including making ethanol for gasoline, people found many ways to process sugars into other chemicals that could be added to consumer products. Then, a commercially cheap and fast way to make sugars from corn entered the market.

Before the Reagan administration pushed for more money to be paid to corn farmers a low-fat diet fad began. Saturated fats were overly blamed for causing heart disease and other health conditions, causing a public outcry for low-fat products to be produced. Saturated fats were chemically processed (hydrogenated) to change them into trans fats, which to current knowledge, are now worse than any other types of fat for the digestive system to process. Sugars were added to improve the taste of these low-fat products, causing a visceral need for sugars that had been unmatched before. The low-cost and large target market implications had big food and drink companies competing to lower fats and increase sugars to make the public need their products excessively. High-fructose corn syrup is sweeter than table sugar and is about 1/3 of the price, making it a staple commercial sweetener to cut production costs.

### **The Chemical Processes to Create High-Fructose Corn Syrup**

How is high-fructose corn syrup made? It is refined by shucking and grinding corn into cornstarch, which is then mixed with water in a fermentation vat. Enzymes (alpha-amylase) are then added to break down the starches (Starches are long chains of glucose that commonly called carbohydrates) into polysaccharides. (Shorter chains of glucose) Glucoamylase is then added to break the polysaccharides into almost pure glucose syrup, which is where Maltose and Dextrose come from. Another enzyme (Glucose-isomerase) is added to convert some of the glucose into fructose, creating a 42-52 percent mixture of fructose to glucose with other sugars. Last, the sugar is distilled using liquid chromatography, which requires passing the sugars over liquid mercury (Hg) that has an electrical charge to purify it into containing higher amounts of fructose, up to a 90% purity.

Because of the rise of high-fructose corn syrup and equivalent products, there has been a parallel rise in obesity, diabetes, and other health issues. The only way to fix this is to create warning labels and tax added-sugar products to help healthcare, exercise programs, and drive down the amount of added sugar products purchased. The following metabolic and addictive effects of sugars on the human body warrant a change in laws to attempt to reverse widespread obesity and adverse health effects. We will explore the metabolic and addictive properties of sugars and how taxing them reduces the amount of added sugar products from being purchased.

### **The Metabolic Implications of Sugars**

It is important to understand that fats are not solely responsible for weight gain, sugars are the reason fats are deposited in the first place. When high doses of sugars are consumed consistently, they make up the whole of our energy source and fats are phased out and deposited for later use when sugars are absent from the diet.

The reason for this deposition of fats is the secretion of insulin when we consume sugars, which is responsible for the breakdown of sugars into ATP and NADH, molecules responsible for energy, and CO<sub>2</sub> and H<sub>2</sub>O, byproducts we breathe out and urinate. Consistent intake of sugars, especially fructose, creates insulin resistance. Insulin resistance causes excess sugars to enter the bloodstream which need to be filtered out, causing the workload to fall onto the liver, which is already responsible for breaking down fat. (Nithya et al.) The liver converts excess sugars into fat for later use, causing fatty liver disease and fatty tissue deposition elsewhere to be used during low-calorie intake periods. Because the amount of energy produced from ingesting sugars is low when insulin is low, it causes unwanted hunger or a need to “snack” consistently.

When sugars overpower the liver, they flood the bloodstream even more, causing hyperglycemia, the metabolism requires extra water to process them because proper metabolic processes require water as a medium. The excess number of sugar molecules and low amount of water in the bloodstream causes blood pressure to rise, regardless of the extra fat deposition on the walls of arteries. This phenomenon has been compared to “pumping thick sludge through a tiny pipe.” (Mclallen)

Excess sugars in the bloodstream do not just affect the blood pressure of the human body, though. Partially oxidized sugars in the bloodstream have a low pH, which is associated with being acidic. Acidic compounds in the blood strip calcium and magnesium from the bones and teeth, causing a compromised bone structure and weak tooth enamel. People with osteoporosis are recommended to avoid sugary foods, and people with high-sugar diets are at a much higher risk of osteoporosis in older age. To detect a high-sugar diet or diabetes, one can measure the amount of calcium and magnesium in the urine.

Experiments done on white rats have proven there is an elevated intake of foods when consuming extra sugars regularly. The starting weight of the rats fed high-fructose corn syrup was about 397g and the ending weight was about 460g, which is an increase of 13.69% body fat. Feed intake was the highest among rats fed high-fructose corn syrup (871g over 6 weeks) proving that sugar creates a larger appetite to attempt stimulating insulin output. (Sadowska and Bruszkowska) Sugars were never meant to be consumed consistently in high doses, unlike seasonal fruits and vegetables before the agricultural revolution.

It has been a tradition in many cultures worldwide to eat high fat and high sugar items after the autumn harvest and before the winter arrived, such as to gain a layer of warmth and a slow-burning energy source of fats in preparation for the cold and low food count. To quote Dr. Timothy RH Regnault:

“Sugars have been a part of the human diet since hunter–gatherer times when sugar containing fruits, berries and honey were used extensively as a seasonal energy source. These foods contained varying amounts of the monosaccharides glucose and fructose, or the disaccharide sucrose (glucose–fructose); however, due to the seasonality of these foods, intake was limited.”

