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Childhood Obesity and High Fructose Corn Syrup. What Is It Good For? Absolutely Nothing!

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Introduction

I teach 1st grade at Wexler-Grant Community School in New Haven, Connecticut. We are a school that begins with headstart and ends with 8th grade. We have an interesting history. We were two separate schools at one time: Helene W. Grant School and Isadore Wexler School. We merged during the 2002-2003 school year. Our population of students is approximately 90% African-American and the remaining 10% is made up of White, Hispanic, and Indian. We are a community school which means that our building is open to the neighborhood in a variety of ways. We open the gym to the youth so that they can play basketball, the cafeteria is used for African drumming, Tai Chi, Pilates, and more. Other types of meetings, seminars, conferences, and workshops take place in our building for various organizations throughout the community. We have a family resource room that provides services for parents, grandparents, and students. We try to truly embrace and embody the concept of community, which is included in our name.

I have been working in the New Haven school system since 1997. I have worked in classrooms from grades kindergarten to 8th. I have seen children of all different sizes. Growing up, there was always the one "fat" kid in class. "Fat" is not a term that I like to use in describing someone's size, but it is commonly used by children. When I was a child, it was a term that was used by kids to describe other kids who were overweight. In my ten years of teaching, there has been an increase in students who might be considered to be "fat." No longer is it just the one child who is overweight, but there are several children who could be deemed as such. I can remember growing up that kids who were overweight were often believed to be carrying "baby fat" and they would grow out of it. Many times, this was the case. I just attended the high school graduation of some of my first students; they were in my 3rd grade class in 1998. Some of those students had "baby fat" back then. As they walked across the stage, I noticed that many of them still had that same "baby fat" nine years later. What has happened? I was one of those kids who had some "baby fat" and grew out of it. Why are children today not losing the "baby fat?"

Rationale

I have noticed a difference in how children are today versus when I was growing up. I was born in the late 60's and grew up in the 70's and early 80's. I was often outside riding my bicycle and playing various outdoor games such as tag and hide and seek. We had many variations of tag such as ball tag (getting hit with a soft ball), freeze tag, TV tag, name tag, and the list goes on. When watching my students play outside, I noticed that they didn't play the same games that I played as a child. When I talk to them about the games that I played, they look at me as if I'm speaking another language. Some kids just want to sit and not really move at all. That is a problem.

There is a very simple formula for looking at weight gain and weight loss. A change in weight equals the calories eaten in minus the calories that are burned. If you burn as many calories as you take in, your weight won't change. If you eat more calories than you burn, then you will gain weight. If you burn more calories than you eat, then you will lose weight. Dieting focuses on eating fewer calories than you burn. Because children today are leading a more sedentary life style, it is even more important to look at the food that they are eating and the amount of calories they are putting into their bodies.

In particular, my curriculum unit will examine High Fructose Corn Syrup (HFCS) and its introduction into the consumer market and how it may play a role in the obesity epidemic.

Overview

The development of the HFCS process came at an opportune time for corn growers. ¹ Refinements of the partial hydrogenation process had improved to the point that it was possible to get better shortenings and margarines out of soybeans than corn. As the need for corn began to decline, HFCS took up the slack.

HFCS was introduced into the consumer market in the early 1970's. Japanese scientists found a reliable way to turn cornstarch into syrup that was sweet enough to compete with liquid sugar. They developed a formula that was 55 percent fructose and 45 percent glucose. This new formula was sweet enough (and cheap enough) to make most soda makers jump from traditional liquid sugar to HFCS to sweeten their soft drinks by the 1980's. Most of the sugar prior to the 1980's came from sucrose derived from sugar beets or sugar cane. As the 1980's began to roll along, the sugar from corn in the forms of corn syrup, fructose, dextrose, dextrine and especially HFCS began to grow in popularity as a sweetener because it was much cheaper to produce.

HFCS is made by processing cornstarch to yield glucose, and then processing the glucose to create a high percentage of fructose, 55% and 45% glucose. The steps for creating HFCS are actually quite complicated. First, the cornstarch is treated with an enzyme called alpha-amylase. This is to produce shorter chains of sugars called polysaccharides. Next, an enzyme called glucoamylase breaks the sugar chains down even further. This process yields the simple sugar glucose. A third enzyme, glucose-isomerase, converts the glucose to a mixture of about 42 percent fructose and 50-52 glucose with some other sugars mixed in. Two final steps produce the HFCS that is used in products today. Liquid chromatography is used to increase fructose in the mixture to 90 percent. Then, this mixture is back-blended with the original mixture to yield the final

concentration of about 55 percent fructose, what the industry has called HFCS.

The use of HFCS has grown rapidly. In 1980, less than three million tons of HFCS were used. In 1995 almost eight million tons were used. By the late 1990's the use of sugar from sugar canes and beets actually declined and was surpassed by HFCS. Today, HFCS is consumed more than sugar in America. Yet despite the fact that special enzymes are required to produce HFCS, it is actually cheaper to produce than sugar. High Fructose Corn Syrup is cheaper to produce than sugar because of subsidies to corn farmers and trade policies that encourage farmers to grow more corn, as well as the tariffs imposed on imported sugar cane. It is easier to transport, it is piped into tanker trucks and they are sent anywhere it is needed. There are 16 chemical plants in the Corn Belt that produce HFCS. All of this means lower costs and higher profits for food producers.

