Dr. Joseph Mercola, M.D.'s Article

RE: Dr. Robert H. Lustig, M.D.'s Lecture:

The Hazards Of Sugar

Dr. Lustig's entire lecture has been posted on YouTube, in full, (9 parts), and is brilliant. I highly recommend it. It does one of the best jobs I have ever seen of debunking the very dangerous and all-too-common nutritional myths that routinely sabotage our collective health. I promise you will learn a great deal that you can immediately apply to significantly improve your health.

Here is the address to watch the entire lecture:

http://www.youtube.com/watch?v=WjxyjcvW7RE

In case the link gets broken, you should be able to find all 9 parts, (start with part 1, of course), by searching YouTube for: "The Hazards Of Sugar". (Be sure to use the quotes so that you are searching for the complete, literal phrase.)

Here is Dr. Mercola's excellent commentary:

This Common Food Ingredient Can Really Mess Up Your Metabolism

Posted by Dr. Mercola on January 26, 2010

What if you were to learn that every day, 25 percent of your calories came from a poison, disguised as a food?

And what if you discovered that this chemical imposter was responsible for your insulin resistance and weight gain?

And elevated blood pressure ...

And elevated triglycerides and LDL ...

And depletion of vitamins and minerals ...

And even gout, heart disease and liver damage?

What if you were to discover that this toxic substance had been dumped into your food in gradually increasing quantities for the last thirty years, with the full knowledge and blessings of the American Heart Association, the American Medical Association, the USDA and the FDA?

Would you be angry?

I wish I could tell you that this is just a dramatic plot from some fiction novel, but it's actually a shocking reality.

The substance dealing such a crushing blow to your health and responsible for many, if not most of the chronic diseases that are so rampant in our society, is **sugar –** and more specifically, **fructose**.

We now know without a doubt that sugar in your food, in all its myriad of forms, is taking a devastating toll on the health of this nation.

By the end of this article, you will have a solid understanding of how and why this has happened. In order to really grasp this material, you'll have to learn a little about the biochemistry of energy, which is rather technical. But hang in there – the knowledge you're about to gain, and the impact it will have on your health, will be well worth the effort.

I will try my best to make the more technical aspects as simple as I can for you.

Big Gulp, Meet Big Belt

We are eating far more than we were 25 years ago.

On average, men are consuming 187 more calories per day, and women 335 more calories. People who were never heavy before are becoming overweight, and the obese are becoming more so. We are now a "supersized" population.

But why?

Modern science has shown that the obesity epidemic isn't simply about lack of self-control, but rather a phenomenon driven by biochemical changes that have altered the way your body regulates energy.

Something has caused your appetite regulation system to go awry. Leptin, the hormone responsible for satiety, isn't working. It isn't simply a matter of calories in and calories out. Six-month old babies are the latest victims of the obesity epidemic--diet and exercise cannot explain that.

So, what are you eating now that you weren't eating thirty years ago? What are you doing to yourself that started the day you were born?

Studies show that all of those extra calories are coming in the form of carbohydrates.

What carbohydrates in particular?

S*ugar* – specifically, *sugared drinks*. Soft drinks (41 percent) and fruit drinks (35 percent) make up the majority of these extra calories.

Today, 55 percent of sweeteners used in food and beverage manufacturing are made from corn, and the number one source of calories in America is soda, in the form of high fructose corn syrup (HFCS). In fact, the average American drinks 60 gallons of soda every year.

High Fructose Corn Syrup Has Only Been Around One Generation!

HFCS was invented in 1966 in Japan and introduced to the American market in 1975. Food and beverage manufacturers began switching their sweeteners from sucrose (table sugar) to corn syrup when they discovered that high fructose corn syrup (HFCS) was far cheaper to make – sucrose costs about three times as much as HFCS.

HFCS is also about 20 times sweeter than table sugar. So it was expected that *less sweetener would be needed per product*. Instead, the amount of sweeteners has steadily risen.

The switch from sugar to fructose drastically altered the average American diet. The statistics are beyond alarming:

- Corn syrup is now found in every type of processed, pre-packaged food you can think of. In fact, the use of HFCS in the U.S. diet increased by a whopping **10,673 percent** between 1970 and 2005, according to a report by the USDA[i].

- The current annual consumption of sugar is 141 pounds per person, and 63 pounds of that is HFCS.

