



FRUCTOSE – A MAJOR CAUSE OF OBESITY, DIABETES, AND THE METABOLIC SYNDROME EPIDEMIC

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Have you seen the commercials on TV lately touting the benefits of fructose? What is fructose? Fructose is a monosaccharide found in nature primarily in fruits. It's eaten as sucrose (common table sugar), which is composed of equal parts of glucose and fructose. We also take in fructose as a component of high-fructose corn syrup (HFCS) made from cornstarch. Another source of fructose is natural fruit. Processed foods and beverages often have HFCS and sucrose added as sweeteners. At minimal cost compared with cane sugar, soft drink makers learned in the 1950's that HFCS could sweeten their drinks. We've been gaining weight ever since.

What's the problem with the intake of beverages like fruit drink? Tulane researchers (*Diabetes Care*, July 2008) showed that eating fruit helps prevent diabetes, but drinking fruit drinks increases risk. (Consumption of orange or grapefruit juice was not associated with any increased risk of diabetes.) In the Nurse's Study of 71,346 women, the outcome showed that eating three servings of whole fruit daily decreased diabetes risk by 18%, but one serving of fruit drink daily increased risk by the same 18%. Some say sugar in the liquid form is not recognized by the brain as extra calories and therefore does not suppress appetite. Others explain that by eating the solid fruit, one slows down the absorption and literally "fills one up", as it's being digested; therefore preventing blood sugar levels from rising too high. The sugar in drinks like fruit drinks passes directly through the intestinal walls causing an immediate spike in blood sugar. It doesn't matter whether this is a "soft drink" or "healthful" fruit drink. Those of us offering fruit drinks instead of soft drinks to our children have been misled.

When a child drinks fruit drinks (or soft drinks) with all this fructose, they get no other nutrients that are found in the solid fruit. (Fruit drinks, of course, have almost no fruit in them.) Also the more soft drinks they consume, the less milk is imbibed. This lessens their protein, calcium and vitamin D levels and their bone density is not optimized. (I would be remiss if I did not mention

fructose damages teeth also.) Finally the calories in these fruit drinks or soft drinks appear to be "add-on's" to the calories of the other foods we eat rather than suppressing intake of these foods by the amount of the calories in the soft drinks and the fruit drinks. In other words, fructose acts as an unhindered appetite stimulant.

Some have stated that the current obesity epidemic could be explained by the consumption of an extra 20 ounce soft drink each day. (George Bray, MD, *Medscape J Med*, 2008; 10(7); 159.) We get both calories and fructose by drinking these.

Dr. Miriam Vos of Emory University has estimated the mean fructose consumption of all Americans as 54.7 g/day or 10.2% of total energy. Adolescents 12–18 years had the highest intake at 72.8 g/day or 12.1% of total energy. The largest sources of fructose were sugar-sweetened beverages (30%), grains (22%), and fruit or fruit drinks (19%). If all sources of fructose were removed other than whole fruit and vegetables, children and adults would ELIMINATE 82% and 75% of fructose respectively from their diets.

Sugar was attributed as "pure, white and deadly" by Dr. Yudkin (London: Penguin Books; 1986). It's the fructose part of the table sugar and HFCS that best suits his treatise. Yudkin stated, "I suppose it is natural for the vast and powerful sugar interests to seek to protect themselves since in the wealthier countries sugar makes a greater contribution to our diets, measured in calories, than does meat or bread or any other single commodity." One needs to evaluate these financial interests in terms of our public health and eventual medical costs.

In a Swiss study, dietary intake of fructose was predictive of an increased low-density lipoprotein cholesterol (LDL) in children. (Aeberli, I, et al. *Am. J. Clin. Nutr.* 2007; 86:1174-1178.) We also know that fructose (unlike other sugars) increases uric acid levels and risk of gout in men (Choi H, et al. *BMJ* 2008;336:309-312.) Nakagawa, et al.

(AMJ Physiol Renal Physiol 2006;290:F625-F631) proposed that high uric acids levels set up atherosclerosis by reducing nitric oxide, which is important for maintaining normal blood pressure and endothelial function.

The Framingham study (Circulation 2007;116:480-488) has linked soft drink consumption and cardiometabolic risks and the metabolic syndrome. Those imbibing at least one daily soft drink had an odds ratio of 1.48 (95% CI, 1.30-1.69) of developing metabolic syndrome. {Parenthetically, as we go to press, there is also some preliminary data that bisphenol A (BPA) is now implicated at current human exposure levels causing insulin resistance and the metabolic syndrome (Environmental Health Perspectives. DOI:10.1289/ehp.11537.)} So there may be multiple potential causations for our added insulin resistance and metabolic syndrome risks.

A newcomer in sweetness, that the FDA will be weighing in on by the end of 2008, is Stevia. This sugar substitute is

derived from a Latin American herb and has been readily available for years as a dietary supplement, but not as a food additive. Its claim is for zero calories, zero carbohydrates, and zero spike in blood sugar levels (a packet of table sugar in comparison, is about 11 calories, 3 grams of carbohydrates and an estimated glycemic load of 2. A packet of sucralose (Splenda) has 3 calories, 1 gram of carbohydrates, and a glycemic load of 1. In the 1960's some animal studies suggested that Stevia might cause oncogenic mutations or reproductive problems. The companies producing Sweet Leaf, Truvia and PureVia (brand names of the sugar substitutes derived from Stevia) are hoping the FDA will give their OK soon.

Where does this present fructose problem leave our public schools and their financial contracts with beverage companies? It's just adding more calories "fueling the fire" to a society that is also exercising less. We have not been wise in our lack of teaching our younger generation (or ourselves) of the dangers of fructose or other high calorie sources.

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