It is important to look at how HFCS interacts with your body. Sugar is sugar right? Your body should deal with High Fructose Corn Syrup the same way as it does with any other sugar. Well... not exactly. HFCS does have the exact same sweetness and taste as an equal amount of sucrose from cane or beet sugar. This is basically where the similarities end. It is believed that because HFCS contains fructose, which can be found in fruit, that it must be healthier than sugar. Dr. Meira Field and her team of investigators at the USDA have discovered otherwise. Sucrose is made up of glucose and fructose. Sugar was given to rats in high amounts. The rats developed multiple health problems. These health problems were noticed especially when the rats were deficient in certain nutrients such as copper. The researchers looked at the initial results and wanted to know whether it was the fructose or the glucose moiety that was causing the problems. The researchers then repeated the experiments with two groups of rats. One group was given high amounts of glucose and the second group of rats was given high amounts of fructose. The rats in the group that were given the high amounts of glucose were relatively unaffected. The rats in the group that were given the high amounts of fructose had disastrous results. The male rats with the high amounts of fructose did not reach adulthood, they had delayed testicular development, they had anemia, high cholesterol, and heart hypertrophy which means their hearts enlarged until they exploded. The females were not as affected as the males, but they were unable to produce live young. Simply put, fructose in combination with copper deficiency, a widespread problem in America, in a growing animal interferes with collagen production. Also, the livers of test animals that were fed large amounts of fructose develop fatty deposits and cirrhosis. The livers of these test animals were similar to the livers of alcoholics.

Well, what does this mean for humans? Glucose can be metabolized by any cell in the human body. Fructose is a different story; it can only be metabolized by the liver. Primarily, fructose is absorbed in the jejunum, a segment of the small intestine, and metabolized in the liver. Fructose is converted into fatty acids by the liver at a greater rate than glucose. This causes an increase in the levels of fat in the bloodstream in the form of triglycerides (fat in blood). When there is an excess of fructose in the system, the liver cannot convert all of it. The excess fructose may be malabsorbed, which is faulty absorption of nutrients in the gastrointestinal tract. The portion that does not become converted, may overload the intestines' ability to absorb carbohydrates because of the excess fructose. This can cause cramps, bloating, and may be expelled in the form of urine and or diarrhea. Fructose converts into fat more than any other sugar. ² This could be one of the primary reasons why Americans are getting fatter and fatter.

There are other processes the body goes through when fructose enters into the body. Fructose is different from other types of carbohydrates made up of glucose. Fructose does not stimulate the pancreas to produce insulin. Studies have also shown that fructose does not increase the production of leptin, which is a hormone produced by the body's fat cells. Insulin and leptin work together to act as signals to the brain to turn down the appetite and control body weight. Research has also shown that fructose does not appear to suppress the

production of ghrelin, which is a hormone that increases hunger and appetite. ³ So how does it all work together? Well, consuming a diet high in fructose could lead to taking in more calories and over time, weight gain, because fructose in isolation doesn't activate the hormones that regulate body weight as do other types of carbohydrates composed of glucose. Simply put, fructose adds to overeating because it does not trigger the chemical messengers that tell the brain that the stomach is full and no longer hungry, like other food and drinks that have regular refined sugar. The reason for this is that fructose in its purist form contains no enzymes, vitamins or minerals, and it robs the body of its micronutrients in order to assimilate itself for physical use. While naturally occurring sugars contain fructose, this fructose is bound to other sugars. High Fructose Corn Syrup has a great deal of "free" or unbound fructose. This free fructose has shown in research that it interferes with the heart's use of key minerals like magnesium, copper and chromium. ⁴

How Sweet Is It?

Many of my students drink soft drinks of all varieties. From the fairly inexpensive juices which are composed primarily of water and sugar to the various soft drinks made by the two "Giant" soda companies. Some of them will even drink the various sport-"ade" drinks. It is important for my students to recognize just how much sugar they are ingesting when they drink these different soft drinks throughout the course of a day or even a week.

The United States Department of Agriculture (USDA) advises that most people limit themselves to 10 to 12 teaspoons of added sugar per day. A single can of soda has anywhere between 10 and 13 teaspoons of sugar! If they are drinking a 20 fluid ounce bottle of a soft drink, they are drinking almost twice as much soda, which is almost double the sugar!