- Adolescents are taking in 73 grams per day of fructose, mostly from soft drinks and juice drinks – and *12 percent of their total caloric intake is from fructose alone.*

- In the past century, fructose consumption has increased 5-fold.

- Processed foods account for more than 90 percent of the money Americans spend on meals.

You've probably heard the statistic that one soda a day is worth 15 pounds of fat per year. However, one soda today does not equal one soda of yesteryear. The original coke bottle was 6.5 ounces. Now, you have 20-ounce bottles and a 44-ounce Big Gulp.

Tragically, many infant formulas are more than 50 percent sugar – 43 percent being corn syrup solids. You might as well be giving your baby a bottle of Coke or Pepsi.

No wonder there is an obesity epidemic.

The War on Fat

Sugar's rise to power was really an accidental by-product of three political winds, beginning with the Nixon administration:

1. In 1972, Richard Nixon wanted to reduce food costs as part of his "war on poverty." He partnered with the USDA to do whatever means necessary to bring food costs down.

2. In 1975, HFCS was introduced, replacing sugar because it was cheap and readily available.

3. In the mid 1970s, dietary fats were blamed for heart disease (more about this later), giving rise to the "low-fat craze." Market response was an explosion of processed convenience foods, all nonfat and low fat, most of which tasted like sawdust unless sugar was added. Fructose was used to make fat-free products more palatable.

In 1982, the American Heart Association (AHA), the American Medical Association (AMA), and the United Stated Department of Agriculture (USDA) reduced fats from 40 percent of your diet to 30 percent. You eagerly complied, believing you were lowering your risks for both obesity and cardiovascular disease.

Yet, as the low-fat craze spread, so did rates of heart disease, diabetes, and obesity – the very illnesses you thought you were preventing. Clearly, the plan wasn't working.

Justification for Low-Fat Diet

But how did the war on fat start, in the first place?

It began with a study called the Seven Countries study by Ancel Keys[ii], a Minnesota epidemiologist who used multivariate regression analysis to examine diet and disease. He compared the diets of seven countries, and his main conclusion was that saturated fats were responsible for cardiovascular disease. After much heated public debate, this notion that saturated fats caused heart disease was widely adopted, especially once he made the cover of *Time Magazine* in 1980.

Keys' study laid the foundation for nutrition science, education, and public policy for the next three decades.

There was only one problem. *His conclusions were dead wrong*.

Keys neglected to perform the converse analysis demonstrating that the effect of saturated fat on cardiovascular disease was *independent of sucrose*. In other words, sucrose and saturated fat were co-mingled into his data. In retrospect, it is impossible to tease out the relative contributions of sucrose versus saturated fat to cardiovascular disease in this study because the original data is long gone and Keys has passed on.

Additionally he never separated out the issue of how the fat was consumed. There is a major difference in raw and cooked animal fat, especially fat cooked at high temperatures, which clearly produces known carcinogens.

Nevertheless, lowering fat (without regard to sugar) became the nutritional model that persists to this day, despite copious evidence that it doesn't work.

As your fats went from 40 percent to 30 percent, your carbohydrates went from 40 percent to 55 percent. And this carbohydrate increase was of the worst possible kind: SUGAR.

Proof that Sugar Causes Obesity

The American Beverage Association claims there is "no association between high fructose corn syrup and obesity."[iii]

However, a long lineup of scientific studies suggest otherwise:

- Dr. David Ludwig of Boston Children's Hospital did a study of the effects of sugar-sweetened drinks on obesity in children[iv]. He found that for each additional serving of a sugar-sweetened drink, both body mass index and odds of obesity increased in the children he studied.

- Dr. Kelly Brownell of Yale University did a systematic review and meta-analysis of 88 studies about the association between soft drink consumption and health outcomes[v]. He found clear associations between soft drink consumption and higher body weight.

- The Fizzy Drink Study in Christchurch, England explored the effects on obesity when soda machines were removed from schools for one year. In the schools where the machines were removed, obesity stayed constant. In the schools where soda machines remained, obesity rates continued to rise[vi].

- A study by Schulze in JAMA in 2004[vii] provides further evidence that sugared drinks cause type II diabetes.

- In 2008 a similar study of African American women[viii] demonstrated higher intake of both sugar-sweetened soft drinks and fruit drinks leads to higher rates of type II diabetes.

