

Carbohydrates, The Metabolic Syndrome, Hb A1c, And The Glycemic Index Of Food

Sugars, And Carbohydrates

Sugars are carbohydrates. Sugars are carbohydrates with a strong sweet taste. Glucose is such a carbohydrate. Glucose is also the sugar found in our blood. Physicians use the word "hyperglycemia" when the level of sugar in the blood circulation is high. (Hyper = high and glycemic = glucose in blood.) The word "Hypoglycemia" defines the opposite situation where the level of glucose in the blood circulation is low (Hypo = low). There are other carbohydrates with a lesser sweet taste than sugar and some carbohydrates have no sweet taste at all. Their presence in food is *undetectable by taste*. Sugar (made of glucose and fructose) and starch (made of glucose) eventually end up as glucose in our blood after a short or longer process involving the digestion and the absorption in the intestine. They trigger a moderate or a sustained surge of the blood glucose level. A large amount triggers a strong surge of blood glucose level.

The Insulin Response

The pancreas gland monitors the blood glucose level. The pancreas gland produces the hormones insulin and glucagon and releases them accordingly the variations of the level of glucose in the blood circulation. Insulin lowers the level of circulating glucose and more of it is released each time the glucose level surges. Insulin lowers the blood glucose level by pushing glucose into the cells. Glucagon restores a crumbling glucose blood level by releasing stored glucose. If we eat much sugar and starch, the jump of the glucose blood level triggers a fierce reaction of insulin release by the pancreas. Hypoglycemia may follow with its symptoms of anger, irritability, impulsiveness, and severe craving for sweet and it all starts again.

Carbohydrates Excess In The American Diet

The American diet is too rich in sugar and starch. Starch is the carbohydrate found in grain, in potatoes. For more information on carbohydrates, please see Newsletter 8 in the Longevity Institute website at <<http://www.longevinst.org>>. With too much sugar and too much starch in the diet, the blood glucose level tends to stay high. The consequences of a constant high blood glucose level have only recently unfolded. It has become evident a constant glucose overload is damaging by itself and by the insulin overload it triggers and maintains.

Damage by Carbohydrate Overload

Carbohydrates have other functions in our biochemistry than only to supply energy. Carbohydrates are also parts of complex molecules, as the molecule embedded in the cell membrane that assume cell recognition and communication. When cells attach carbohydrates to proteins to make complex molecules, they attach the carbohydrate at a specific site of the molecule and on a specific molecule for a specific purpose only. In contrast, carbohydrates (mainly glucose and fructose) can also haphazardly attach to any of several sites along any available protein or other molecule. This happens more when the level of circulating carbohydrates remains high. The random attachment of carbohydrates to proteins and other molecules triggers a cascade of chemical reactions that culminate in the formation, and eventual accumulation, of irreversible cross links between adjacent molecules (Amadori products). *The linked molecules lose their mobility and function. The consequences affect all organs, brain included.* Red blood cells exposed to a high carbohydrate level have their hemoglobin altered by the binding of the carbohydrate. Bound hemoglobin is said glycosylated (or glycated) hemoglobin (Hb A1c). A Hb A1c level of 5 to 6 is considered acceptable, 3 or 4 is better. The Hb A1c level reflects the overall damage of a carbohydrate excess.

Damage By Insulin Overload

Another aspect of a sustained high glucose level in circulating blood is the insulin overload it triggers and maintains; A - A higher insulin release tends to push glucose in the cells beyond cells' capacity. To defend themselves cells down regulate the activity and the number of their insulin receptors. Cells become insulin resistant.

B - The pancreas—monitoring the glucose blood level, *not the level of glucose in the cells*—continue to release more insulin, which increases cell's insulin resistance. The resulting constant high glucose and high insulin level create disturbances in several cells and organ functions. The condition is named "Metabolic Syndrome"

C - With time diabetes may appear.

Metabolic Syndrome

Metabolic Syndrome contribute to cardiovascular disease, hypertension, obesity, stroke, cognitive disorders, depression, worsening of many other conditions (like arthritis), exaggerated immune response resulting in a multitude of other ailments. Metabolic syndrome is also the precursor of diabetes. Definition of the Metabolic Syndrome At least three of these: 1 - Abdominal obesity. 2 - A blood pressure greater or equal to 130/85 . 3 - A fasting glucose level greater than 110 milligrams per deciliter. 4 - A serum triglycerides level higher than 150 milligrams per deciliter. 5 - A serum HDL level lower than 40 milligrams per deciliter.

The Glycemic Index Of Food

The glycemic index—a system of ranking carbohydrates and the foods that contain carbohydrates according to how fast they affect blood sugar levels—started out years ago as a dietary tool for people with diabetes. Now the GI concept has spread as a way to evaluate carbohydrates for people who are not (yet) diabetic. High-GI carbohydrates (to be avoided) include processed breads, most cereals, potatoes, short-grain white rice, and some fruits. Low-GI carbohydrates (fine to eat) include whole grains, brown rice, pastas, legumes, sweet potatoes, oats, and some fruit. (See table 1, page 2 for more).

List of some foods with their Glycemic Index

A Glycemic Index (GI) is low if under 55 (green in the table), high if greater than 70 (red).

BEANS		COOCKIES		VEGETABLES	
Soy	18	Oatmeal	55	Sweet Potato	54
Soy	22	Shortbread	64	Beets	64
Kidney	27	Graham Crackers	74	Carrot	65
Red Lentils	27	Vanilla Wafers	77	Ruitabaga	72
Black	30	CRACKERS		Potato	92
Butter	31	Rye	63	Parsnips	97
Split Peas	32	Stoned Wheat	67	MILK	
Brown	38	Saltine	72	Whole	27
Navy	38	Rice Cakes	82	Soy	31
Pinto	42	PASTAS		Skimmed	32
DRINKS		Spaghetti enriched	28	Yogurt	33
Apple Juice	23	Vermicelli	35	Ice Dream	60
Tomato	39	Spaghetti	40	FRUITS	
Oreng Juice	44	Linguine	50	Grapefruit	25
Cranberrie	54	Cheese	64	Strawberries	32
Coca-Cala	63	Macaroni	80	Apple	32
Sport Drinks	70	Brown Rice	92	Pear	36
BREADS		CEREALS		Peach	42
Barley	48	Oatmeal	49	Orange	43
Rye, whole	50	Frosted Flakes	55	Kiwi	52
Multigrain	54	Oatmeal Minute	66	Apricot	55
Muffins	60	Shredded Wheat	69	Banana	56
Croissant	66	Cheerios	74	Papaya	58
Rice	73	Corn Bran	75	Raisin	64
Waffles	75	Rice Krispies	82	Cherries	72
White	85	Corn Flakkes	83	Dates dried	100
Baquette	95	Puffed Rice	90	data/HD/carb/GI 040531	

Table 1 - List of food with its (glucose scale) Glycemic Index * In Australia
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For more information, see the comprehensive list of Glycemic Index of food published by Rick Mendosa at:

<http://diabetes.about.com/library/mendosagi/ngilists.htm>

Both GI and Glycemic Load (GL) of foods are listed there.

The GI of foods based on the glucose index—where glucose is set to equal 100. The GL is the glycemic index divided by 100 multiplied by the available carbohydrate

content (i.e. carbohydrates minus fiber) of food in grams.

Do your own research: To find the GI of (almost) any food go to the web site of the University of Sydney: <http://ziag4.mmb.usyd.edu.au>, and enter a food name in the query box.