In 2000, the average person in the United States ate an average of 31 teaspoons of sugar a day. That is more than 15 percent of the suggested caloric intake. Most of that sugar came in the form of sweetened soft drinks. The amount of soda consumed in this country has more than doubled since 1970 to about 56 gallons per person a year. According to the USDA, in 2001, the average person consumed almost 63 pounds of HFCS. The *American Journal of Clinical Nutrition* in 2002 published reports that the milk consumption for teenagers between 1965 and 1996 decreased by 36 percent. During this time, soda consumption increased by more than 200 percent. Dr. George Bray, the principal investigator of the Diabetes Prevention Program at Louisiana State University Medical Center believes that without the calcium kids would normally get from milk, kids got fatter. Bray believes this because calcium can help the body regulate weight. Bray says that he could find no other single combination of environmental or food changes that were as significant to the rise in obesity. ⁵

Teenagers and children are the soft drink industry's main targets. They are among the largest consumers. In the United States, the soft drink industry has increased production from 22 to 41 gallons of soft drinks per person a year between 1970 and 1997. Soft drink consumption among children has almost doubled in the past 10 years here in the United States. On average, teenage boys now drink three or more cans of soda per day, and 10 percent drink seven or more cans per day. Teenage girls average more than two cans per day and 10 percent drink more than five cans per day. ⁶

Where do teenagers and children get soft drinks? It is estimated that there are approximately 20,000 vending machines in schools across the country. This is according to the National Automatic Merchandising

Association. The USDA collected data on vending machines in schools and have an interesting report. They found that 88 percent of high schools, 61 percent of middle schools, and 14 percent of elementary schools have food or beverage vending machines for students to use. The USDA also found that 34 percent of high schools and 15 percent of middle schools permit students to use the school vending machines at any time. Only 6 percent of elementary schools allowed students to use the vending machines during lunch only.

New Haven has done a unique thing and pulled most of their soft drink vending machines out of their schools. There was an initial uproar because many of the schools made quite a bit of money from the vending machines. This money was used for a variety of school needs: i.e. supplies, field trips, and books. With school budgets getting smaller and smaller, it was a genuine concern as to how some schools were going to supplement this lost income. It is comforting to know that the district I work for didn't buckle and cave-in to the demands and put the health of its students first. There are many other things that need to be done in regards to nutrition in New Haven, but the removal of soft drink vending machines was an excellent first step in the right direction.

The interesting thing about soft drinks is that as the price of HFCS began to drop in the 1980's and people began drinking a lot more soda, the price of soft drinks dropped also. The two big soft drink companies, rather than cut the price of a bottle of soda, came up with a unique idea. They would make their soft drinks larger or to coin a phrase "supersize" them. With HFCS, the main ingredient in a soft drink, now much cheaper, they could get people to pay just a few pennies more for a substantially bigger bottle. The strategy was to drop the price per ounce, but sell more ounces. Thus began the transformation from the traditional 8 ounce soft drink bottle and 12 ounce soft drink can into the larger 20 ounce bottle, which is commonly found everywhere. ⁷

Why Focus on High Fructose Corn Syrup?

Michael Pollan in his excellent book *The Omnivore's Dilemma* weighs in on the issue of the rising obesity issue in the United States. He says in his book that since 1985, the average American's annual consumption of HFCS has gone from forty-five pounds to sixty-six pounds. As I stated earlier, HFCS had surpassed refined sugar consumption in this country. One would think that sugar consumption has gone down, but that hasn't happened. During the same period, American's consumption of refined sugar actually went up by five pounds! What does this mean? It means that we as Americans are eating and drinking a lot of HFCS *on top of* the sugars we were already consuming. Since 1985, America's consumption of all added sugars which includes sugar cane, beet, HFCS, glucose, honey, maple syrup, whatever, has climbed from 128 pounds to 158 pounds per person. ⁸

Pollan reveals that it is in soft drinks that Americans consume most of their sixty-six pounds of their dose of HFCS. Because children today are leading a more sedentary life style, it is even more important to look at the food that they are eating. Today, HFCS is used to sweeten many foods like jams, ketchup and soft drinks. It has also become a favorite ingredient in many health foods. Although I think that there are various factors that have contributed to the obesity of this country, I strongly believe that HFCS is one of the main contributing factors. The Center for Disease Control (CDC) released some interesting statistics in the *Journal of American Medical Association*. In 2004, 19 percent of boys and girls ages 6-11 were considered to be obese. In 1971, just 4 percent of kids in the same age range were considered obese. In the same time span, kids aged 12-19 jumped from 6.1 percent in 1971 to 17.4 percent in 2004. Children aged 2-5 had 5 percent considered

obese in 1971 to 14 percent considered obese in 2004. When all of the children are included, it totals out to be 32 percent of American children are considered obese. This is a major concern.

Children who are obese are already starting to develop the illnesses that are associated with obese people in their 40's and beyond. Children are displaying heart disease, liver disease, diabetes, gallstones, joint breakdown, and even brain damage. 90% of obese children have at least one avoidable risk factor for heart disease, such as high cholesterol or hypertension. This is very alarming!

Carol Porter, the director of nutrition and food services at UC San Francisco sums it up best. "It's not that fructose itself is so bad, but they put it in so much food that you consume so much of it without knowing it." ⁹ This is the most important reason why I want my students to be knowledgeable about reading nutrition labels. HFCS mixes very easily, it extends shelf life and is as much as 20 percent cheaper than other sources of sugar. It can help prevent freezer burn, so it can be found on the labels of many frozen foods. It also helps breads brown and keeps them soft, which is why hot dog buns and even English muffins hold unexpected amounts. ¹⁰ So even if kids are eating a frozen dinner or hamburgers or hot dogs at home, they are consuming quantities of HFCS.

What Makes Kids Obese?