- In a very recent study[ix], sixteen volunteers were fed a controlled diet including high levels of fructose. Ten weeks later, the volunteers had produced new fat cells around their hearts, livers and other digestive organs. They also showed signs of food-processing abnormalities linked to diabetes and heart disease. A second group of volunteers who were fed a similar diet, but with glucose replacing fructose, did not have these problems.

But it doesn't stop at soft drinks.

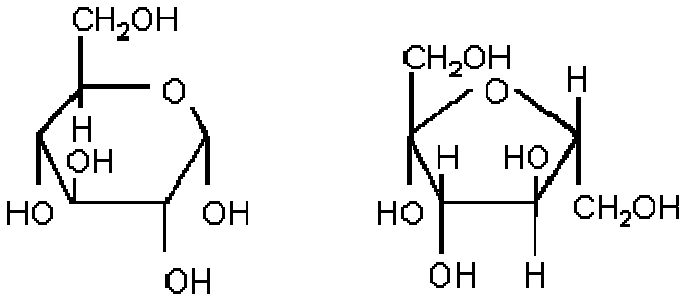
Sweetened fruit drinks are contributing to your expanding waistline as well. High fruit juice intake (sucrose) is associated with childhood obesity, especially in low-income families[x].

What is it in soft drinks and juice drinks that is damaging your health?

Primarily, it's the fructose. Read on to discover exactly how and why this is so.

Fructose is NOT the Same as Glucose

Glucose is the form of energy you were designed to run on. Every cell in your body, every bacterium – and in fact, every living thing on the Earth – uses glucose for energy.



glucose fructose

Image from Clinton Community College

Fructose is not the same molecule. Glucose is a 6-member ring, but fructose is a 5-member ring. Sucrose (table sugar) is 50 percent glucose and 50 percent fructose, and HFCS is 42-55 percent fructose.

If you received your fructose only from vegetables and fruits (where it originates) as most people did a century ago, you'd consume about 15 grams per day – a far cry from

the 73 grams per day the typical adolescent gets as a bolus from sweetened drinks. In vegetables and fruits, it's mixed in with fiber, vitamins, minerals, enzymes, and beneficial phytonutrients, all which moderate the negative metabolic effects.

It isn't that fructose itself is bad – it is the MASSIVE DOSES you're exposed to that make it dangerous.

Before you can understand the differences between how your body metabolizes glucose and fructose, you have to have a basic understanding of LDL.

There are Two Types of LDL – and Only One is Bad

In the 1970s, low-density lipoproteins (LDLs) were discovered. LDLs were found to be higher in people with cardiovascular disease, so the focus of medicine and nutrition became lowering your LDLs.

One of the crucial pieces of the puzzle that wasn't recognized at the time was that *there are two kinds of LDL: Pattern A and Pattern B.*

1. Pattern A LDLs are large, light, buoyant "floating" LDLs that don't get under your endothelial cells, and they don't cause plaque formation. They are harmless.

2. Pattern B LDL (or VLDLs) are smaller, denser LDLs that are able to wedge themselves under your epithelial cells and therefore roughen surfaces and stimulate plaque formation. *These are the bad guys*.

Unfortunately, when you get a standard lipid profile at your annual check-up, the LDL measured is a combination of both types. Lab measurements lump them together unless you have a very specialized panel, which most physicians don't order.

To decipher whether or not you have an excess of the bad type, you can look at your triglycerides and high-density lipoprotein (HDL) levels. (HDL, or "high density lipoprotein is commonly called "good cholesterol.")

Here is a simple way to determine if you have too much bad LDL:

1. If your triglycerides are low and your HDL is high, then the LDL you have is the good variety.

2. If your triglycerides are high and your HDL is low, then the LDL you have is the bad variety. **The triglyceride-to-HDL ratio is a far better indicator of cardiovascular disease** than the total cholesterol-to-HDL ratio that everyone uses.

Now, here's the bottom line: Dietary fat raises your large, buoyant LDL – the one that is harmless. **Dietary sugar raises your small, dense LDL – the one that correlates with heart disease!**

So, what has happened over the past 30 years is that sugar was added to our low-fat foods to improve palatability – in the form of either HFCS or sucrose – and a high-carb, high-risk diet was created – simply the worst combination for your health.

And the fiber was eliminated.

