

How Sugar Makes You Fat and Ruins Your Health

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Sugar is as dangerous as tobacco [and] should be classified as a hard drug, for it is harmful and addictive (1) *British Medical Journal*

We've all heard about the dangers of sugar

So we're not going to harp on about refined sugars, how evil the sugar industry is, and how unfair it is that we're all duped into eating sugar by shadowy executives and flashy marketing campaigns.

If you eat processed food - food that man has in some way altered between the day it was harvested from the field or taken from the water and the day you put it into your body, it's probably got refined sugar in it.

If it doesn't look anything like something you can see in a field or growing on a tree (like a soft drink, candy bars, most bread) it almost certainly contains added sugar or artificial sweetener.

You'll be told it's ok because it's from a 'natural' source, as though some sort of halo should then appear over ingredients with the suffix "-ose" (which means it's a sugar).

Uranium is 'natural', so is heroin, cocaine, more than one strain of lethal mushroom, and a particular type of puffer fish, not to mention a few poisonous but very 'natural' frogs.

Don't believe the hype surrounding the word 'natural'. The bigger and brighter the word 'natural' appears on packaging, the more it's trying to hide. Engage your intelligence.

Such marketing often makes it easier to buy food that is bad for us, but it doesn't change the truth.

Refined sugar is just one part of the blood glucose jigsaw

The fact is that most carbohydrates are turned into sugar (blood glucose) by your body. What matters is the rate at which your body is able to break down those carbohydrates into blood glucose.

Not all carbohydrates are created equal in this regard, which is why the Glycemic Index has become a popular tool in assessing how quickly carbohydrate enters your blood as sugar.

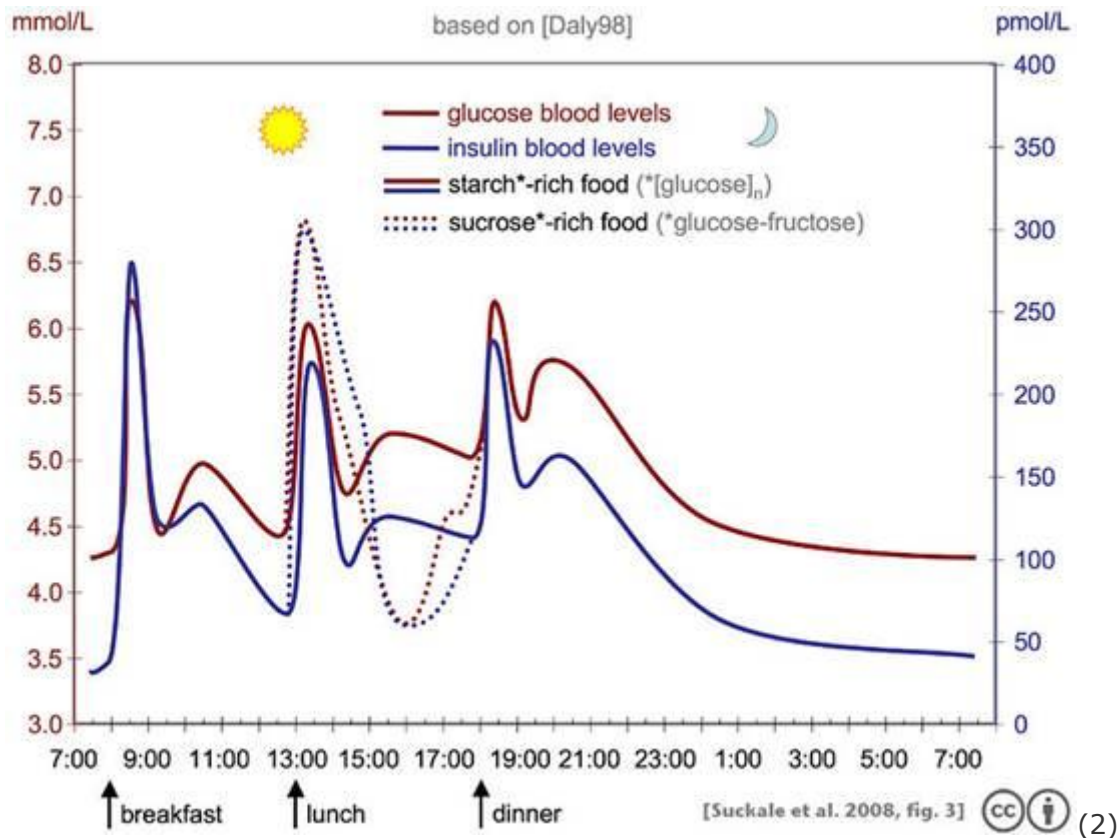
Sucrose (refined table sugar) sends your blood glucose level through the roof (see diagram below), as does that other industrially used form of refined sugar, high fructose corn syrup. On the other hand, raspberries also contain sugar, but your body takes a lot longer to release the sugars from the raspberry into your bloodstream.