There are many contributing factors to the epidemic of childhood obesity. "Time" magazine did a special health issue titled *Our Super-Sized Kids* June 23, 2008 in which they tackle this very problem with a variety of different articles. Bryan Walsh writes an article looking at various factors that contribute to this problem ranging from income, ethnicity, and geography. He discovered some very interesting statistics from the CDC. He reports that obesity discriminates in a multitude of ways. Obesity discriminates by race, a 2006 study shows that 30.7 percent of white American kids are overweight or obese, compared with 34.9 percent of blacks and 38 percent of Mexican Americans.

Obesity discriminates by income, 22.4 percent of 10 to 17 year olds living below the poverty line, which is less than \$21,000 for a family of four, are overweight or obese. As compared with 9.1 percent of kids whose families earn four times that amount. Walsh reports that obesity even discriminates by geography. A report by the National Survey of Children's Health done in 2003 showed that 16.5 percent of rural kids qualified as being obese, compared with 14.4 percent of urban kids. Walsh writes that the poorest states of the South and Appalachia which consist of Arkansas, West Virginia, Mississippi, and Kentucky have the heaviest children. Adult obesity levels triple when you cross north of 96th street in Manhattan, leaving the mostly white and well off Upper East Side for the predominantly minority, poorer neighborhood of Spanish Harlem. ¹¹ Geography and income play an interesting role in this epidemic.

Walsh reports that it is the lack of good food choices that appears to play the greatest role in making poor kids fat. He says that it's not just that parents don't have enough time to cook and shop. Many times, the healthiest foods such as fruits and vegetables and whole grains, just are not available. Walsh says that many obese children live in what are called nutritional deserts, an area where there are few supermarkets nearby that offer the produce nutritionists are recommending. So families may have to rely on corner delis and bodegas, which tend to stock fattening, processed foods. ¹² Why? The HFCS, which may be in many of these

foods, allows it to sit on the shelves indefinitely and also because it is cheaper. Supermarkets, where better choices are found, are three times as common in neighborhoods that are in the highest quintile (one fifth) of income as they are in neighborhoods in the lowest quintile of income. ¹³ A recent study found that the obesity rate among fifth, seventh, and ninth graders in the 10 poorest communities in Los Angeles County was 32 percent, compared to 8 percent for the city's wealthiest communities. ¹⁴ With the poorer communities not having the healthier food choices readily available, it makes sense that a single parent coming home from working two or three jobs is not in a position to offer their child the healthiest meal. If they have to travel long distances to provide a "healthy" meal for their child or children, it probably won't happen. In addition, healthier food tends to cost more. Single parents who are trying to make ends meet and stretch their money as far as they can will more than likely opt for the cheaper processed foods. This applies to families that may have two working parents.

Parents are always looking for ways to cut costs and they unknowingly may be making poor food choices. I look at the neighborhood my school is located in. Within half a block of the school are three "convenience" stores. None of them sell any fresh fruits or vegetables. The students at my school visit these stores quite frequently. One dollar can easily buy them one 20 ounce soda and two bags of potato chips. I see this combination or other variations of it so often during lunch because many times that's what the kids will claim to be their lunch. Up until about a year ago, our school was in a nutritional desert. Luckily a small grocery store chain opened a store and is now providing the fresh fruits and vegetables that were so desperately needed in the community. This is so important because many health experts are reporting that due to the obesity problems in children, this current generation may be the first in American history to have a shorter life expectancy than their parents. Neuroscientist Randy Seely, the associate director of the Obesity Research Center at the University of Cincinnati Medical School says, "When you're talking about morbidly obese kids, zero percent will grow up to be normal weight adults." ¹⁵ This is very scary. Dr. Seely has made a profound statement and should be a wake up call for parents and teachers alike.

Jeffrey Kluger in his article in Time titled "How America's Children Packed On the Pounds", writes about the potential futures of obese children. Obese boys and girls are already starting to develop the illnesses of excess associated with people in their 40's and beyond. Children are exhibiting symptoms of heart disease, liver disease, diabetes, gallstones, joint breakdown and even brain damage as fluid accumulation inside the skull leads to headaches, vision problems and possibly lower IQs. A staggering 90 percent of overweight kids already have at least one avoidable risk factor for heart disease, such as high cholesterol or hypertension. Type 2 diabetes is now being diagnosed in teens as young as 15. ¹⁶ An intervention has to be done to reverse this trend. Studies are now showing that the epidemic has begun to level off as parents become more aware and educated about what they can do to help themselves and their children.

Michael Pollan in his book ***In Defense of Food: An Eaters Manifesto*** writes about a study that was done in Australia in 1982 involving 10 Aborigines who were living in settlements in the town of Derby in Western Australia. These ten men had been living out of the bush for many years and adopted a lifestyle more consistent with modern America and Australia. They were very sedentary and no longer ate the native foods that they had grown up on but ate a more western diet which consisted mostly of processed and refined foods. All ten men had developed type 2 diabetes and a host of other illnesses. The 10 Aborigine men agreed to return to their traditional homeland where they would have no access to store food and beverages. They were to live off of the land for seven weeks, like their ancestors before them. Luckily for the men they had not forgotten the skills they learned earlier in their lives. They were accompanied by Kerin O'Dea a nutrition researcher who had designed the experiment.

