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High Fructose Corn Syrup and the Obesity Epidemic

High fructose corn syrup has become the primary sweetener used in the United States population in the past forty years. Although the FDA calls this a “natural” product, it has tremendously devastating effects (High Fructose Corn Syrup a “Natural?” 1). This was a major change from the use of natural sugar, which what was primarily used before high fructose corn syrup was invented. Another major change that has happened in the past forty years in America is the number of Americans that are considered to be overweight or obese. Although America is one of the richest countries in the world, it is also one of the unhealthiest countries throughout the world, home to the most obese people in the world. According to the Center for Disease Control and Prevention, adult obesity has risen almost sixty percent within the past twenty years and childhood obesity has tripled in the past thirty years or so (Obesity in America 1). Why is America suffering from such a harmful and deadly epidemic? There are many theories why, but the diet of Americans is ultimately causing the rates of obesity to rise each year. American diets are full of processed foods, foods-on-the go, and foods containing high fructose corn syrup. Most Americans consume high fructose corn syrup each day without even realizing it. **High Fructose Corn Syrup is very detrimental product and**

a major factor on why so many people in the United States are overweight and unhealthy.

There are many different types of sugars that are available to be used in America. There are monosaccharide sugars, which are single sugar units, and disaccharides, which are two monosaccharides linked together (Obesity and Diet: Facts About Fructose 1). Glucose, which is a monosaccharide, is the main energy source for the body because of the foods we eat get digested and made into glucose (Obesity and Diet: Facts About Fructose 1). Fructose is also a monosaccharide that has the same exact chemical formula as glucose, but a very different structure (Obesity and Diet: Facts About Fructose 1). Lastly there is sucrose, which is a disaccharide, which is known as table sugar to most people. Sucrose is made up of fifty percent fructose and fifty percent glucose (Obesity and Diet: Facts About Fructose 1). Sucrose is found naturally. It is found in sugar cane and sugar beets. Sucrose was the leading sweetener used in the United States until high fructose corn syrup was invented. High fructose corn syrup is a man made and manufactured sweetener, that is made to have the same structure as sucrose, or regular table sugar. However, it can be made to have up to eighty percent fructose and only 20 percent glucose, which makes it much sweeter than table sugar (Sanda 2). Since it's twice as sweet as fructose is, that potentially means that it is twice as unhealthy to consume. Since it is man-made and can be manufactured differently it is not exactly the same as sucrose, and that is where the problems arise with overconsumption of high fructose corn syrup and obesity.

High fructose corn syrup is a relatively new product in the United States food industry. High fructose corn syrup was not invented until late in 1957. Until that time people operated with the understanding that there was no such thing as fructose in corn syrup (High Fructose Corn Syrup 1). In simpler terms, they did not understand that corn syrup could be turned into a sweetener. Corn syrup by its self is not very sweet and would not be considered a sweetener. Then in 1957 high fructose corn syrup was invented in a laboratory setting. Two researchers named Marshall and Kooi created an enzyme that is called glucose isomerase (Rada 1). This enzyme would forever change the history of sugar products, especially in the United States. Marshall and Kooi then used the glucose isomerase and rearranged the molecular composition of glucose to convert it to fructose (High Fructose Corn Syrup 1). When the natural glucose gets converted into fructose it makes the corn much syrup sweeter and way more appealing to consumers. With the enzyme, glucose isomerase, corn syrup, which is normally not very sweet, has the potential to become unusually sweet.

Although high fructose corn syrup was invented in the late 1950's it took a while before it actually went out on the selling market. The major use of high fructose corn syrup actually did not start until the 1970's. It first was put on the market in 1970 and has risen at an alarming rate. According to a USDA report that was conducted in 1997, in 1970 sucrose accounted for eighty-three percent of sweeteners Americans ate, but by 1997 sucrose was down to only forty-three percent of sweeteners used (High Fructose Corn Syrup 2). High fructose corn syrup started becoming more appealing to Americans for many reasons initially. For one, high fructose corn syrup is not only a

sweetener but it is also a preservative. Since it is a preservative, it can extend the shelf life of processed foods by almost two times the normal shelf life. The way it preserves food is that it keeps food moist, which makes spoilage take a longer time to set in (Slone 1). This a large benefit for the people in the United States because the food they buy with high fructose corn syrup can last way longer than foods with natural sugar in it. This means that people can buy these foods when they are on sale and keep them for a long time until they need them, so it saves Americans money each year. High fructose corn syrup also adds flavor enhancement with fruit and spice flavors and depresses the freezing point, which is useful in ice cream and other cold foods (White 1220).

