The McDougall Newsletter

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Sugar, Coated with Myths

According to the Sugar Association, "Pure and simple, sugar is as perfect as it gets."[1] Eating sugar causes immediate changes in the brain's chemistry—similar to those seen after the use of narcotics—producing heightened pleasure.[2] No wonder people find sweet-tasting foods so irresistible. Of contrary opinion, one leading author believes there are 146 reasons "sugar is ruining your health."[3] I like sugar, so the first message appeals to me, but I also like life and I do not want to risk my health. So how should I act?

Some Common Forms of Simple Sugars:

Sucrose (white, table sugar)	Corn syrup
Fructose	Honey
Glucose	Maple syrup
Lactose	Molasses
Maltose	Agave Nectar
High-fructose corn syrup	

All of these sugars contain 2.5 to 4 calories per gram and provide mostly "empty calories."

Sugar conveys the picture of a white crystalline substance in a bowl. This well-liked carbohydrate is used as a sweetener and as a preservative. The main natural source of relatively pure sugar is honey—a mixture of glucose and fructose—made by bees. Less concentrated, but also very sweet-tasting, simple sugars are naturally plentiful in fruits. The primary agriculture sources of sugar are sugar cane and sugar beets, which after refining, yield sucrose—a 50-50 mixture of glucose and fructose .

Carbohydrates, except for milk and honey, are found in significant amounts only in plant-derived foods. Even these two foods (milk and honey) obtain their simple sugars originally from plant sources (grasses, grains, and pollen). In a broader sense, the word sugar can be used to describe all forms of carbohydrates, from the natural complex sugars (starches) found in plant-foods to non-absorbable sugars synthesized in a laboratory, like lactulose, used as a medical treatment for chronic constipation.

Forms of Carbohydrate

Sugars can be divided into several categories:

* **Simple sugars** are usually thought of as unhealthy foods—for example, white sugar (sucrose) or high-fructose corn syrup. But simple sugars are also plentiful in sweet-tasting fruits—an important part of a healthy diet.

* **Complex carbohydrates** are long branching chains of simple sugars connected together—the proper name for this form of carbohydrate is *starch*. These sugars are abundant in common plant foods, like corn, potatoes, rice, whole wheat flours, and beans. Green and yellow vegetables also synthesize and store complex carbohydrates, but in lesser amounts.

* **Dietary Fiber** is another chain form of complex carbohydrate, but its structures are not digested by the human intestine. Although providing no calories, fiber is important for proper bowel and other metabolic functions.

* **Glycogen** is a form of complex sugar made of branching chains of glucose. It is synthesized in the body and then stored in the muscles and liver for future activities.

* **Non-absorbable sugars** (also called sugar alcohols) are sweet-tasting but are not readily absorbed from the intestine into the body. Although many are found in small amounts naturally, they are manufactured for commercial use. Examples are non-caloric sweeteners, like sorbitol and mannitol, used in candies and gums. Because they are poorly absorbed they have a laxative effect—lactulose is prescribed for this purpose.

We Are Hard-Wired to Enjoy Sugar

Humans are anatomically and physiologically designed to seek and consume sugar. The tip of our tongue tastes with pleasure only one calorie-containing substance, sugar (carbohydrate). In our natural environment this stimulus comes from plant foods—such as, potatoes, sweet potatoes, beans, rice, fruits, and vegetables. Food manufacturers take advantage of our nature, adding highly-refined, powerful-tasting sugars to our foods.

Taste Buds of the Human Tongue

Once past the tongue, the remainder of the intestinal tract, as well as all of the internal systems of the body, is geared to efficiently utilize sugars. Our nervous system uses sugars almost exclusively as a source of energy—and 20% of the calories consumed daily go to operate the brain.

Research indicates that consumption of carbohydrates provides a reward to the person by producing opioid- and dopamine-mediated responses—changes in the brain's chemistry which cause us to feel pleasure.[4] The sweet taste of sugar produces intense pleasure with effects similar to those derived from the use of narcotics (opium). Therefore, us "pleasure seekers" quickly learn from our tongues and our brains that consuming carbohydrate is the right thing to do—and consuming sugar is intoxicating.

Some tissues of our body, such as red blood cells and kidney cells (glomeruli cells) will only burn carbohydrates. Endurance athletes know well the winning advantage of a diet high in sugars (carbohydrates)—sports drinks used during their races are made of concentrated simple sugars. Considering the importance of sugars to our existence, why are they vilified? Before discussing some of the negative consequences of consuming too much refined sugar, I need to clear up some important misinformation.