When the men returned to their homeland, their diet consisted of mainly seafood but was supplemented by birds, kangaroo, witchetty grubs, freshwater fish, shellfish, turtle, crocodile, yams, figs, and bush honey. This diet was very different from what they ate in the settlements which consisted of flour, sugar, rice, carbonated drinks, alcoholic beverages, powdered milk, cheap fatty meat, potatoes, onions and other fruits and vegetables. After seven weeks in the bush, O'Dea tested the blood of the ten Aborigine men and found striking improvements in virtually every measure of their health. All had lost weight (an average of 17.9 pounds) and seen their blood pressure drop. Their triglyceride levels had fallen into the normal range. The proportion of omega-3 fatty acids in their tissues had increased dramatically. ¹⁷ To sum it all up, all the symptoms and elements of their type 2 diabetes had significantly decreased or disappeared altogether. Why bother to tell this story? In seven weeks, less than two months, the ten Aborigine men had reversed the effects of type 2 diabetes and had become overall, healthier men. That is remarkable! Seven weeks is not a long time, and if those men could do it in seven weeks, imagine what could be accomplished with our kids in one school year! A child's body is much more resilient than an adult's body. If we educate the parents as well as the kids, significant changes can be made in the lives of our children. We are going to take it step by step starting with reducing the consumption of HFCS and move up the scale until the kids and parents are better informed about how to make good healthy food choices.

Joseph Thompson, the director of the Arkansas Center for Health Improvement sums it up the best. "This (obesity) is not a disease that will be solved with medicines or vaccines. A social movement has to solve this." ¹⁸ Well said Dr. Thompson. I would like to take on the challenge issued by Dr. Thompson and start the social movement in my classroom. With education, determination, and a little luck, the movement will spread to the home, other classes, the school, and hopefully the district. From there the sky is the limit!

My goal and objectives for this unit are to teach my students about the dangers of HFCS and to take steps to limit their consumption. One easy way to do this is to look at the soft drinks that they drink and try to steer them and their parents to other healthier alternatives. We will keep a food journal for a week and look at the different foods that we have eaten. I am also going to keep a food journal with them so that I can monitor the food that I am eating also. We are going to look at websites like <http://www.calorie-count.com/> which has an extensive list of foods and displays their nutritional content very similarly to what my students will see on any package of food they buy. It also has very easy to read graphical displays of the nutritional content as well as grades from A to F on how healthy a food is for eating. We will also look at the website <http://www.calorieking.com/> which also has an extensive database of foods but has a unique feature which is it will display different exercises and the amount of time a person would have to do those exercises to burn off the calories they just consumed. The average person needs about 2,000 calories a day. For children it can be a little more or a little less depending on how active or sedentary they are. Using these various calorie counting websites we are going to see how many calories we are consuming in a day.

One of the books I am going to be using is ***Food is Elementary: A Hands-on Curriculum for Young Students*** by Antonia Demas, PhD. Dr. Demas has written a wonderful curriculum for all ages that has hands-on lessons and recipes that kids from all grade levels can use at school and at home. Dr. Demas is passionate about educating children about food. She writes a moving introduction which I would like to share excerpts from.

If children consume healthy plant-based foods in the school lunch program, billions of dollars in health care costs can be avoided in the United States in years to come. The relationship between diet and chronic disease must also be addressed through education. Most children do not learn about the relationship of diet and chronic disease at home. As a result, schools must take a

leadership role in educating children about the relationship between diet and disease in order to make food choices with promote health rather than disease. We owe it to our children to serve them meals that will benefit their health and well-being. This is especially true for poor children who depend on school meals for a significant amount of their daily calories. Antonia Demas, PhD *Food is Elementary*, 2001

Teachers today have to take on a myriad of other roles in the classroom besides "teacher." There have been times when I have had to be a mom, dad, nurse, referee, custodian, judge, jury, counselor, and cheerleader. With so many other things demanding our time, this may seem like one more hand pulling on our coattails. But if we really care about our kids than Dr. Demas has hit the nail on the head. Schools have to take a leading role in not only educating our kids about how to eat properly, but also their parents.

Here are some ways that my students are going to learn about how we can avoid the pitfalls of HFCS and other added sugars. I am going to have different kinds of soft drinks on display and we are going to figure out which ones are the best for you. They will know by the end of that lesson to buy only 100 percent juice instead of fruit "drinks," "punches," cocktails," or "-ades" which are really code words for added sugar, usually HFCS. ¹⁹ Students should limit their juice to one 8-ounce serving a day. If the student has a choice, they should choose whole fruits over fruit juices. Even 100 percent juices have a concentrated source of fructose and calories without the fiber and nutrients found in whole fruits. My students will also learn to cut back on soda. We are going to do a lesson where we will use linking cubes where each cube will represent one teaspoon of sugar. There will be various food items and we will link cubes to represent how many tablespoons of sugar there are in each item. When they observe that a typical can of soda has anywhere between ten and thirteen teaspoons of sugar, they will hopefully see that in one can of soda they are getting all of the sugar that the United States Department of Agriculture says they should have in a day. I believe that this will be an eye opening experience. We will then talk about what are better choices for them to drink such as water (the best choice), seltzer, sugar-free iced tea and low-fat milk instead of soda.

