

Beer Without the Buzz

WHY ARE WE A NATION OF THE OBESE AND UNWELL?

Everyone despairs about spiraling obesity, heart disease, and diabetes rates in America. We point to sloth, gluttony, and an inability to follow nutrition advice. But before we judge too harshly, let us take a fresh look at body chemistry. How do our bodies respond to *what* we eat?

High fructose corn syrup (HFCS) has received a terrible rap over the last few years. It has been blamed for everything from high blood pressure, to doubled triglyceride levels, obesity, diabetes, and to overeating since it fails to stimulate the hormone (leptin) that encourages fat burning and signals the brain to reduce hunger. Experts also inform us there is no receptor for

fructose on the beta cells that produce insulin, so HFCS does not trigger insulin release. Insulin's job is to escort sugar out of the bloodstream before it can cause massive damage. Last, it is said that fructose, for all of its calories, does not suppress the hunger hormone, ghrelin. Without that brain signal for satiety, we continue to eat.

The corn industry furiously refutes these allegations. In 2008, it launched an advertising campaign vigorously equating HFCS to sucrose, or table sugar.

And guess what. They are right! HFCS is no worse than sucrose!¹ And no better. Our bodies process sucrose and HFCS the same

GLUCOSE VERSUS FRUCTOSE



Glucose in moderation is not a problem. It is what our bodies were designed to run on. The body in normal metabolism can use eighty percent of glucose. Fructose is the common denominator that makes table sugar and HFCS equally toxic – guilty of all the above and more.

Context and dosage matter. Neither pure fructose nor sugar was ever meant to be dissociated from the fiber and nutrients with which they naturally occur. The high fiber content of fruits and

sugar cane for instance discourages excessive consumption, slows down the entrance of fructose into the bloodstream, and help moderate negative metabolic effects. Also, the nutrients and enzymes in foods that contain fructose help metabolize it. A whole food, including its fiber, is a perfect packet of nutrition.

Dr. Lustig, a pediatric metabolic specialist from the University of Southern California says that fructose, whether from sucrose or HFCS, is metabolized exactly like ethanol with but one exception – *where* each is metabolized. Your brain metabolizes your favorite whisky so you fully experience its alcohol toxicity. It is your liver that must process nearly three-fourths of your favorite fruit juice, soda, or

INGREDIENTS: 43.2% CORN SYRUP SOLIDS, 14.6% SOY PROTEIN ISOLATE, 11.5% HIGH OLEIC SAFFLOWER OIL, 10.3% SUGAR (SUCROSE), 8.4% SOY OIL, 7.7% COCONUT OIL; **LESS THAN 2% OF:** C. COHNII OIL¹, M. ALPINA OIL², CALCIUM PHOSPHATE, POTASSIUM CITRATE, POTASSIUM CHLORIDE, MAGNESIUM CHLORIDE, SODIUM CHLORIDE, ASCORBIC ACID, CHOLINE CHLORIDE, L-METHIONINE, TAURINE, ASCORBYL PALMITATE, FERROUS SULFATE, m-INOSITOL, MIXED TOCOPHEROLS, ZINC SULFATE, d-ALPHA-TOCOPHERYL ACETATE, L-CARNITINE, NIACINAMIDE, CALCIUM PANTOTHENATE, CUPRIC SULFATE, THIAMINE CHLORIDE HYDROCHLORIDE, VITAMIN A PALMITATE, RIBOFLAVIN, PYRIDOXINE HYDROCHLORIDE, FOLIC ACID, POTASSIUM IODIDE, POTASSIUM HYDROXIDE, PHYLLQUINONE, BIOTIN, SODIUM SELENATE, BETA-CAROTENE, VITAMIN D₃ AND CYANOCOBALAMIN.
CONTAINS SOY INGREDIENTS.

Similac Isomil Advance Baby Formula

way because their chemical structures are nearly identical. They are both roughly half fructose and half glucose. (Sucrose is 50/50; HFCS is 42-55 percent fructose.)

¹If you lay aside for a moment, the issue of genetically engineered crops and possible contamination of HFCS with mercury.

other fructose-loaded beverage – into ethanol – so you never feel the damage. Dr. Lustig goes on to say that nevertheless, fructose causes eight out of the twelve problems excessive alcohol consumption is known for: liver dysfunction, heart problems, high blood pressure, improper fat metabolism, inflammation of the pancreas, obesity, fetal alcohol syndrome, and addiction. He points out that:

- Uric acid, from fructose metabolism increases blood pressure – and contributes to gout.
- Thirty percent of fructose ends up as fat, not glucose. He points to a study of medical students who ingested high amounts of fructose for six days. In that six-day period, their triglyceride levels doubled.

Fat-making increased by more than five times, and the number of free fatty acids in the blood (FFAs) also doubled, causing a doubling of insulin resistance. Insulin resistance is an early warning sign of diabetes development.

- Some of the fat does not make it out of the liver, so it contributes to a fatty liver – a kind of hepatitis.
- Fructose keeps your brain from sensing leptin (leptin resistance), so you overeat and likely, make more fat. If you read *Mouth Matters*, you know leptin works through the brain's hypothalamus, therefore it also influences other functions as well. Some of these are the stress response through the adrenal glands, bone growth, thyroid function, the sympathetic nervous system, and reproductive behavior.
- Fructose metabolism contributes to insulin resistance in the liver. In this case, the pancreas has to

work harder to pump out more insulin. High insulin leads to higher blood pressure. High insulin also leads leptin resistance, further fat making, and other metabolic problems.