The Human Body Does Not Turn Sugar to Fat

The process of synthesizing fat from sugar is known as *de novo lipogenesis*—the new production of fat. This activity is highly efficient in some animals, such as pigs and cows—which is one reason they have become popular people foods—these animals can convert low-energy, inexpensive carbohydrates—grass, say, in the case of cows and grains for pigs—into calorie-dense fats.[5] However, human beings are very inefficient at this process and as a result de novo lipogenesis does not occur under usual living conditions in people. Thus the common belief that sugar turns to fat is scientifically incorrect—and there is no disagreement about this fact among scientists or their scientific research.[5-8]

Under experimental laboratory conditions, however, where people are ***overfed large amounts of simple sugars***, the human body will resort to converting a small amount of sugar into a small amount of fat (triglycerides) in the liver. For example, in one recent study, trim and obese women were overfed with 50% more calories than they usually ate—note, 535 of these extra calories each day came from four and a half ounces (135 grams) of refined sugar. In this forced-fed situation, the women produced less than 4 grams (36 calories) of fat daily from the extra carbohydrate.[8] Extrapolation from these findings means a person would have to be overfed by this amount of food and table sugar every day for nearly 4 months in order to gain one extra pound of body fat from the conversion of sugar to fat—by de novo lipogenesis. Obviously, even overeating substantial quantities of sugar is a relatively unimportant source of body fat. (So where does all that fat come from?—the fat you eat is the fat you wear.)

Sugar Does Not Cause Obesity

A universally accepted mantra among dieters is, "Don't eat starches—starches turn to sugar—sugar makes you fat." If this were true then obesity would be rampant among rice-eating Japanese—obviously, the opposite is the case. Worldwide, populations with the highest consumption of carbohydrate are the trimmest and fittest.[9]

Studies of people also show that the higher their sugar intake the lower their calorie intake and the fewer people who are overweight.[10] This makes a lot of sense because when you add carbohydrate (even pure sugar) to the diet then fat must be removed—kind of a fat-sugar seesaw—one goes up, then the other must go down. Fat is very concentrated in calories (9 per gram vs. 4 for pure sugar), fat is almost effortlessly stored, and fat provides little appetite satisfaction. Thus, replacing fat in the diet with sugar will cause weight loss. Furthermore, the practice by "low-carbohydrate dieters" of decreasing sugar intake often results in a higher calorie intake, because of all the fat that is added.

Sugar Does Not Cause Diabetes

After eating high-carbohydrate foods you might suspect that all that dietary sugar would cause the sugar in the blood to rise and this might lead to diabetes. That's what many lay people believe. Even a few scientists have theorized that chronically elevated levels of sugar in the blood might wear out the insulin-producing cells of the pancreas and produce diabetes.[11] Actually, this common thinking is incorrect—studies comparing sugar intake with risk of

developing type-2 diabetes show people on high sugar diets are less likely to get diabetes.[12] There is, however, a strong relationship between red meat consumption and diabetes.[13]

The lowest rates of diabetes in the world are found among populations that consume the most carbohydrate—for this reason type-2 diabetes is almost unknown in rural Asia, Africa, Mexico and Peru.[14,15] However, when these people change to a diet rich in fats and low in carbohydrates they commonly become diabetic. Some of the highest rates of this disease (and associated obesity) are found in Hispanics, Native Americans, Polynesians, and Blacks who have recently adopted the American diet.[16]

Contrary to popular belief, refined sugars actually make the body's insulin work more efficiently.[17] When the refined sugar content of an experimental diet of people with mild diabetes was doubled from 45% sugar to 85% sugar, every measurement of their diabetic condition improved—fasting blood sugar, fasting insulin levels, and the oral glucose tolerance test all showed their diabetes was better.[18] The researchers concluded, "These data suggest that the high carbohydrate diet increased the sensitivity of peripheral tissues to insulin." The increase in insulin's sensitivity (efficiency) exceeds any blood sugar-raising effect from consuming more carbohydrate.[17] Because sugar does not cause type-2 diabetes, the American Diabetic Association has recommend "55% to 65% of a diabetic's diet come from carbohydrate," and sugary foods are allowed.[19]

The carbohydrates found in whole foods (starches, vegetables, and fruits) are much healthier to consume than refined sugars for a person wanting to prevent or cure type-2 diabetes for a variety of reasons—especially because of the adverse effects on weight gain and blood cholesterol and triglycerides of sugars compared to starches (more in next month's newsletter). A high carbohydrate, vegan diet, has recently been shown to help diabetics stop medications and improve their overall health.[20] (See my August 2006 newsletter)

Acceptable Sugar Use

The main reason sugar has a bad reputation is because of the company it keeps. People living in Western societies eat loads of rich foods that make them fat and sick. Along with their high intake of meat, dairy, and refined grains, they also eat a lot of simple sugars. In this caldron of malnutrition, sugar's exact contribution becomes indistinct. But, in most people's minds, sugar is the villain—the scapegoat, taking focus off the animal-foods and free fats (vegetable oils), which are much more of a burden to one's health than simple sugar is. This misplaced emphasis results in a lost opportunity to regain lost health and appearance.