Another lesson will be looking at canned fruits. Which canned fruit is the better choice: the fruit in juice or the fruit in heavy syrup? We will then talk about which one is better and why and talk about other options if they have to choose a processed fruit like choosing unsweetened applesauce and even frozen fruits.

Another lesson will look at the choices of nuts, cheese, and candy for a possible snack. It will be understood that if fruit is an option that should always be the first choice. However, out of the three, my students will discover that a handful of nuts or even a chunk of cheese (not the pre-sliced American) is much better for the body than candy. We will also look at what to eat for breakfast, the most important meal of the day. This can be a challenge because New Haven provides free breakfast for all elementary/middle schools. The breakfasts usually consist of some generic version of a name brand sweet cereal. Sometimes it will be a muffin or graham crackers. Each breakfast comes with fruit juice and milk. We will analyze the cereal that we are given everyday and determine its nutritional value. We design a more healthful breakfast which should consist of oatmeal or a bowl of low-sugar whole-grain cereal, fruit, and low fat milk. This breakfast is infinitely better than cereal bars, toaster pastries, doughnuts, sweet rolls, or danishes.

Lessons

Lesson 1

How much sugar do we need?

Materials needed: linking cubes or Unifix cubes, graph paper

Working in pairs students will use linking cubes to make a tower that represents the total amount of teaspoons of sugar that the USDA says that a person should have in a day. One linking cube will represent one teaspoon of sugar. They will then compare the daily amount of sugar that a person should have to how much sugar is in one can of a typical soft drink. We will then increase the number of cans until we reach three cans. The students will have to look at the graphical representations for how much sugar the average person should have in a day as opposed to someone who has consumed three cans of a soft drink. The USDA says that a person should have no more than ten to twelve teaspoons of sugar a day. An average can of soda has anywhere between ten and thirteen teaspoons of sugar. This lesson has room for a lot of variations. The teaspoons can be equal or one can have more teaspoons of sugar than the other. No matter how you manipulate the numbers, the students should see that just by drinking one can of soda, they are at the maximum daily amount. They should see the affect of drinking two or three cans of soda in a day also. They will have had a previous lesson about the affect of excess sugar on the body. They should make the connection that with the excess sugar in their body, that sugar will more than likely be turned into fat. The students can also make bar graphs of the various amounts of sugar. Other variations of this lesson can use twenty ounce bottles of soda which has about eighteen teaspoons of sugar, a container of yogurt which has about ten teaspoons of sugar, and an individual container of applesauce which has about five teaspoons of sugar.

Lesson 2

The Importance of Fruit

Materials needed: Variety of fresh fruits and dried fruits for sampling, canned fruits in water and in syrup

In this lesson we will analyze the differences and similarities between fresh fruit, canned fruit, and dried fruit. We will use a three circle Venn diagram to show how fruits are similar and how they are different. The students will decide which category of the three is the healthiest. We will talk about their choices and then figure out together which of the three is the healthiest. We will look at Walter C. Willett's M.D. (chairman of the Department of Nutrition at the Harvard School of Public Health) food pyramid to determine how much fruit should be eaten. We will also look at the labels of the canned fruit and determine which is healthier, the fruit in juice or the fruit in syrup. The students will understand what a fruit is and how it is different from a vegetable. The students will understand that fruits contain vitamins and nutrients. The students will also understand that one way to preserve a fruit is to dehydrate it or remove much of the water stored in fruit. Also, the students will understand that water can be removed (dehydration) or added (hydration) to change the texture of foods. The students will understand that it is better for them to eat fruit than to drink a sugary soft drink and that the sugar they get from fruit is processed by the body differently than the HFCS found in soft drinks.

Lesson 3

How many calories is that?

Materials needed: computers with access to the internet

In this lesson students will have written down two of their favorite meals. One meal will be their favorite fast food restaurant meal from McDonald's, Burger King, Wendy's, etc. The second meal will be their favorite big meal at home such as Thanksgiving, or Christmas, or Easter. The students will then access the websites to find out how many calories each meal contains. The website <http://www.calorie-count.com/> has an extensive list of foods and displays their nutritional content very similarly to what my students will see on any package of food they buy. It also has very easy to read graphical displays of the nutritional content as well as grades from A to F on how healthy a food is for eating. They will also look at the website <http://www.calorieking.com/> which also has an extensive database of foods but has a unique feature that is different from calorie-count.com. Calorieking.com will display different exercises and the amount of time a person would have to do those exercises to burn off the calories they just consumed. The average person needs about 2,000 calories a day. Based on the meals that the student has input, they will find the difference between calories consumed in each meal and the daily amount of calories a person needs. The students will understand metabolism and how it is different from person to person. However, metabolism can be influenced by activity or inactivity as well as the type of food you eat. The students will understand what will happen if you consume more calories than you are burning. After this lesson, the students will be more aware of the calories that they are consuming and how portions are also important.

Appendix A

Connecticut Comprehensive School Health and Physical Education Content Standards

The State of Connecticut says that these are standards students should know by grade 4.