Another reason high fructose corn syrup has become such a popular product in the United States is because of the money it saves the food producers. In 1977, there was a new tax that burdened the United States immensely. There was a new tariff made for importing sugar into the United States (Rada 1). This tariff really made the price of buying sugar from other countries rise to the point where it was not worth buying the sucrose anymore. Since the United States does not produce natural sugar cane or sugar beets many manufactures had to search for a cheaper way to sweeten their foods. This is really when the market for high fructose corn syrup took off. The price and the availability of high fructose corn syrup made it very attractive to the manufacturers (Rada 1). The new need for an abundant amount of corn happened at the perfect time for the corn growers. Around the late 1970's the corn growing companies started to see a lot of competition in the areas of margarine and shortening, which were mainly made of corn oil until there were new improvements in partial

hydrogenation to refine the taste (Rada 1). The corn growers were very pleased when there was a demand for corn to make high fructose corn syrup. The manufacturers were also very pleased with this because corn prices are much lower than the sugar prices because of government subsidies and overproduction (Rada 1). Ever since the late 1970's, high fructose corn syrup has become the number one sweetener used in the United States.

There are several different types of high fructose corn syrup that is manufactured by the food industry. They use the enzyme to produce different combinations of the glucose and fructose in each. For example, there is high fructose corn syrup-42, which is made of forty-two percent fructose, fifty-three percent glucose, and five percent higher saccharides (Forshee and Storey 1). The next type of high fructose corn syrup is high fructose corn syrup-90, which contains ninety percent fructose, nine percent glucose, and one percent higher saccharide (Forshee and Storey 1). The last kind made is high fructose corn syrup 55, which has fifty-five percent fructose, forty-two percent glucose, and three percent higher saccharides (Forshee and Storey 1). While the most commonly used high fructose corn sugars are forty-two and fifty-five, you will find high fructose corn syrup fifty-five in most common foods because it contains more fructose than the other two kinds.

From the above information, it seems that America had found its answer to their sugar problem. It looks like high fructose corn syrup is here to stay in the United States for a long time. High fructose corn syrup kept food from spoiling for a long time and most importantly was much cheaper to buy for producers and consumers, however

every good thing has a catch. High fructose corn syrup's major catch is how unhealthy it is to consume. Consuming too much of both regular sugar and high fructose corn syrup has created very dire consequences for American's health. The first danger that comes from ingesting too much high fructose corn syrup is the risk of getting type two diabetes. In the past, it was thought that fructose was more beneficial to people who have diabetes because it did not absorb as quickly as glucose leading to a slower rise in blood sugar (Sanda 2). However, new information on diabetes has show the opposite of this theory and that fructose actually promotes the onset of type two diabetes. This is because glucose is metabolized throughout the body in every single cell, but fructose only gets metabolized in the liver (Sanda 2). This will lead to the liver and the kidneys to be damaged. There are now studies on the Maillard reaction, which is a browning reaction that occurs when compounds are exposed to various sugars, and how fructose contributes to this (Sanda 2). Fructose browns faster than glucose, which makes a decrease in protein quality and they become toxic (Sanda 2). Diabetes is easily seen when an insulin receptor is blocked. This is exactly what happens if too much high fructose corn syrup is being consumed (Sanda 3). This is now creating more problems than just type two diabetes. For example, because fructose is only metabolized in the liver the development of fatty liver deposits and cirrhosis are being seen (Sanda 2). Gerald Shulman of Yale University School of Medicine stated, "Fructose is much more readily metabolized to fat in the liver than glucose is and in the process can lead to non-alcoholic fatty liver disease." (Missing Link Between Fructose, Insulin Resistance Found 1). This means that people who consume too much high fructose corn syrup could

possibly do as much damage to their liver as alcoholics who develop fatty liver disease, which eventually leads to liver failure and death.

Another major problem that surrounds high fructose corn syrup is the fact that it evidently causes obesity. Consuming any type of sugar not in moderation is obviously going to make people gain weight rapidly, and the same goes along for high fructose corn syrup. And since the consumption of high fructose corn syrup has increased one-thousand percent from 1970 to 1990, according to the American Journal of Clinical Nutrition, I would say most Americans are eating too much of it (Mohr 2). When we eat too much of this product a hormone in our body is not being released as it normally would. For example, like I said above, insulin receptors are being blocked when people consume too much high fructose corn syrup. This is a very large problem because insulin also controls leptin, a hormone that controls hunger. The hormone leptin is in control of telling your body to stop eating when it is full (Mohr 2). It sends signals to the brain that sends signals of feeling full so you do not eat as much. However, when leptin is blocked the person eating does not feel full and will continuously keep eating excessive amounts of this unhealthy food. Since insulin controls leptin, when the insulin receptors are blocked because of high fructose corn syrup that means the leptin hormone will also be blocked, leading to obesity.