Sugar tastes great and can hugely enhance the enjoyment of eating. One practical point is that the addition of sugar will boost the acceptance of a low-fat diet, like the McDougall diet—increasing long-term compliance. However, to reap the greatest pleasure with the least harm, simple sugar should be put on the surface of the food where the tongue makes direct contact. This means sugars should not be added to the food during preparation—mixed up in the ingredients where the sweet flavors are hidden from the tongue's taste buds. Using a small amount of sugar on the surface of the food is my recommendation for trim, healthy people.

However, there can be some real drawbacks and health hazards caused by consuming simple sugars, especially for those in poor health. I will discuss these in next month's newsletter. In the meantime, if you have concerns about your weight loss or have artery (heart) disease, then you should strictly limit your intake of all simple sugars, including fruits and their juices.

References:

1) Sugar Association: http://www.sugar.org/contactus/

2) Yamamoto T. Brain mechanisms of sweetness and palatability of sugars. *Nutr Rev.* 2003 May;61(5 Pt 2):S5-9.

3) 146 Reasons Why Sugar Is Ruining Your Health by Nancy Appleton, Ph.D: http://rheumatic.org/sugar.htm

4) Levine AS, Kotz CM, Gosnell BA. Sugars: hedonic aspects, neuroregulation, and energy balance. *Am J Clin Nutr.* 2003 Oct;78(4):834S-842S.

5) Hellerstein MK. De novo lipogenesis in humans: metabolic and regulatory aspects. *Eur J Clin Nutr.* 1999 Apr;53

Suppl 1:S53-65.

6) Acheson KJ, Schutz Y, Bessard T, Anantharaman K, Flatt JP, Jequier E. Glycogen storage capacity and de novo lipogenesis during massive carbohydrate overfeeding in man. *Am J Clin Nutr.* 1988 Aug;48(2):240-7.

7) Minehira K, Bettschart V, Vidal H, Vega N, Di Vetta V, Rey V, Schneiter P, Tappy L. Effect of carbohydrate overfeeding on whole body and adipose tissue metabolism in humans *Obes Res.* 2003 Sep;11(9):1096-103.

8) McDevitt RM, Bott SJ, Harding M, Coward WA, Bluck LJ, Prentice AM. De novo lipogenesis during controlled overfeeding with sucrose or glucose in lean and obese women. *Am J Clin Nutr.* 2001 Dec;74(6):737-46

9) The thinnest people eat the most carbohydrate:

http://webcenters.netscape.compuserve.com/homerealestate/package.jsp?name=fte/thinnestpeople/thinnestpeople

10) Bolton-Smith C, Woodward M. Dietary composition and fat to sugar ratios in relation to obesity. *Int J Obes Relat Metab Disord. 1994* Dec;18(12):820-8.

11) Koyama M, Wada R, Sakuraba H, Mizukami H, Yagihashi S. Accelerated loss of islet beta cells in sucrose-fed Goto-Kakizaki rats, a genetic model of non-insulin-dependent diabetes mellitus. *Am J Pathol.* 1998 Aug;153(2):537-45.

12) Janket SJ, Manson JE, Sesso H, Buring JE, Liu S. A prospective study of sugar intake and risk of type 2 diabetes in women. *Diabetes Care.* 2003 Apr;26(4):1008-15.

13) Song Y, Manson JE, Buring JE, Liu S. A prospective study of red meat consumption and type 2 diabetes in middle-aged and elderly women: the women's health study. *Diabetes Care.* 2004 Sep;27(9):2108-15.

14) Kitagawa T. Increased incidence of non-insulin dependent diabetes mellitus among Japanese schoolchildren correlates with an increased intake of animal protein and fat. *Clin Pediatr (Phila).* 1998 Feb;37(2):111-5.

15) Llanos G. Diabetes in the Americas. *Bull Pan Am Health Organ.* 1994 Dec;28(4):285-301.

16) Egede LE, Dagogo-Jack S. Epidemiology of type 2 diabetes: focus on ethnic minorities. *Med Clin North Am.* 2005 Sep;89(5):949-75, viii.

17) Smith U. Carbohydrates, fat, and insulin action. *Am J Clin Nutr.* 1994 Mar;59(3 Suppl):686S-689S.

18) Brunzell JD, Lerner RL, Hazzard WR, Porte D Jr, Bierman EL. Improved glucose tolerance with high carbohydrate feeding in mild diabetes. *N Engl J Med.* 1971 Mar 11;284(10):521-4.

19) ADA recommends high carbohydrate intake: http://www.diabetes.org/diabetes-research/summaries/anderson-carbs.jsp

20) Barnard ND, Cohen J, Jenkins DJ, Turner-McGrievy G, Gloede L, Jaster B, Seidl K, Green AA, Talpers S. A low-fat vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with type 2 diabetes. *Diabetes Care*. 2006 Aug;29(8):1777-83.