Standard 1 Comprehend concepts related to health promotion and disease prevention

E (elementary).1.4. Explore how families can influence personal health

E.1.6. Identify health problems and illnesses that can be prevented or treated early

Standard 3 Demonstrate the ability to practice health-enhancing behaviors to reduce health risks

E.3.1. Identify responsible health behaviors

E.3.4. Demonstrate strategies to improve or maintain personal health by examining influences and rules that affect decisions

Standard 6 Demonstrate the ability to use decision-making skills to enhance health

E.6.1. Demonstrate the ability to apply a decision-making process to enhance health

E.6.3. Predict outcomes of positive health decisions

Standard 8 Demonstrate the ability to advocate for personal, family and community health

E.8.1. Describe a variety of methods to convey accurate health information, concepts and skills

E.8.2. Express opinions about health issues based on accurate health information

E.8.4. Describe ways to encourage and support others in making positive health choices

E.8.5. Identify ways to work cooperatively in small groups when advocating for healthy individuals, families and schools

Appendix B

Vocabulary

Here are some terms and words that the students will be required to be familiar with. This will help them when they are reading labels to know what they are looking at and what to look for. The vocabulary will come from the state department's handbook: Connecticut Nutrition Standards for Food in Schools, published in January 2008.

Added Sugars: Sugars and syrups added to foods in processing or preparation, as opposed to the naturally occurring sugars found in foods like fruits, vegetables, grains and dairy products. Names for added sugars include brown sugar, corn sweetener, corn syrup, dextrose, fructose, fruit juice concentrates, glucose, high-fructose corn syrup, honey, invert sugar, lactose, malt syrup, maltose, molasses, raw sugar, sucrose, sugar and syrup.

Dietary Fiber: Non-digestible carbohydrates and lignin (a non-carbohydrate substance bound to fiber) that are naturally occurring in plants, e.g., gums, cellulose, fiber in oats, and wheat bran. Fiber improves gastrointestinal health and reduces risk of some diseases, such as heart disease.

Whole Grains: Grains that consist of the entire kernel, including the starchy endosperm, the fiber-rich bran, and the germ. All grains start out as whole grains, but many are processed to remove the bran and germ, which also removes many of the nutrients. Whole grains are nutrient rich, containing vitamins, minerals, fiber and antioxidants. Examples include whole wheat, whole oats/oatmeal, whole grain cornmeal, popcorn, brown rice, whole rye, whole-grain barley, wild rice, buckwheat, triticale, bulgur (cracked wheat), millet, quinoa, and sorghum.

Saturated Fat: A type of fat that raises blood cholesterol, which is a risk factor for cardiovascular disease. Major sources of saturated fats include animal products (e.g., cheese, beef, milk, oils, snack foods, butter and lard) and tropical vegetable oils (palm, palm kernel and coconut).

Trans Fats: Trans fats are the result of "hydrogenation," a process where vegetable oils are made into a more solid (saturated) fat. Trans fats are used in food products to increase shelf life and enhance texture. Like saturated fat, trans fat raises blood cholesterol, which is a risk factor for cardiovascular disease. The majority

of trans fats in the American diet (80 percent) come from processed foods made with hydrogenated or partially hydrogenated oils, such as cakes, cookies, crackers, snack chips, fried foods and margarine. Trans fats also occur naturally in low amounts in some foods of animal origin (e.g., dairy products, beef and lamb).

Student Resources

Kimi Sue by Tracy White - A sugar glider learns the hard way about manners and proper eating habits.

The Children's Health Food Book by Ron Seaborn - A book written in comic style, Glass Man, whose transparent body allows the reader to see when he has eaten the right and wrong foods, takes the reader on a journey complete with villains and heroes known as the Health Guardians.

Spriggles Motivational Books for Children: Health & Nutrition by Jeff Gottlieb and Martha Gottlieb - When Stanley Seal eats all the right foods, he has lots of energy and stays healthy.

The Race Against Junk Food (Adventures in Good Nutrition) by Anthony Buono and Roy Nemerson - Tommy and the Snak Posse win the race against the Sugar Coat Gang and their evil ways.

Showdown at The Food Pyramid by Rex Barron - There's trouble afoot at the Food Pyramid: Strange new junk food like "candy bar" and "hot dog" are kicking off all the healthy food to have their own party.

Gregory The Terrible Eater by Mitchell Sharmat - A very picky eater, Gregory the goat refuses the usual goat diet staples of shoes and tin cans in favor of fruits, vegetables, eggs, and orange juice.

Teacher Resources

The Omnivore's Dilemma by Michael Pollan - This book answers the question, "What do you eat when you can eat everything?"

In Defense of Food: An Eater's Manifesto by Michael Pollan - This book teaches you how to escape the Western diet and relearn which foods are healthy.

Food is Elementary: A Hands-on Curriculum for Young Students by Antonia Demas, PhD - A wonderful curriculum for all grades that has engaging lessons and recipes that foster healthy eating.

Fat Land: How Americans Became the Fattest People in the World by Greg Critser - A critical analysis of the many social and economic factors that make Americans obese.

Fast Food Nation by Eric Schlosser - This book explains how the development of fast-food restaurants has led to the standardization of American culture, widespread obesity, urban sprawl and more.

