

The obesity and diabetes epidemic

“The conventional wisdom is that people are eating too much and exercising too little. Of course, there’s a lot of evidence that supports that... It’s too much energy in, too little out, and the rest is turned into fat.

This is the law of thermodynamics, and there’s some truth to it. The issue is that when people talk about this, they seem to think that it’s the culture that’s driving obesity...

But what we know is that animals in general will regulate their weight very tightly... In order to gain weight significantly, you actually have to block your sensation of fullness, so that you’re hungry more, and you have to block your energy output. You actually block the ability to oxidize fat to burn fat.”

How Leptin Resistance Causes Obesity

In order for you to significantly gain weight, you must first become leptin resistant. Leptin is a hormone that helps you regulate your appetite. When your leptin levels rise, it signals your body that you’re full, so you’ll stop eating.

However, as you become increasingly resistant to the effects of leptin, you end up eating more. Many people who are overweight also have an impairment in their body’s ability to oxidize fat, which leads to a low-energy state.

The question then is: what drives this basic process? Why do you become leptin resistant in the first place?

Dr. Johnson’s research clearly shows that refined sugar (in particular fructose) is exceptionally effective at causing leptin resistance in animals, and it’s very effective at blocking the burning of fat.

“When you give fructose to animals, they lose their ability to control their appetite, they eat more, and they exercise less. Fructose looks like it’s playing a direct role in weight gain,” he says.

His research also reveals that fructose has effects independent of this mechanism to induce this metabolic syndrome. Whereas fructose increases weight through the standard mechanism of stimulating more food intake and blocking the burning of fat, even when you control caloric intake, fructose can affect body composition.

This is because when you eat fructose, you actually generate more fat in your liver for the same amount of energy intake, compared to other types of sugar... For example, if you calorically restrict an animal but give it a high-fructose diet or a high-

sugar diet, it will *still* produce fatty liver and will still become insulin resistant. According to Dr. Johnson, fructose has two effects:

1. It stimulates weight gain through its effects on your appetite and by blocking the burning of fat
2. It also changes your body composition to increase body fat even when you are on a caloric restriction

Fruits... Are You Eating Too Much of a Good Thing?

Most overweight Americans have some degree of insulin and leptin resistance. This also includes people with diabetes, and many individuals with high blood pressure or high cholesterol.

If you fall into this category, it would be prudent for you to restrict your fructose consumption to about 15 to 25 grams of fructose per day from all sources.

Those who are normal weight and relatively healthy may also benefit from reducing their intake of fructose, particularly from foods containing high fructose corn syrup or sugar, as the effects of high sugar and HFCS intake may have effects that build up over time.

Naturally, fruits also have fructose but contain many beneficial nutrients and antioxidants. For someone who is obese, one has to be careful with eating fruits that have substantial fructose content. Some fruits, such as lemons and limes, have minimal fructose content and are safe.

Other fruits, such as grapefruit, kiwi, and berries, also have relatively low fructose content and high levels of nutrients. However, fruit juices, dried fruits, and some fruits that are rich in fructose (such as pears, red apples, and plums) should be eaten relatively sparingly. Dr. Johnson explains:

“Most animals will regulate their weight very carefully. They even regulate it in a seasonal way. Towards the fall and before winter, many animals will gain weight, particularly animals that hibernate. They will dramatically increase their fat. A lot of them do so by actually becoming leptin resistant and by blocking their ability to oxidize fat.

It's the same mechanism that we see in people who are getting fat except these animals are doing it purposely in preparation for hibernation. It's a survival advantage.

Normally, a natural fruit is also a source of fructose. But most natural fruits have relatively small amounts of fructose, like four to eight grams. If you eat a lot of fruit,

that could be an issue. But they also often have a lot of things that are very healthy, like antioxidants, flavonols, and so forth.

We've actually discovered that many of these compounds in natural fruit can counter some of the effects of the fructose. So when you have a fruit that has a small amount of fructose, oftentimes the good components in the fruit can keep it neutralized."

Interestingly, as a fruit ripens, the sugar content goes up while many of the antioxidants and other beneficial nutrients go down—and animals appear to instinctively know this. Bears, for example, will eat huge amounts of berries in the fall to fatten up. It's worth keeping this in mind, as the fructose in fruit *can* add up quickly if you eat a lot of it.

"There was just a paper published in the British Medical Journal, which looked at individual fruits as a risk factor for obesity and diabetes," Dr. Johnson says. "Certain fruits, which we know have relatively low-sugar content and very high vitamin and antioxidant contents, are actually quite healthy. Berries, in particular blueberries, are very, very healthy.

But juices, where you put all the fruit together and you get a lot of sugar in one glass, it's just too much. When you drink that, you can flood your liver with fructose, and then that will overwhelm the benefits of all the antioxidants. You'll still get an increased risk for fatty liver, obesity, and diabetes from fruit juice."