But it's your body's response to high blood glucose levels we're interested in.

When your body gets too much glucose too quickly, it goes into crisis mode. The amount of glucose in your blood is far too high - and your brain tells your pancreas (your islets of Langerhans to be precise) to release insulin.

How insulin helps us store blood sugar as fat

Insulin release is serious: it's one of your most important hormones and its presence in large quantities means that your blood glucose level is dangerously out of balance. Long term insulin exposure leads to a plethora of health complications, as we'll discuss further below. The role of insulin is to lower blood glucose levels, but something has to happen to that excess sugar in your blood - it doesn't just disappear.



Insulin causes your body's cells to take up and store glucose as glycogen in your liver (causing it to swell) and muscles, but when those are full, glucose is metabolized into fatty acids and stored around your waist, buttocks and thighs.(3) When the line in the graph returns to normal after a large spike, you might think it's a good thing - after all, blood glucose levels are under control.

What that flat line actually means is that the excess blood sugar shown by the spikes on the graph is likely to have been stored as fat in your adipose tissue.

That's how sugar, refined carbohydrate and starchy carbohydrate intake makes you fat.

Here's a table showing how increased intake of carbohydrates (from all sources, not just sugar) has led to increased rates of obesity:

Year	Sex	Carbohydrate	Fat	Protein	Obesity
1971	Male	42.4%	36.9%	16.5%	12.1%
1971	Female	45.4%	36.1%	16.9%	16.6%
2000	Male	49.0%	32.8%	15.5%	27.7%
2000	Female	51.6%	32.8%	15.1%	34.0%

(4)

The message is clear: while fat intake has decreased, carbohydrate intake has increased while levels of obesity have skyrocketed.

Insulin is effective at its job too - as the graph above shows. Once it has rid your blood of glucose, your glucose level drops below the normal 4.0 - 6.0 mmol/L range. You then feel the need for another quick fix of blood glucose - have a look at the sucrose lines on the graph again and notice how low your blood sugar becomes after high sucrose intake. Your body tells your brain it's now low on sugar and your brain directs you to get glucose fast in the form of a sugary snack or drink, starting the whole blood sugar/insulin cycle off again.

Insulin also stops our bodies from burning fat as fuel,(5) a real problem if you're trying to lose fat. Once your body releases insulin it immediately starts to inhibit a fat-burning hormone called hormone-sensitive lipase. This hormone is responsible for releasing fat into your bloodstream to be utilized as fuel. Once this enzyme is inhibited, your body is unable to burn fat (known as lipolysis) and will then begin utilizing amino acids from your muscle, and carbohydrates, as fuel.

Amino acids are used by our bodies to produce and maintain muscle. If they've been used up, existing muscle is placed at risk, and new muscle becomes harder to create. This is important because muscle is an active tissue which burns calories efficiently, and muscle is essential for effective fat loss.

Excess insulin production is a great way to inhibit muscle maintenance and production, and the fat burning potential that goes with it.

The path to insulin resistant (type II) diabetes and other complications

When there's excess glucose in your blood, say after a sugary or high starch food has been digested, your insulin directs muscle cells (myocytes) and fat cells (adipocytes), which form about 2/3rds of your body, to allow glucose through the cell wall. This is how glucose is removed from your blood.

The trouble is that after long term exposure to insulin the insulin receptors in the cell walls stop listening to the message insulin is delivering, and they stop transporting glucose out of the blood and into your cells.

This means that you now have uncontrolled higher levels of blood glucose for longer: hyperglycemia.

Controlling type II diabetes can be achieved in more than one way; through diet, exercise, and through injecting more insulin.

Insulin response and diabetes are just two ways in which excess blood glucose, whether caused by refined sugar or carbohydrates, or by excess intake of starchy carbohydrates, ruins your health. Complications arising from type II diabetes are wide ranging and include hypertension, elevated cholesterol, kidney damage, retinal degradation (loss of eyesight) and cognitive dysfunction.

Alternatives to Sugar

So straight sugar, refined carbohydrates and starchy carbs (the last in excess) can cause a series of health issues. What's the alternative?

We firmly believe that the best thing to do is deal head on with the addiction to sugar. With relatively large amounts of dietary sugar now a part of everyday life, addiction is a reality for many of us.

