The myth of the complex carbohydrate

We have a difficult relationship with sugar...

On the one hand, our bodies use glucose as one of its principal fuels; in fact, the brain runs almost entirely on glucose, and cannot directly use protein or fat for its energy. Because it is a quick energy source, glucose is also good for quick bursts of energy, and our body thus releases a flood of glucose for immediate use in "fight-or-flight" emergencies. We've all experienced the problems of low blood sugar: sapping of energy, low motivation, and even wooziness as the brain is deprived of its energy source. On the other hand, high blood sugar is a major health problem, too -- and not just for diabetics.

Glucose is a chemically active substance, not an inert, neutral fuel. One of the things to which it likes to bind is protein. When blood sugar is high, it tends to react with the proteins in our cells, forming structurally-ruined protein /sugar complexes known as **Advanced Glycation End products (AGEs).** This sticky refuse is appropriately named: the slow buildup of AGEs over the years stiffens our arteries, clogs our cells with the waste product **lipofuscin**, reduces the functionality of our kidneys, slows nerve transmission, and clouds over the lenses of our eyes. AGEs are a major source the complications of diabetes, but they are also implicated in the aging process itself.

Mention the word "sugar," and most of us immediately think of soda pop and candy bars. But actually, all the carbohydrates in our diet are made up of sugars, from starches to monosaccharides. The differences in the carbohydrates present in our foods come down to two basic factors: the **length of the chain** of sugars strung together, and the **chemical structure** of the individual sugars making up the chain. All carbohydrates are made up of a fairly small number of very simple, isolated sugars called **monosaccharides.** From a dietary perspective, the most important of these is **glucose**. It is glucose that your body uses as fuel for the brain, and glucose is the most important sugar circulating in your blood. Other simple dietary sugars – such as the **fructose** in grapefruits, or the **galactose** which forms part of the sugar content in milk – are "isomers" of glucose: they have the same number and type of atoms in them, but these building blocks are arranged differently. But most of the carbohydrate in our diet does not come in the form of monosaccharides: instead, we get our sugars in longer or shorter chains, from the basic two-sugar-molecule **disaccharides** like the **lactose** in dairy products (which is made up of one glucose molecule bonded to one galactose molecule) to much longer sugar chains – the so-called **complex carbohydrates**, like the **starch** in wheat or potatoes (composed of long strings of glucose molecules). But when you break it all down, it all comes back to those three simple sugars. So when, decades ago, doctors were first asked what changes diabetic patients could make in their diets to help keep their blood sugar levels stable, the answer seemed simple: more of the longer-chain carbohydrates. Complex carbs (so the theory went) would take longer to break down in the gut, and would thus give a "time-release" glucose supply, lowering the glucose spike and helping to fill in the blood sugar valley. It was a great-sounding little story. It made intuitive sense. In fact, it made *so much* sense that the story was preached as received truth, and accepted as a proven fact, when it was never anything more than

an hypothesis – an hypothesis that had never been put to the test. The myth of the complex carb became so entrenched in mainstream medical thinking that it just didn't seem worthwhile to invest the money and time to see just how quickly those sugars were really being released into the blood.

All this changed in the early 1980s. Starting in 1981, scientists like Thomas Wolever of the University of Toronto and Dr. Jennie Brand-Miller at the University of Sydney began giving subjects foods with equal amounts of carbohydrate in them and measuring just how much glucose was released into the bloodstream. And whether they used healthy volunteers, diabetic patients, athletes, or people with heart disease, the results were essentially the same: **the simplicity or complexity of the**

The myth of the complex carbohydrate continued

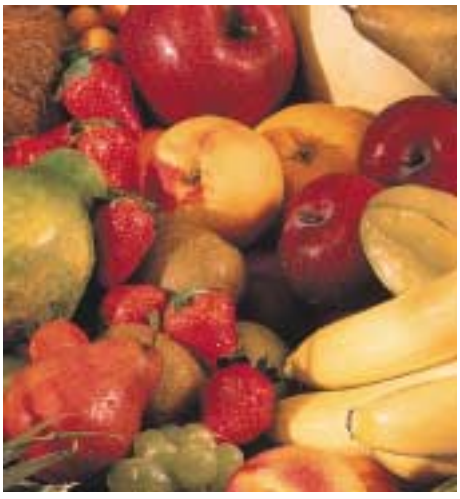
carbohydrate bore almost no relationship to the glycemic response[3]. The "complex carbohydrate" story turned out to be a complete myth.

Make no mistake: there *are* real differences between the rate at which different foods release their sugars into the blood – that is, between the **glycemic indexes** (**GIs**) of different foods. But cooking at a ranking of tested foods[2] is like staring into the looking glass: not only does the table not look like the ranking predicted by the "complex carb" story, **the glycemic index tables look like the expected tables turned on their head.** Wheat, rice, and potatoes , for instance, are among the *fastest* sugar-releasers yet tested; by contrast, many foods we think of as "sugary" because of their sweetness – such as black cherries and grapefruit – are extremely low-GI foods. Even candy bars and table sugar, while relatively high-GI, still beat an *equal amount of carb* in the form of whole wheat bread or rice cakes in terms of how quickly the sugars they contain spike – and crash – blood sugar levels. This doesn't make table sugar any more nutritious (it's empty calories, void of nutritional value) but it does mean that many foods that are both sweet *and* nutritious are better food choices than starches – which are neither.