Obesity Increases Your Body's Absorption of Fructose

Another interesting tidbit is that if you're insulin resistant and obese, it doesn't take much fructose to activate the processes that will keep you fat. Some of Dr. Johnson's most recent research shows that the more high-fructose corn syrup you eat, the more you absorb and the more you metabolize it. Thus, eating fruits may be more of an issue if you are insulin resistant, whereas fruit intake is likely safer or even beneficial if you are lean and healthy.

This helps explain the paradox of how some very fit people can eat a lot of fruit without gaining any weight. I'm not insulin resistant, and when I decided to play around with adding some extra fruit to my diet on strength training days, I actually *lost* five pounds, which to me didn't make sense at first, since fructose should do the opposite. Part of that may be related to the fact that my body was optimized to burn fat as my primary fuel, as I was regularly practicing [intermittent fasting](#).

According to Dr. Johnson, if you exercise regularly, a small amount of fructose can actually be quite beneficial, because the fructose will accelerate glucose absorption in your gut and improve muscle performance. But it really depends on *how your body*

metabolizes the fructose. Your body normally cannot absorb fructose well. But the more fructose you eat, the more the transporters that allow for fructose uptake in your gut are turned on. Hence, the more fructose your body will absorb. Lean children tend to only absorb about half of the fructose they consume, whereas obese children who have fatty liver disease absorb close to 100 percent.

“Not only that – the kids with fatty liver, we’ve previously shown that they have high levels of enzymes in their liver that metabolize the fructose. Not only did they absorb more, but they metabolized it more effectively. This is a problem,” he says.

The Power of Intermittent Fasting

Intermittent fasting is a powerful tool to help you resolve your insulin and leptin resistance. It’s also one of the fastest ways to shed excess pounds, as it helps shift your body from burning sugar to burning fat as its primary fuel. To me, the most remarkable aspect of intermittent fasting is that once you make the transition, your hunger and cravings for sweets virtually disappears.

Granted, in order to get it right, you need to severely restrict your sugar or fructose intake. A healthy diet becomes all the more important when you start intermittently fasting. Ideally, you’ll want to swap your non-vegetable carbs for healthful fats. Most benefit from anywhere from 50 to 70 percent of their daily calories in the form of healthful fat, such as avocado, olives, butter, nuts (I prefer macadamia and pecans), and coconut oil for example.

When it comes to protein, Dr. Johnson agrees that most people could benefit from cutting down on animal protein, especially those high in purines, such as shrimp and lobster. According to Dr. Johnson, a high animal protein diet can accelerate kidney disease, and this appears to be a result of the purines. The following infographic offers a quick review of the basics of [intermittent fasting](#). For a more in-depth review, please see this previous [article](#).

Exercising while fasting can further boost results. A simple way of doing this is to exercise in the morning, and skipping breakfast. As explained by Dr. Johnson:

“If you exercise at night, you’re basically burning primarily your glycogen and carbohydrate stores. You don’t actually burn too much fat. But if you exercise in the morning, you burn more fat than carbohydrates.

The question is why? The reason is that as soon as you quit eating, you’re burning the carbohydrates in your liver. It takes about eight to 10 hours for the glycogen to be completely depleted. What happens is that every time you get a good night’s sleep,

during that time your body is burning off the carbohydrates. In the morning, you are basically in a low-carbohydrate state, and you're now burning fat. That's why exercising in the morning burns more fat, because you don't have the big carbohydrate stores."

If you need to eat a little in order to exercise, make sure to avoid all sugars and carbs. That means no bread products or juices, for example. Essentially, you want to carbohydrate-restrict completely in the morning, in order to allow your body to keep burning fat instead of sugar. As noted by Dr. Johnson, another "trick" to really making intermittent fasting work for you is to restrict most all your non-veggie carbs to a very short period of time each day (typically dinner). He recommends restricting your carb consumption to a window of just two hours per day.

Exercise Stimulates Your Body's Energy Production

Exercise is really important in this entire process. Not only does it help burn off fat; it also stimulates your mitochondria. Mitochondria are the "power stations" inside your cells that produce the energy that drives your body. As explained by Dr. Johnson, sugar and obesity are both associated with a decrease in the energy levels in your cells, because of the adverse effects sugar has on your mitochondria. Over time, obese people actually lose mitochondria. There are only three factors that stimulate mitochondria really well, according to Dr. Johnson, and those are:

1. Exercise
2. Vitamin C (it even helps block some of the adverse effects of sugar. Dr. Johnson recommends getting about 500 mg of vitamin C per day)
3. Dark, raw chocolate, high in flavonols

Uric Acid as a Marker for Fructose Toxicity

Dr. Johnson promotes using your [uric acid](#) level as a marker for fructose toxicity, which we've discussed at some length in a [previous interview](#). Interestingly, for whatever reason, I have a relatively high baseline uric acid level. It's above Dr. Johnson's ideal recommendation of 5 or less. Mine's typically closer to 6. When I implemented intermittent fasting and eliminated most carbs from my diet, replacing them with high quality fats, my uric acid shot up closer to 8. Still, I have no symptoms of gout or other uric acid-related issues. I often wondered if perhaps it was a complication of intermittent fasting, however according to Dr. Johnson, such an effect is fairly normal when you first start fasting and become ketotic.