Furthermore, sugar intake is carefully controlled by animals as well. Birds eat only seasonal fruits, berries, and seeds while maintaining a year-round consistent diet of bugs and small lizards that are high in proteins and fats. Hummingbirds are known for their high-sugar diet, yet for proper muscle growth, hormone creation, and feather/skin growth they still eat some amounts of small bugs.

The reason natural sugars are important is because they are slow-release, due to the natural fibers and proteins surrounding the sugars, but soda, candy, and pastries are a speedy delivery system that overloads the human body. If someone wanted to eat some apples to equal a 20oz Mountain Dew, they would have to eat about 7 apples to gain the same amount of sugar, and the apples would take about 4-6 hours to digest compared to the 20-40 minutes it would take for soda.

Many argue that some studies and research regard consuming sugars as having no link to obesity (Forshee et al.) but in 2007 there was not enough research and studies to fully back up

the argument one way or the other. Sugar by itself does not contribute to weight gain, but fats and proteins are more important to the human diet as they are responsible for muscle growth and amino acid creation. Purely consuming sugars is toxic, just as consuming only olive oil would be. Regardless of how much sugar contributes to fat gain, it has highly addictive properties as well.

### **The Addictive Properties of Sugar**

It is important but extremely difficult to not give in to sugar cravings and eat sugar when stressed. One of the reasons that added sugar products exist is because of the added sugars in powdered baby formula in the early 1970s and the addiction has carried into adulthood. It has been proven that sugars are as addictive as cocaine or cigarettes (*Is sugar more addictive than cocaine*) (McLallen) (Ahmed et al.) and there are similar health effects regarding the growth of cancer cells. (McLallen)

When sugars are consumed, the brain starts the secretion of insulin from the pancreas. Since food is necessary for survival, the brain likes to reward by giving a dose of endorphins that makes the brain feel happier, and this same feeling is achieved after exercising. Although, since the taste of sugar is extremely pleasurable, the brain also rewards humans with dopamine as well, just as humans also feel pleasure when having sex because it is necessary for humans to reproduce for survival. Dopamine output is also produced when injecting addictive drugs or smoking cigarettes, causing a relaxing, pleasurable feel that lasts for some time. (Ahmed et al.)

If the output of dopamine is the same, humans must consider the implications this has on ADHD people. ADHD causes the brain to secrete underwhelming amounts of dopamine, causing the brain to seek a fix of dopamine. This lack of dopamine encourages overeating and other

unhealthy habits, proven by the fact that ADHD people are four times more likely to be obese or abuse drugs than a person without ADHD.

People reason that sugar is not as addictive as cocaine, due to the extreme need for cocaine after the first dose. But isn't it true that as humans we can never go without sugars, unlike cocaine? Complex carbohydrates are still necessary for some hormone production.

### **Taxing and Imposing Warning Labels Curbs National Obesity Rates**

Americans need politicians to pass laws regarding taxes and warning labels on added sugar products. Lawmaking in 2016 did pass a law that requires commercially produced food products to display grams of "added sugars" below grams of "total sugars" but this does not communicate the dangers of added sugars to those who do not understand the costs. Warning labels should be a brightly colored area on the product label that must be visible when reading the brand name on the front of the product. This warning label must communicate the health dangers of added sugars on the physiology of the human body, as well as communicate how the products' sugars make up or exceed the recommended daily amount of sugars.

According to studies, it has been found that taxing sugars does reduce consumption and helps raise enough money to buoy the healthcare system. Taxing sugar sweetened beverages at 1 cent per ounce has been calculated to possibly yield a revenue of over \$50B over a 10 year period, increasing as it becomes commonplace. During the Obama administration, this subject surfaced during the passing of healthcare bills but was later squashed due to lobbying by soft drink manufacturers. Taxing sugar-sweetened beverages in America has also suggested a 23 percent decrease in purchasing of sugar-sweetened beverages. (Jerrett)

Banning high-fructose corn syrup altogether has promising effects as well. In Sweden, it is illegal to put high-fructose corn syrup in consumer products, which suggests that it is reflected in the national obesity rate which is only 13% compared to the U.S. rate of 35-40%. This could be because of the Swedish free healthcare as well, making for better exercise programs and personal wellbeing.

Some argue that sugar taxes do not reduce the amount of sugar consumed, because countries that pass taxes on sugar sweetened beverages have better healthcare, discounted in comparison to America or free altogether. While this may be true, Coca-Cola makes more than a quarter of its annual revenue in North America alone, regardless of the 200+ other countries that sell its various products.

## **Conclusion**

The implications of high sugar consumption are alarming to Western society. Taxing, labeling, and controlling the amount of sugar-sweetened beverages a society consumes is the only way to keep widespread hyperglycemia and obesity from becoming commonplace. 2 out of every 5 people in the United States are clinically obese. By consuming enough food to be obese a person can change their genome for the worse, (epigenetics) promoting obesity through future offspring. Future projections of obesity in America predict the nation will be 60-80% obese by the year 2050. We need to change legislation to start with the future in mind, to prevent rather than cure by using taxpayer money and healthcare programs. Australia, Sweden, and Mexico have seen enormous success in improving national health averages by taxing SSBs and promoting learning about healthy diets in depth. Saying no to the next soft drink or cake one sees is the first step at a healthy relationship with sugar.





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