- Fructose is seven times more likely to cause the arterial glycation products called AGEs that are discussed in *Mouth Matters*.
- The sugars that make it into the liver must be phosphorylated, therefore the body can quickly become depleted of phosphate.
- Cellular energy generation from sugar metabolism is called ATP. As ATP breaks down, it degrades into the waste product, uric acid. Uric acid causes gout. It also contributes to high blood pressure because it blocks nitric oxide (NO) in the blood vessels. NO decreases blood pressure.

Perhaps more critical than all the above: after all the metabolic passes fructose makes through the body, roughly 60 percent exit as LDLs,

the reason so many doctors pass out statin prescriptions, such as Lipitor and Crestor. And these are not just any LDLs. LDLs can be broken down into two groups – the large “floaters” that are too big and buoyant to pass through the lining of blood vessel walls to cause the damage of atherosclerosis, and the VLDLs. These very low density LDLs are the ones that can burrow into your circulatory system. Because currently LDL tests do not differentiate what ratio of LDLs to VLDLs you have, Dr. Lustig contends a more accurate assessment of where you stand for heart disease risk is the triglyceride to HDL ratio. If your triglycerides are low and HDLs high, you have a high fraction of large, buoyant LDLs. High triglycerides and low HDLs signal a problem. Dietary fat raises large, buoyant LDLs; sugars raise VLDLs!

Glucose metabolism does not move you to type II diabetes, obesity, and heart disease. Fructose metabolism does.

A CLOSER LOOK:

What happens when you eat white bread? Eighty percent is used by all the organs in the body because every cell and bacteria can use glucose. About twenty percent enters the liver, where it is stored as glycogen. Only glucagon or epinephrine can release it. An unlimited amount can be stored there, which is why athletes can carbohydrate load without liver toxicity. A small amount goes into the cells to generate energy and, if you don't burn it all off, gets stored as fat. Glucose has the advantage in that it signals the brain that you are full and you stop eating.

What happens when you drink alcohol? The statistics flip. The stomach, intestines, kidneys, muscles, and brain utilize twenty percent of the ethanol calories. The liver must metabolize eighty percent, or four times more than when you eat white bread. The liver turns ethanol into acetaldehyde, which, if you read *Mouth Matters*, you know is a carcinogen. It also cross-links liver proteins (causing liver cirrhosis), and starts

massive oxidation reactions. And of course a large portion is metabolized into the VLDLs described above.

What happens when you drink a glass of fruit juice? Sucrose is the sugar in fruit juices, so half of the calories are glucose. As I've said, our bodies *are made* to run on glucose, so no problem with processing that half. As with bread, 20 percent of the glucose goes to the liver to be metabolized. But the other half of the calories in orange juice is fructose. *All* of that must go to the liver to be metabolized.

It is metabolized into ethanol, so about 70 percent of fruit juice is metabolized just like your favorite alcoholic beverage.



SUGAR FACTS TO PONDER

- Total sugar consumption in the United States is about 149 pounds per year. Of that, HFCS intake is 79 pounds/year.
- Anything ending in “-ose” is a sugar. Levulose equals fructose.
- As fats began to get a bad reputation in the 1980s, processed foods began to omit them. Also removed was fiber. In their stead, added sugars improved taste and provided browning. Fiber intake has plummeted from 100 - 300 grams per day to an average of 12 grams per day.
- A century ago, typical fructose consumption was 15 grams/day. Today, 73 grams/day is not uncommon for adolescents that drink soda, energy, or sport drinks.
- Agave syrup is nearly all fructose.
- The *Seven Countries Study* mentioned in *Mouth Matters* correlated heart disease with fat intake and, as was said, is the basis for the fat guidelines recommended over the last 30 years in America. Only in Greece and Japan did fat intake not correlate with cardiovascular disease. These two countries had significantly lower rates of heart disease. Japan had the lowest fat consumption – around 9 percent – but about 37 percent of the calories in the Greek diet derived from fat. The key was the type of fats they ate. But the other significant feature of the study was contained in one paragraph. The author, Ancel Keys, noted that in the five countries where high fat intake correlated with high rates of heart disease, sugar intake surged in line with fat consumption. Keys noted that the conclusions about fat intake could not be disentangled from the issue of increased sugar intake.
- Note: HFCS and sucrose are each roughly half glucose. Glucose *does* stimulate leptin and decrease the hunger hormone ghrelin, so there is a slight moderation in hunger when they are ingested in fractionated form.

Solutions for children recommended by the University of Southern California:

- Get rid of all sugared liquids including sports and energy drinks. Drink only water or milk.
- Eat all carbohydrates with fiber. Fiber is an essential nutrient. (Whole fruit is healthy in moderation. It is juice, isolated from the nutrients contained in a whole food and from the fiber that slows down the sugar absorption, that is problematic. That is, the fiber in fruit is the antidote to its fructose.)
- Wait 20 minutes for 2nd portions, so the brain has time to get the signal you are full.
- Buy screen time (texting, computer, or TV) minute-for-minute with physical activity. Exercise is critical because it:
 - Improves skeletal muscle insulin sensitivity
 - Reduces stress. Stress and obesity are related.
 - Exercise burns off energy before sugar can turn into VLDLs.

This article is a synthesis of information from *Mouth Matters*, and a lecture, “Sugar, the Bitter Truth”, given by Dr. Robert H. Lustig, neuroendocrinologist and Professor of Pediatrics at the University of California. <http://www.youtube.com/watch?v=dBnniua6-oM>