"We don't really know why. It might be a compensation mechanism. But it does come down over time under a ketotic diet," he says.

That said, uric acid is a very strong predictor for developing obesity, diabetes, insulin resistance, and fatty liver. If you have a high-serum uric acid—7 or higher—your risk for developing diabetes, hypertension, obesity, and metabolic syndrome is significant.

Why Many Need General Carb Restriction in Addition to Restricting Fructose

Dr. Johnson recently published a paper in the peer-reviewed journal *Nature Communications*, showing that restricting fructose may not be enough if you're severely overweight or obese. General carb restriction may also be needed in such cases. The reason for this is that restricting carbs allows you to burn off glycogens. But Dr. Johnson's team has also made another significant discovery, which explains why general carb restriction is necessary for those struggling to shed excess pounds:

*"We've recently had another discovery: carbs like glucose or flour and bread may be able to cause metabolic syndrome in their own right, but it's **through fructose**. How does that work? What we did is we fed animals glucose. That's a different sugar. There's no fructose in it. It's what's present in flour and bread. When we fed mice a high-glucose diet, to our amazement, they actually over time started to develop fatty liver, insulin resistance, obesity, and all those bad things.*

When we studied them, we found that they were converting some of the glucose to fructose in their liver. Even though they weren't eating fructose, they were able to use the white flour and the glucose that they eat to convert it to fructose in their body.

We then used special mice that cannot metabolize fructose. They are lean, healthy machines. When we gave them glucose, they did not get fatty liver and they did not get insulin resistance. We could show that the mechanism by which carbs are causing fatty liver is actually still through fructose."

So, the bottom line is that this is another argument for avoiding bread, rice, and other non-vegetable carbs—especially if you are insulin resistant. If you're trying to lose weight, restricting carbohydrates will your body to burn fat better, and prevent fructose from being formed in your liver.

The Difference Between High Fructose Corn Syrup and Table Sugar

According to Dr. Johnson, most of the fructose you get comes from table sugar, which is sucrose, and from high-fructose corn syrup. Whole fruits actually play a minimal role in the amount of fructose most people eat Dr. Johnson explains:

“Sucrose is table sugar. It comes from sugar cane and sugar beets. It’s a molecule of glucose and fructose that are bound together in what we call as disaccharide. But basically, the glucose and fructose are bound together. One gram of sucrose is half a gram of fructose.

High-fructose corn syrup is a mixture of fructose and glucose that are mixed freely together. The ratio can vary. Usually, like in soft drinks, the amount of fructose is higher than the amount of glucose. It’s typically 55 percent fructose and 45 percent glucose. A recent study showed that the industry sometimes adds even more fructose in soft drinks; a lot of times it’s 60 percent or 65 percent. It’s really quite a significant amount of more fructose than you see with table sugar.”

There are important differences between these two types of sugars. Dr. Johnson’s team has done studies comparing the metabolic effects of fructose and sucrose, finding that high-fructose corn syrup causes greater increases in fructose blood levels, higher uric acid rise, and a higher rise in blood pressure. The unbound form of fructose also causes more fatty liver disease in animals than the bound form found in sucrose.

“The bottom line is it looks like high-fructose corn syrup is different from sucrose,” he says. “It looks like it is worse. But both of them are major sources of fructose. You don’t really want to switch from high-fructose corn syrup to table sugar; you want to reduce both. But in terms of effects, they are different. I believe high-fructose corn syrup is biologically worse than sugar.”

Understand the Ramifications of a High-Fructose/High-Carb Diet

People everywhere are finally waking up to the indisputable fact that all sugars are *not* created equal when it comes to the physical end results they create. Again, part of what makes fructose so unhealthy is that it is *metabolized by your liver to fat* in far more rapidly than any other sugar. But recent research also reveals that, if you are overweight or obese, your liver tends to convert some of the glucose you consume into fructose, *even if you’re not eating fructose primarily from sources such as HFCS or sugar.*

What this means is that if you are overweight, or insulin and leptin resistant, you likely need to restrict not only fructose from your diet in order to shed the excess weight, but other non-vegetable carbohydrates (such as potatoes, rice, and grains) as well. In addition to that, maintaining a regular eating schedule can be very helpful. Personally, I believe there is good reason to consider a scheduled eating or intermittent fasting program. There is an emerging consensus that narrowing the window of time that you consume food may have enormous health benefits and also help you reduce your percentage of body fat.