Fiber Foregone

Fiber is an important nutrient (although not acknowledged as such by the government) and offers many health benefits, particularly if the fiber comes from vegetables.

A high-fiber diet may offer some protection from colorectal cancer, although the research is unclear exactly how this works and what all the factors are. The benefits of vegetable fiber are not yet completely understood. We do know that the risk of colorectal cancer is lower among populations with high intakes of vegetables and fruits, and there is some evidence that vegetable fiber may offer some protection from prostate cancer.

Fiber has three important roles:

- It reduces the rate of intestinal carbohydrate absorption, reducing your insulin response.
- It increases the speed of transit of intestinal contents to your ileum, which speeds up release of satiety hormones.
- It inhibits absorption of some free fatty acids to your colon, which would become short chain fatty acids, which suppress insulin.

Thousands of years ago your ancestors likely consumed 100 to 300 grams of fiber every day. Now, you are lucky to get 12 grams daily.

Why is this?

- Fiber-less foods are cheap.
- They have a longer shelf life and are easier to ship. This makes them easier to export to other countries.
- Fiber-rich foods take too long to prepare and eat, and are often less appealing to the general public.

The standard American diet (SAD) is typically loaded with processed foods full of sugar, and devoid of most nutrients and fiber. Sounds like the perfect recipe for an explosion of chronic disease.

The Molecule that Makes Fat Stick to You

Obesity is a disorder of excess fat accumulation. But what regulates fat accumulation?

Fat is a metabolically active tissue. Your adipose tissue is in a perpetual state of flux with free fatty acids (FFAs) being converted into triglycerides and back again, in an ongoing cycle.

FFAs can move in and out of your cells, across cell membranes, but triglycerides (three fatty acid molecules plus one glycerol molecule) are too big to cross. Fat enters and exits a cell as FFA, but is stored as a triglyceride. When fuel is needed, the triglyceride is broken down into FFAs, which can then be burned as fuel.

The glycerol molecule, which is a primary component of a triglyceride, comes from something called glycerol-3-phosphate (g-3-p), or "activated glycerol," which originates from the metabolism of glucose. *The amount of G-3-p you make determines the rate that FFAs are "esterified" into triglycerides inside your fat cells*[xi].

The rate of deposition of fat into your fat cells is dependent on the presence of g-3-p. The more g-3-p that is available, the more fat is deposited.

Carbohydrate Biochemistry 101

I promised you a crash course in biochemistry – so here we go.

Much of the following information comes from the important work of Dr. Robert Lustig[xii] Professor of Pediatrics in the Division of Endocrinology at the University of California, San Francisco.

In order to appreciate just how damaging fructose is to your body, it is crucial to have a basic understanding of how different types of carbohydrates are metabolized.

We'll start with glucose since it's the basic carbohydrate energy source for all living cells.

I. Glucose Metabolism

Glucose is the basic fuel for living organisms, from bacteria to humans, and is the primary energy source for your brain. It is a product of photosynthesis and is found in rice, corn and other grains, and bread and pasta.

Once you take in glucose from a meal – like, say, from two slices of bread – 80 percent of it is used by all of the organs of your body – every single cell. The remaining 20 percent goes to your liver to be metabolized and stored.

The following is what happens to that 20 percent, once it reaches your liver:

- Whatever glucose your body doesn't need immediately gets converted into **glycogen** for storage in the liver. Glycogen is your body's non-toxic short-term energy storage package, where it can be easily converted to energy when you need it. Your liver has no limit to how much glycogen it can store without detrimental effects. (That is what athletes take advantage of when they "carbo-load.")

- A small amount of pyruvate is produced, which ends up being converted to ATP (the chemical storage form of energy) and carbon dioxide. An even smaller quantity of citrate is produced from this process through the "citrate shuttle," which ends up as VLDL (very low density lipoproteins, the bad ones) in a process known as *de novo* lipogenesis – but we're talking about *a very small amount* (less than one calorie from two slices of bread).

- **Insulin** is released by your pancreas in response to the rise in blood glucose (i.e., blood sugar), which helps the glucose get into your cells. Without insulin, your cells would not be able to process the glucose and therefore would have no energy for movement, growth, repair, or other functions. Insulin is key to unlocking the door of the cell to allow the glucose to be transferred from the bloodstream into the cell.
- When you consume 120 calories of glucose, *less than one calorie contributes to adverse metabolic outcomes*.

