Understanding Sugars

Basics about carbohydrates and the Glycemic Index

A carbohydrate (carb) is a chemical compound; composed of carbon, oxygen and hydrogen, usually with the hydrogen and oxygen in a ratio of 2:1; the right proportions to enable the formation of water.

Common types of carbs are starches, sugars, cellulose, and gums.

One of the basic foodstuffs (proteins, vitamins & minerals and fat are the others); carbohydrates are more readily used for energy production than are fats and proteins.

Carbs can be classified as either a simple carbohydrate or a complex carbohydrate. Usually (but not always) their complexity determines the speed with which they can be broken down.

Simple carbohydrates are monosaccharides and disaccharides occurring naturally in fruits, vegetables, and dairy products; and unnaturally in refined carbohydrates such as table sugar and white flour products.

Complex carbohydrates are foods of plant origin consisting of 3 or more simple sugars bound together. Compared to most monosaccharides, complex carbs require a prolonged enzymatic process for digestion and thus provide a slow, even and ideal flow of energy. This avoids fluctuations in glucose (blood sugar) levels which can affect energy. Complex carbs usually also contain fiber and many vitamins & minerals. (Fiber is mainly the indigestible type of complex carb (polysaccharide) that makes up plants' cell walls; cellulose, hemicellulose, pectin, and a

variety of gums, mucilages, and algal polysaccharides. It is an important part of the diet that stimulates the gut and enhances digestion.)

The three main categories of carbohydrates are:

Monosaccharides (simple; one-sugar molecule) examples: glucose, fructose, sorbitol, galactose, mannitol, mannose.

Disaccharides (simple; two-sugar molecules) examples: Sucrose (glucose + fructose), maltose (glucose + glucose), lactose (glucose + galactose).

Polysaccharides (complex; three or more sugar molecules) examples: starch, dextrin, cellulose, and glycogen; (all made of chains of glucose (glucose polymers, maltodextrins)).

Monosaccharides and disaccharides are commonly called sugars, while polysaccharides are called complex carbohydrates or glucose polymers.

Absorption

Digested carbohydrate enters the circulatory system in the form of monosaccharides, primarily glucose. Before they can be absorbed into the bloodstream, polysaccharides and disaccharides must be broken down into monosaccharides by specific enzymes during the digestive process either in the gut or in the liver.

Fructose and galactose

There's been some confusion about fructose lately, with (false) claims that it could provoke metabolic syndrome in the same way sucrose (table sugar) does. However, there are a lot of misunderstandings about it:

Firstly, fructose in fruit and veg is not at all the same as 'fructose' in stuff like "high-fructose corn syrup", and many studies have taken them as being the same thing.

On its own in its natural state (eg, in the fruit) fructose behaves very differently than if it is mixed with anything or if it is cooked. On its own it tastes sweeter than sucrose (a variable here is temperature, the colder the sweeter), it also provides the same amount of calories as sucrose, but has only one-third the GI (fructose GI=19).

However, when fructose is eaten with other sugars, it is absorbed much more quickly and behaves as though it were higher GI (but still not anything like as high as that of sucrose).

Secondly, in glycemic index terms "the faster the absorption the greater the number", and fructose gets all the way through the small intestine wall and into the liver pretty much without changing in any way. Once there, fructose doesn't stimulate the pancreas to produce insulin (because uptake of fructose by the liver is not regulated by insulin), and fructose consequently results in lower circulating insulin.

Thirdly, fruit has a safety valve -too much of it gives humans diarrhea, and fruit isn't very dense. The average fruit (for example a peach) has a GI of 28 and a glycemic load of 4 (compare to a cup of white flour or the same weight in bread, which has a GI of around 140 and a GL of 22). To get high glycemic input from fructose you would need to eat SO MUCH fruit that you wouldn't be able to keep it in your systen long enough (or get out of the bathroom for long enough) to worry about it. (Don't try this at home follks! :)

Galactose is also eventually converted to glucose in the liver.

Glycemic Index (GI):

GI is determined by consuming a food with 50 grams of carbohydrates and seeing how fast the blood sugar responds in the body, compared to how fast 3 tablespoons of pure glucose would respond in the same test subject.

GI is effectively a measure of carbohydrate complexity, because it is based on carb-release speed in vivo. The body delays carb release in different foods by various means, so a food that is absorbed by the gut quickly doesn't necessarily have a fast release rate (for example fructose).

Glycemic Load (GL):

GI does not take into account the "serving size" of each food and the amount of carbohydrates "one serving" contains. To work out the Glycemic Load of any food, use this formula:

(n/100)x g

Where 'n' is the GI and 'g' is the weight in grams of the serving. If something has a high GL, you simply eat a smaller serving.