Chew On This: Everything You Don't Want to Know About Fast Food by Eric Schlosser - Covers the history of the fast-food industry and delves into the agribusiness and animal husbandry methods that support it.

Bibliography

Pollan, Michael. *In Defense of Food: An Eater's Manifesto* New York: Penguin Press, 2008

Pollan, Michael. *The Omnivore's Dilemma* New York: Penguin Press, 2006

Kluger, Jeffrey. "How America's Children Packed on the Pounds." *Time*, 171, no. 25 June 23, 2008 66-69

Walsh, Bryan. "It's Not Just Genetics." *Time*, 171, no. 25 June 23, 2008 70-80

Severson, Kim. "Sugar Coated - We're drowning in high fructose corn syrup. Do the risks go beyond our waistline?" *San Francisco Chronicle* 18 February 2004, E-1, p. 1

Poirot, Carolyn. "High-fructose corn syrup fueling obesity epidemic, doctors say" *The Seattle Times* 4 December 2005,

Demas, Antonia. *Food is Elementary: A Hands-on Curriculum for Young Students* Trumansburg: Food Studies Institute, Inc., 2001

Forristal, Linda J. "The Murky World of High-Fructose Corn Syrup." *Wise Traditions in Food, Farming, and the Healing Arts* (fall 2001)

Sanda, Bill. "The Double Danger of High-Fructose Corn Syrup." *Wise Traditions in Food, Farming, and the Healing Arts* (winter 2003)

Appleton, Nancy. "Fructose is No Answer For a Sweetener," *Mercola.com Take Control of Your Health*, 5 January 2002, <http://articles.mercola.com/sites/articles/archive/2002/01/05/fructose-part-two.aspx> (25 June 2008).

Endnotes

1. Linda Joyce Forristal. "The Murky World of High-Fructose Corn Syrup" *Wise Traditions in Food, Farming and the Healing Arts*. (fall 2001).

2. Nancy Appleton. "Fructose is No Answer For a Sweetener," *Mercola.com Take Control of Your Health*, 5 January 2002, <http://articles.mercola.com/sites/articles/archive/2002/01/05/fructose-part-two.aspx> (25 June 2008).

3. Nancy Appleton. "Fructose is No Answer For a Sweetener," *Mercola.com Take Control of Your Health*, 5 January 2002, <http://articles.mercola.com/sites/articles/archive/2002/01/05/fructose-part-two.aspx> (25 June 2008).

4. Bill Sanda . "The Double Danger of High Fructose Corn Syrup" *Wise Traditions in Food, Farming, and Healing Arts*, (winter 2003).

5. Kim Severson. "Sugar Coated: We're drowning in high fructose corn syrup. Do the risks go beyond our waistline?" *San Francisco Chronicle on the Web*, 18 February 2004, <http://www.sfgate.com/cgi-bin/article.cgi?f=/chronicle/archive/2004/02/18/FDGS24VKMH1.DTL> (8 July 2008)

6. Bill Sanda . "The Double Danger of High Fructose Corn Syrup" *Wise Traditions in Food, Farming, and Healing Arts*, (winter 2003).

7. Michael Pollan. *The Omnivore's Dilemma* (New York: The Penguin Group, 2006), 105.

8. Michael Pollan. *The Omnivore's Dilemma* (New York: The Penguin Group, 2006), 104.
9. Kim Severson. "Sugar Coated: We're drowning in high fructose corn syrup. Do the risks go beyond our waistline?" *San Francisco Chronicle on the Web*, 18 February 2004,
<http://www.sfgate.com/cgi-bin/article.cgi?f=/chronicle/archive/2004/02/18/FDGS24VKMH1.DTL>> (8 July 2008)
10. Kim Severson. "Sugar Coated: We're drowning in high fructose corn syrup. Do the risks go beyond our waistline?" *San Francisco Chronicle on the Web*, 18 February 2004,
<http://www.sfgate.com/cgi-bin/article.cgi?f=/chronicle/archive/2004/02/18/FDGS24VKMH1.DTL>> (8 July 2008)
11. Bryan Walsh. "It's Not Just Genetics," *Time*, 23 June 2008, 73.
12. Bryan Walsh. "It's Not Just Genetics," *Time*, 23 June 2008, 77.
13. Bryan Walsh. "It's Not Just Genetics," *Time*, 23 June 2008, 77.
14. Bryan Walsh. "It's Not Just Genetics," *Time*, 23 June 2008, 73.
15. Jeffrey Kluger. "How America's Children Packed On the Pounds," *Time*, 23 June 2008, 68.
16. Jeffrey Kluger. "How America's Children Packed On the Pounds," *Time*, 23 June 2008, 68.
17. Michael Pollan. *In Defense of Food: An Eaters Manifesto* (New York: The Penguin Group, 2008), 86-87.
18. Bryan Walsh. "It's Not Just Genetics," *Time*, 23 June 2008, 78.
19. Carolyn Poirot. "High-fructose corn syrup fueling obesity epidemic, doctors say" *The Seattle Times*, 4 December 2005,
http://seattletimes.nwsourc.com/html/health/2002658491_healthysyrup04.html (8 July 2008)

<https://teachers.yale.edu>

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