This is all very normal, and it's how you were designed to operate.

II. Ethanol Metabolism

Ethanol, or ethyl alcohol, is the favorite carbohydrate of many. But it is also a carbohydrate that undergoes a very different metabolic process, leaving in its wake a trail of toxins a mile long.

Ethanol is an acute central nervous system toxin and a chronic hepatotoxin due to the fact that it must be metabolized almost completely in the liver.

After consuming an alcoholic beverage, 10 percent of the ethanol gets broken down by the stomach and intestine as a "first pass" effect, and another 10 percent is metabolized

by the brain and other organs. The fact that ethanol is partially metabolized in your brain is the reason you experience that familiar "buzz."

The remaining 80 percent hits the liver, where it must be broken down. *This is four times the load on the liver as the same number of calories from glucose.*

But the metabolic process in the liver is quite different from that of glucose.

This metabolic cascade can be summarized as follows:

- The liver converts ethanol to aldehydes, which produce free radicals that damage proteins in the liver.

- Some of these aldehydes are converted to glucose, but a large amount of excess citrate is formed in the process, stimulating "junk chemicals" that result in free fatty acids (FFAs), VLDL and triglycerides. As compared to the 1 calorie from glucose that was converted to VLDL (see previous section), the same caloric intake from ethanol produces 30 calories of VLDL that are transported to your fat cells and contribute to your obesity, or participate in plaque formation. This is what leads to the *dyslipidemia of alcoholism.*

- The resulting lipids, together with the ethanol, lead to an enzyme that begins an inflammation cascade, which in turn causes hepatic insulin resistance, liver inflammation and *cirrhosis*.

- Fat globules accumulate in the liver as well, which can lead to *fatty liver disease.*

- Free fatty acids (FFAs) leave the liver and cause your skeletal muscles to become insulin resistant. This is a worse form of insulin resistance than hepatic insulin resistance and can lead to *type II diabetes.*

- After a 120-calorie bolus of ethanol, a large fraction (about 40 calories) can contribute to disease.

Why am I including a discussion of ethanol metabolism in a report about fructose?

Because, in nearly every way, *fructose is metabolized the same way as ethanol, creating the same toxins in your body.*

III. Fructose Metabolism

Now we finally come to fructose.

When you consume fructose, 100 percent of it goes directly to your liver to be metabolized. This is why it is a hepatotoxin – it overloads the liver. Fructose metabolism creates the following adverse effects:

- Fructose is immediately converted to fructose-1-phosphate (F1P), depleting your liver cells of phosphates.
- The above process produces waste products in the form of uric acid. Uric acid blocks an enzyme that makes nitric oxide. Nitric oxide is your body's natural blood pressure regulator, so when it is blocked, your blood pressure rises – leading to *hypertension*. Elevated uric acid levels can also cause gout.
- Almost all of the F1P is turned into pyruvate, ending up as citrate, which results in *de novo* lipogenesis, the end products of which are FFAs, VLDLs, and triglycerides. The result – *hyperlipidemia*.
- Fructose stimulates g-3-p (activated glycerol), which you will recall is the crucial molecule for turning FFAs into triglycerides within the fat cells. Remember, the rate of deposition of fat into fat cells is dependent on the presence of g-3-p. The more g-3-p that is available, the more fat is deposited. *Fructose is the carbohydrate most efficiently converted into g-3-p*11. In other words, fructose is the most lipophilic carbohydrate.
- FFAs are exported from the liver and taken up in skeletal muscle, causing *skeletal muscle insulin resistance*.
- Some of the FFAs stay in the liver, leading to fat droplet accumulation, *hepatic insulin resistance* and *nonalcoholic fatty liver disease (NAFLD)****[xiii][xiv]***.
- Insulin resistance stresses the pancreas, which pumps out more insulin in response to rising blood sugar as your cells are unable to get the sugar out of your bloodstream, and this can progress to *type II diabetes*.
- As with a bolus dose of ethanol, a 120-calorie bolus of fructose results in a large fraction (again, about 40 calories) that directly contributes to disease.

Do these symptoms sound a bit familiar to you? Hypertension, lipogenesis and dyslipidemia, obesity, inflammation, insulin resistance, and central nervous system leptin resistance?