Those are not the only effects high fructose corn syrup has on people. Nancy Appleton, a clinical nutritionist, conducted studies on high fructose corn syrup. She found out that expenditure of fructose cause an increase in the concentration of uric acid. An increase in uric acid indicates that there could be an onset of heart disease

(Sanda 3). She also came to the conclusion that too much fructose leads to increase of blood lactic acid, which in very extreme cases can cause metabolic acidosis and even can result in death. (Sanda 3) Along with that, high fructose corn syrup surprisingly causes premature skin aging. Scientists have done a study with rats to find this out. The rats have unwanted cross-linking changes in the collagen of their skin, which leads to skin with more wrinkles (Sanda 4). Lastly, mercury is now found to be in high fructose corn syrup, which can put children at risk for developmental problems later in life (Wenner 1). The FDA found out that the mercury is found in lye, which is used to separate cornstarch from the kernel when making high fructose corn syrup (Wenner 1). Although the FDA says there is not enough mercury to cause a problem when children eat these foods it is still unhealthy to be digesting.

People can also be hypersensitive to fructose, which makes these people more at risk for contracting any of the diseases that high fructose corn syrup possesses. People who are hypersensitive to fructose are people that have hypertension, hyperinsulinemia, people who are hypertriglyceridemic, diabetics that do not rely on insulin, and postmenopausal women (Sanda 4). These people with any of those symptoms above should avoid over-exposure of high fructose corn syrup, or any type of sugar products as much as possible. All of these problems have just risen in the past forty or so years. That means that the children when high fructose corn syrup was invented are just becoming older adults right now and that means that we do not have a lot of long term information about other effects that high fructose corn syrup can cause (Goldstein 1).

Once people hear about the problems high fructose corn syrup can cause it does not seem like the perfect product it was before. Some people think then that they will just cut high fructose corn syrup out of their diets. However, the problem is that high fructose corn syrup is so much of the food that we consume on a daily basis. High fructose corn syrup is in the sugary foods that we expect it to be in such as sodas, syrups, juices, cookies, and ice cream. It is also in some not so sweet food such as crackers, salsa, and bread. However, it is in many supposedly healthy foods also. For example, high fructose corn syrup is even in Yoplait yogurt, low-fat salad dressings, “smart” ice cream sandwiches, Special-K cereal, and one hundred calorie snacks (8 Health Foods That Contain High Fructose Corn Syrup 1-2). There is a lot more food that high fructose corn syrup is in that we do not even realize that we are eating for the most part. According to the American Journal of Clinical Nutrition, “High fructose corn syrup now represents more than 40 percent of caloric sweeteners added to foods and beverages and is the sole caloric sweetener in soft drinks in the United States.” (Mohr 2).

High fructose corn syrup is available to other countries around the world just as readily as it is to the United States. However, unlike the United States most other countries around the world do not use it. It is even known that around the world high fructose corn syrup is only used for around eight percent of the caloric sweeteners (Slone 1). In Europe and most other countries, sucrose is still the main sugar product that they use. This makes their products taste very different from what ours taste like with the use of high fructose corn syrup. For example, the coca-cola product made in

Mexico with sucrose is now being introduced in America in some Costco stores (Coke vs. Coke 1). When the coca-cola from Mexico was brought over into San Francisco the prices seemed to be much more expensive than the coke that was made in the United States. Taste is something that people look for when they are picking their beverages and the taste is something different from the American version. However, in a blind taste test people said that the coca-cola from Mexico was slightly sweeter, fuller, and had a more complex flavor (Coke vs. Coke 1). It is easily seen in other countries that they do not have the great amount of obese people that we do in the United States. High fructose corn syrup is not the only reason why Americans are more obese than people in other countries, however it does play its own role in it.

When high fructose corn syrup was invented in the late 1950's, nobody could have guessed that it would change the diets of American's so much. Before high fructose corn syrup really took off in the late 1970's, sucrose was the main sugar product used in the United States. However, because of the preserving value, sweet taste, and the low cost of high fructose corn syrup has now taken the role of sucrose and does not look like that will change anytime soon. High fructose corn syrup has become one of the leading causes of the obesity epidemic that has been arising in the United States each year. High fructose corn syrup however has many more risk factors along with it such as diabetes, metabolic syndrome, mercury poisoning, and non-alcoholic fatty liver. Other countries around the world do not use high fructose corn syrup and we can see a direct correlation between the obesity rate in their countries compared to the United States. There are many theories on why American's today have

become the most obese people on the earth. However, if people limit the amount of high fructose corn syrup that they intake, it would definitely help the obesity rate and overall health of the United States.