As it turns out, our GI tracts are a lot better at breaking down carbohydrate than anyone had guessed. True, there were some carbohydrates – **dietary fibers** – which the gut can't break down at all(although some of these fibers are digestible by our friendly bacteria). But when scientists looked at the *digestible* carbohydrate content of foods, they found that the GI tract made fast work of them, indeed. Chain length made no difference: irrespective of its "complexity," carbohydrate is broken down into simple sugars in mere moments. What makes the difference is not the *length* of the carbohydrate chains involved, but the *components* of the chain. The starch in potatoes and rice is made up entirely of **glucose, which is released directly into the bloodstream**. By contrast, the simple sugars in a grapefruit are dominated by **fructose, which must be converted into glucose in the liver before it is released into the blood.** And the lactose in milk is composed of 50% quick-release glucose, but also 50% **galactose, which is converted and released as slowly as fructose.**

The higher the GI of the carbs a person eats, the greater his or her risk of developing diabetes.

Fiber content also makes a difference – but it depends on the fiber type. The **insoluble fibers** typically present in grains have little effect on GI, so that white bread and whole-wheat have almost identical ratings. But **soluble fibers** – the gums and pectins found in legumes and many fruits – make the digested meal more viscous, slowing the emptying of the stomach and thus the release of the sugars in the food. Another



nutrient which slows gastric emptying, and thus lowers GI, is **fat content**, so that adding a little high-quality fat to a meal can help curb glycemic response. Other factors – from the amount of processing of a carbohydrate (mashed vs. whole kidney beans, for instance, or parboiled vs. sticky rice), the "superstructure" of starches (**amylose** vs. **amylopectin**), and even the presence of GI-lowering **fruit acids** like citrate and malate, also affect glycemic index[6, 10].

The GI of a meal thus plays a major role in controlling our blood sugar, determining whether we get a sugary rush followed by will-sapping hypoglycemic doldrums on the one hand, or smooth sailing on the other. And this, in turn, affects a variety of parameters, from **insulin sensitivity** and **glucose tolerance**[4], to **how much food we will eat** at our next meal[5], to our capacity for **endurance sports**[1,9]. Further, because fast-releasing sugars drive up insulin levels, studies also show that there is a relationship between GI and risk of **diabetes**: **the higher the GI of the carbs a person eats, the greater his or her risk of developing diabetes**[8,9]. And because elevated insulin is a very powerful risk factor for **cardiovascular disease**, there is a strong argument to be made that high-GI carb eating may contribute to the development of this major killer too[6].

So don't fall for the hype. Consider cutting back on the bagels, pasta, bread, rice, and potatoes, and eating more of most fruits, vegetables, and legumes. See how you like oatmeal as a breakfast cereal instead of Special K. You don't have to ride the blood sugar roller coaster.

Did you know?

The glycemic index broke into public consciousness with Barry Sears' Zone nutrition program. At the time, carrots were thought to have a very high GI (92), but newer research suggests it may be much lower (49). Now "zoners" --like wabbits-- eat carrots!

Representative Foods' Glycemic Indexes:

100	Glucose	44	Oranges
98	Baked Potato	42	Whole Wheat Spaghetti
97	Parsnips	42	Whole Grain Rye Brea
87	Honey	38	Apples
80	Cornflakes	38	Tomatoes
72	Whole Wheat Bread	36	Ice Cream
72	Watermelon	36	Chickpeas
72	White Rice	36	Yogurt
69	White Bread	36	Lima Beans
68	Mars Bar	34	Pears
67	Shredded Wheat	32	Skim Milk
66	Brown Rice	32	Strawberries
64	Beets	29	Lentils
64	Raisins	29	Kidney Beans
62	Bananas	26	Peaches
59	Corn	26	Grapefruit
59	Pastry	25	Plums
59	Table Sugar	23	Cherries
51	Bran	20	Fructose
51	Green Peas	15	Soybeans
51	Potato Chips	13	Peanuts
51	Sweet Potato	08	Chana Dal
50	White Spaghetti		
49	Slow-Cook Oatmeal		
46	Grapes		

For more complete, accurate GI lists, see Reference 2 below, or http://www.mendosa.com/gilists.htm

References

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Over the years, some supplements have become so well-established, and so readily available, that we tend to think little of them, or (worse) think that they're all the same. Holistic International™ was the first to introduce some of these products (like Glucosamine Sulphate) to the Canadian market, and we continue to set the standard for purity and potency, where others cut corners on "commodity items." And we still occupy a unique niche with many of these classics, like our hypoallergenic tapioca-sourced Vitamin C and the precisely titratable dosing of the Ultra-Potent herbals. So remember next time you reach for that low priced name brand commodity item, how strong is your weakest link?