Your palate can be trained away from specific tastes, just as any wine or food critic will tell you - it takes some time, but the same can be done with sugar.

For those of us who just can't live without that sweet taste, artificial sweeteners have become another dietary staple. Just because something isn't sugar, doesn't mean to say it has a halo automatically placed above it - many man produced chemical sweeteners are linked to significant health issues.

Aspartame (E951): Aspartame has always been controversial, from the politics behind its approval for human consumption, to the industry power and money behind it, to the conflicting studies regarding its safety. The fact remains that this is an industrially used man made artificial sweetener, and if you pick up a 'diet' version of anything (and you'd be surprised what other foods aspartame is used in), it's likely to contain aspartame.

We believe the evidence leans towards aspartame being harmful to human life, and we recommend that it is avoided - 75% of all adverse reactions from food substances reported to the FDA between 1981 and 1995 were related to aspartame.

Xylitol: Xylitol is a sugar alcohol derived from berries, corn husks, mushrooms, birch and plums, among other things. Of course it's a processed and refined product, and therefore should be treated with caution. The thing we like about xylitol is that the sugar alcohols have much less impact on blood sugar levels than other sugars, making it a better alternative. It also contains 40% less food energy and is absorbed more slowly than sugar. It has shown no known toxicity in humans to date. (6)

Stevia: Stevia is a herb native to tropical South and Central America. It's 300 times sweeter than sugar (so you don't need much of it) and has a negligible effect on blood sugar levels, with reports suggesting that it may even help to enhance glucose tolerance.(7) Although stevia is widely used in China, Japan, South America and many other countries, its availability has been restricted in the US and the European Union, where it's only available as a supplement, not an additive. We suspect that these restrictions are commercially motivated rather than safety motivated, and no doubt we'll see stevia and it's derivatives approved by the US and EU regulatory authorities now that Coca Cola and Cargill are developing commercial stevia products (trade names Rebiana and Truvia).

When buying Stevia it's important to find it as unprocessed as possible - as with many foods, processing has unintended effects on isolated derivatives and stevia may be no different:

In his book *Healing With Whole Foods*, Paul Pitchford cautions, "Obtain only the green or brown [whole] stevia extracts or powders; avoid the clear extracts and white powders, which, highly refined and lacking essential phyto-nutrients, cause imbalance."

How to eat carbohydrate: Glycemic Index, fat and protein

So carbs are broken down into blood sugar, and you'd be forgiven for thinking that a low carb diet is the best way forward. Certainly for some people cutting down on carbs to some extent might be a good idea. But carbohydrate intake is essential for energy production, so where does that leave us?

Of more importance are the types of carbohydrates we eat, and what we eat with them. As we mention above, not all carbohydrates are created equal - some are broken down into blood sugar quickly, others more slowly, and as we know, how quickly a food releases sugar into your bloodstream dictates the insulin response.

The Glycemic Index (GI) has been developed to give us an idea of how fast each food gives us its sugars. As you probably know, low GI foods are good, high GI foods cause that undesirable insulin response.

At 3D PTS we tend to keep things simple: the best way to eat carbs is to predominantly eat vegetables that grow *above ground* - excluding rice and other grains. As far as starchy carbohydrates like those that tend to grow below ground (plus rice grains) go, don't cut them out completely. Just restrict them.

Fruit tends to have high sugar content, and while better than chocolate if that's the choice you face, keeping your fruit intake to a reasonable level is a good idea - apples and most berries are good in terms of insulin response.

We'll also take a moment to emphasize that there is no one size fits all diet rule as far as eating carbohydrates go - each of us has different requirements and are able to tolerate different levels of carb intake. We call this biochemical individuality, and although there are some rudimentary tests such as Metabolic Typing, the best way to discover your own level of below ground carb tolerance is to see how you feel after eating it, experimenting and most of all paying attention to what your body is telling you.

Even high GI foods can be made better by eating them with a fat and a protein - eating an apple with a small amount of cheese for instance. Doing so slows the breakdown of the carbohydrate, releases sugar into your bloodstream more slowly and makes life easier in terms of that fat storing insulin response.

As a final note, please ignore adverts implying that fruit juice is good for you: it's not. Firstly, it's pasteurized which kills the good and bad stuff alike, and secondly it's packed full of easily broken down sugars which is great if you want diabetes - a recent study showed that women who drink a glass of fruit juice daily are 18% more likely to develop type II diabetes.(8)

Wishing you all the best in health and fitness,

Craig, Matt and the 3D PTS team

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