If you are thinking it sounds a lot like ***classic metabolic syndrome***, you are dead on!

The point to take away is: consuming fructose is consuming fat. Fructose is not really a carbohydrate – **a high fructose diet is a HIGH FAT diet**. A high-fat diet that creates a vicious cycle of consumption that won't turn itself off.

You can see by comparing the metabolism of fructose with the metabolism of ethanol that they are very similar. In fact, when you compare the metabolism of 150 calories of soda with 150 calories of beer (a 12 ounce can of each), about 90 calories reach the liver in either case. Fructose causes most of the same toxic effects as ethanol because both come from sugar fermentation.

Both ethanol metabolism and fructose metabolism lead to visceral adiposity (belly fat), insulin resistance and metabolic syndrome.

Studies are accumulating that bear this out.

For example, high-fructose diets were shown to cause dyslipidemia in healthy people with and without a family history of type II diabetes, a recent study showed[xv].

Two other studies were done using medical students, both looking at biological responses to fructose loading. In the first, the med students were given either a large glucose load or a large fructose load. In the students given fructose, almost 30 percent of the calories ended up as fat. In the students given glucose, almost none ended up as fat.

In the second study, medical students were given a high-fructose diet for 6 days. In just that short time, *their insulin resistance and triglycerides doubled*!

The Neurochemical Basis for Gluttony

You eat as a result of the activation of the "reward pathway" (also known as the hedonic pathway) of your brain.

Your brain's pleasure center (aka ventral tegmental area, or VTA, and nucleus accumbens, or NA) is the root of all behavior, driven by chemical messengers that are intimately tied into the energy processes I have outlined above.

The part of your brain that responds to what you eat is the same part that responds to nicotine, morphine, amphetamine, ethanol, sex and exercise! That is why people taking narcotics tend to overeat.

Leptin and insulin are modulators of these reward responses, decreasing this VTA-NA activity. In other words, leptin and insulin cause your brain to send you signals to stop eating.

Fructose undermines these normal satiety signals, increasing caloric consumption both directly and indirectly:

1. Fructose does not stimulate a leptin rise, so your satiety signals are diminished.

2. Glucose suppresses ghrelin (the hunger hormone—it makes you want more food), but fructose does not.

3. By raising triglycerides, fructose reduces the amount of leptin crossing your blood-brain barrier.

4. Fructose increases insulin levels, interfering with the communication between leptin and your hypothalamus, so your pleasure signals aren't extinguished. Your brain senses starvation and prompts you to eat more.

5. Fructose decreases the production of malonyl-CoA, which may help promote a sense of energy adequacy.

Along with causing insulin resistance, fructose alters the hedonic response to food thereby driving excessive caloric intake, setting up a positive feedback loop for overconsumption.

Big Fat Lies From the Corn Industry

Now that scientific studies have shown the metabolic similarity between HFCS and sucrose, the Corn Refiners Association has embarked on a vociferous campaign to convince the public that their product is equal to table sugar, that it is "natural" and safe.

Of course, many things are "natural" – cocaine is natural, but you wouldn't want to use 141 pounds of it each year.

The food and beverage industry doesn't want you to realize how truly pervasive HFCS is in your diet – not just from soft drinks and juices, but also in salad dressings and condiments and virtually every processed food. The introduction of HFCS into the Western diet in 1975 has been a multi-billion dollar boon for the corn industry.

Now the corn industry has come up with another product it's using in beverages called "crystalline fructose." This is produced by allowing the fructose to crystallize from a fructose-enriched corn syrup, resulting in a product that is 99.5 percent pure fructose – a fructose level twice as high as regular HFCS!

Clearly, all the health problems associated with HFCS could become even more pronounced with this product.

Making matters worse, crystalline fructose may also contain arsenic, lead, chloride and heavy metals – a virtual laundry list of toxic agents you should clearly avoid. In fact, more than one study has detected unsafe mercury levels in HFCS[xvi]. If you have children, all of these contaminants can impact your child's development and long-term health.

Why doesn't the FDA regulate fructose since it poses the same health risks as ethanol – and it regulates ethanol?

The FDA doesn't touch *chronic toxins*. They regulate only acute toxins, and ethanol falls into that category because it produces immediately toxic neurological effects. Fructose doesn't get metabolized in the brain, so it's effects, although damaging, are cumulative and magnify over time.

