

The Chi Farm



Acupuncture and Nutritional Counseling Centre

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Nutrition Information Series

Oh honey. Sugar, sugar.

Humans require three macronutrients for survival: carbohydrates, fats and proteins. This Nutrition Information Tipsheet discusses certain types of carbohydrates, the sugars. A detailed discussion on how excess carbohydrate consumption in general may lead to health issues can be found in The Chi Farm's Nutrition Information Tipsheet entitled, *Insulin Resistance, Metabolic Syndrome, Type II Diabetes, Oh My!*

What is sugar?

Sugar, like all carbohydrates, primarily provides energy for the body's functions. The simplest sugars are monosaccharides (glucose, fructose and galactose). Two monosaccharides combine to form a disaccharide (sucrose and lactose). Polysaccharides (starch and cellulose) are many monosaccharides bonded together.

Glucose is produced naturally in plants via photosynthesis. It is also the only energy source human cells can utilize. Most carbohydrates are broken down into glucose as part of the digestive process.

Fructose is also made in plants, particularly fruits, and is also known as fruit sugar. Current research indicates that fructose is turned into fat directly and is generally not converted into glucose for energy use. Furthermore, fructose eaten with fat or just before fat is consumed tends to cause the fat to be stored rather than converted to glucose for energy production. Fructose also tends to increase appetite. Excess fructose consumption may lead to liver damage, hypertension and obesity.

The monosaccharide galactose is found in dairy products and beets primarily. Most often it is combined with one of the other monosaccharides to form a disaccharide.

Much of the sugar consumed in the American diet is in the form of disaccharides, the most common of which is sucrose, also known as cane sugar, beet sugar, table sugar and dextrose. Sucrose is a 50:50 mixture of glucose and fructose. Other common disaccharides are lactose, or milk sugar, (a mixture of glucose and galactose) and dextrose, which is two glucose molecules bonded together. Maltose is also a disaccharide comprised of 2 glucose molecules and is derived from the breakdown of starch or when glucose is caramelized.

Sugar-based sweeteners

A teaspoon of table sugar (sucrose) contains 2.1 grams each of glucose and fructose, or a total of 4.2 grams of carbohydrate and 16.8 Calories (one gram of carbohydrate is equal to 4 Calories). To avoid insulin resistance and related diseases, it is recommended that no more than 60 grams of non-vegetable based carbohydrates be consumed daily. It is easy to see how a few

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teaspoons of sugar, while making it easier for the medicine to go down, can quickly add up to a larger percentage of the daily-recommended total.

Almost everyone has heard of the health risks associated with High Fructose Corn Syrup (HFCS) such as increased chance of Type II Diabetes, immune system damage and speeding up the aging process. Many processed food products are trying to sound healthier by now using “cane sugar syrup” rather than HFCS. Cane sugar is simply sucrose with its 50:50 glucose to fructose composition. As it turns out, this is just a marketing ploy seeing that HFCS is actually 45:55 glucose-to-fructose, almost the identical fructose content. Excess consumption of either of these sweeteners may lead to the same health risks. A teaspoon of HFCS contains 4.8 grams of carbohydrate and 19 Calories.

Many individuals have switched to honey or agave nectar believing these are healthier choices. Unfortunately this is not the case. Honey is comprised of 49% glucose and 43% fructose. The remaining 8% is a combination of maltose and sucrose (recall that both of these are made from glucose). A teaspoon of honey is equal to 5.77 grams of carbohydrate, so while it has less fructose than other sweeteners, it also has more Calories (23). Agave is perhaps the worst of all sugar-based sweeteners coming at 90% fructose and 10% glucose in addition to it being highly processed. A teaspoon of agave syrup provides 5.27 grams of carbohydrate.

The Glycemic index and its shortcoming

The Glycemic Index (GI) is an indicator of how carbohydrate-laden foods affect blood sugar values, and thus insulin release. The GI ranges from 0 to 110 and is based on how quickly a particular food increases glucose in the blood. Pure glucose is given the value of 100 and is used as the standard. Simple sugars easily pass into the bloodstream causing a rapid rise in blood glucose and thus have a high GI number. An equivalent amount of carbohydrate in a more complex form (a whole grain, for instance) digests slower and thus will increase the blood glucose to a lower level over a longer amount of time (same net glucose release) and will be given a lower GI value. Diabetics and others with sugar-handling issues are encouraged to eat foods with lower GI numbers.

The shortcoming of the GI is that it only looks at glucose levels and no other sugars or carbohydrates. Thus, foods like agave nectar have a low GI value, even though it is almost pure fructose and a higher level of carbohydrate than glucose. Just because a food is given a low GI value does not mean it is necessarily healthy.

Natural sugar substitutes

While there are many artificial sweeteners on the market, nearly all of these have certain health risks associated with them. If one must use a sweetener, stevia and xylitol are recommended.

Stevia is derived from the plant *Stevia rebaudiana* and has a GI value of zero. Its active ingredient is steviol glycosides, which are glucose-containing compounds. The glucose triggers the tongues sweet receptors, but during digestion the glucose is not passed into the bloodstream; it is utilized by the intestinal bacteria and excreted. Stevia contains no fructose or other sugars.

Xylitol is considered a sugar alcohol and is found naturally in the fibers of many fruits and vegetables. The body does not metabolize sugar alcohols like regular alcohols and there is no chance of getting intoxicated by consuming them. Its GI value is around 10. A teaspoon contains only about 1 gram of carbohydrate. The unique property of xylitol is that it can actually reduce the occurrence of dental cavities and increases remineralization of tooth enamel. Excess consumption may cause intestinal distress. It is also extremely poisonous to dogs.

Note: this information is for educational purposes only and is not intended to diagnose, treat, or cure any diseases. Please consult a qualified healthcare professional for nutritional advice.