Also realize that nearly all HFCS is made from genetically modified corn, which comes with its own set of risks.

The FDA classifies fructose as GRAS: Generally Regarded As Safe. Which pretty much means nothing and is based on nothing.

It is interesting to note that soda taxes[xvii] have recently been proposed both in New York and California, and legislation for the removal of soft drinks from schools has been enacted in several states.

What's a Sugarholic to Do?

Ideally, I recommend that you avoid as much sugar as possible. This is especially important if you are overweight or have diabetes, high cholesterol, or high blood pressure.

In fact, I believe that the positive health impacts of breaking the country's sugar addiction would be even greater than if everyone stopped smoking, because elevated insulin levels are the foundation of nearly every chronic disease known to man, from cancer and arthritis to cardiovascular disease.

I also realize you don't live in a perfect world, and following rigid dietary guidelines is not always practical or even possible.

If you want to use a sweetener occasionally, this is what I recommend:

1. Use the herb stevia
2. Use organic cane sugar in moderation
3. Use organic raw honey in moderation

Avoid ALL artificial sweeteners, which can damage your health even more quickly than HFCS.

And I don't recommend agave syrup since it is a highly processed sap that is *almost all fructose*. Your blood sugar will spike just as it would if you were consuming regular sugar or HFCS. Agave has gained meteoric popularity due to a great marketing campaign, but any health benefits present in the original agave plant are processed away.

Be sure to eat your sugar with fiber ... as in a piece of fruit. As Dr. Lustig says, "When God made the poison, he packaged it with the antidote: fiber."

Wait 20 minutes before second portions at meals, giving your brain a chance to receive satiety signals.

And exercise regularly. Dr. Ludwig recommends you "buy your screen time with physical activity."

Exercise is important for several reasons, some of which might surprise you:

- Exercise improves skeletal muscle insulin sensitivity (insulin works best in your muscles)
- Exercise reduces stress and lowers cortisol, which decreases appetite
- Exercise suppresses ghrelin, thereby decreasing appetite
- Exercise speeds up metabolic cycles, reducing citrate levels, thus reducing fat production
- Exercise can make you sharper, reduce arthritis, lift your mood, strengthen your bones, and even slow down aging

Avoid so-called energy drinks and sports drinks because they are loaded with sugar, sodium and chemical additives.

Rehydrating with pure, fresh water is a better choice.

If you or your child is involved in athletics, I recommend you read my article Energy Rules for some great tips on how to optimize your child's energy levels and physical performance through good nutrition.

A Word of Warning About Infant Formula

And finally, be extremely careful about the infant formula you are feeding your baby. Nearly all infant formulas have as much or more high fructose corn syrup than a can of soda – in addition to many other things that are extremely detrimental to your baby's health and development.

You have learned that, metabolically, there is very little difference between ethanol and sugar, so by giving your infant formula, you might as well be giving him a bottle of beer or soda!

And studies have shown that the earlier you expose kids to sweets, the more they crave them later.

It is important for pregnant women to keep their blood sugars well managed not only for their own health, but also for the long-term health of their children.

Researchers have found that children born to mothers with gestational diabetes (high blood sugar during pregnancy) had an 82 percent chance of becoming obese between the ages of 5 and 7 through a phenomenon called "metabolic imprinting." Even mothers with elevated blood sugar, short of gestational diabetes, had children with a significantly increased risk for obesity.[xviii]

I advocate breastfeeding if at all possible – it is by far the healthiest option.

One of the most clear-cut, non-debatable topics in health care is that breast milk is the best source of nutrition for newborns. The benefits to the baby and the new mom are enormous. Breastfed infants have shown lower obesity rates in later childhood[xix].

Acknowledgements

I would like to thank Dr. Robert H. Lustig, Professor of Pediatrics in the Division of Endocrinology at University of California, San Francisco, for sharing his incredibly important insights, without which this article would not have been possible. Much of the above information came directly from Dr. Lustig's work related to central regulation of energy balance, and I am very grateful for his willingness to share it with me so that I can pass it along to you.

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Related Links:

- **Sugar May Be Bad, But This Sweetener is Far More Deadly, Part 1 of 2**
- **Don't Believe the Hype – Fructose Truly is Much Worse Than Glucose**
- **Why High-Fructose Corn Syrup Causes Insulin Resistance**