

High Fructose Corn Syrup: Myths vs. Science

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In my conversations over the past year with school nutrition dietitians and other staff, one of the issues I often hear is that parents and school personnel have concerns about high fructose corn syrup, particularly in flavored milk served with school meals.

The bottom line is all caloric sweeteners should be used in moderation as part of a balanced, nutrient-rich diet based on current dietary guidelines, including school nutrition programs. Rather than eliminating sugars, I promote choosing your sugars by the “company” they keep. Foods and beverages like chocolate milk, flavored yogurt, oatmeal cookies and breakfast cereals all provide an abundance of nutrients that children need for a healthy diet along with the small amounts of sucrose or high fructose corn syrup they contain.

Because misconceptions and misinformation about high fructose corn syrup abound, I want to provide information you can use to dispel some of the most common myths.

MYTH: High fructose corn syrup is driving the obesity epidemic, especially in children

According to USDA data, Americans are consuming an average of 600 more calories/day than in 1970. ⁽¹⁾ Of this, caloric sweetener intake (from sucrose, HFCS, honey and other sweeteners) has increased by only 50 calories a day while grains and flour products have risen by about 200 calories/day and added fats by approximately 300 calories/day. So it's impossible to blame one food

or ingredient as the cause of rising weights; rather, the problem is an overall increase in food intake from all sources as well as a decline in physical activity.

MYTH: High fructose corn syrup is high in fructose

Actually HFCS is only higher in fructose than traditional corn syrup which is 100% glucose, and this is why it was given its name when it was developed in the 1970's. HFCS has either 55% fructose or 42% fructose depending on the product, which is similar to sucrose, or table sugar, which has 50% fructose. The body is unable to distinguish the difference between fructose that comes from sucrose vs. that from HFCS.

MYTH: Fructose in high fructose corn syrup is metabolized differently from fructose in sucrose

In studies^(2,3) comparing two groups of women drinking beverages at meals sweetened with either HFCS or sucrose as part of a balanced diet, there were no differences in blood glucose, insulin, leptin, ghrelin, hunger or desire to eat ratings. According to the Academy of Nutrition and Dietetics Evidence Analysis Library review of thirteen studies that examined the effects of high fructose corn syrup (HFCS) compared with other nutritive sweeteners: “These studies consistently found little evidence that HFCS differs uniquely from sucrose and other nutritive sweeteners in metabolic effects (circulating glucose, insulin, postprandial triglycerides, leptin and ghrelin), subjective effects (hunger, satiety and energy intake

at subsequent meals) and adverse effects such as risk of weight gain. Randomized trials dealing specifically with HFCS were of limited number, short duration and of small sample size; therefore, long-term data is needed.”⁽⁴⁾

MYTH: High fructose corn syrup doesn't promote satiety

In the previously mentioned study⁽²⁾, no differences were found between hunger, desire to eat or appetite hormone levels in women consuming either HFCS or sucrose-sweetened beverages as part of a balanced diet. In addition, several other studies^(5,6,7,8) have confirmed this, concluding that there is no evidence that either sucrose or HFCS have significantly different effects on hunger, satiety or short-term calorie intakes.

MYTH: There is no reason HFCS needs to be in so many food products

On the contrary, HFCS in small amounts has several functional properties that enhance food products beyond sweetening. These include maintaining freshness in condiments, promoting browning of baked goods, enhancing fruit and spice flavors in marinades, aiding in fermentation of breads and yogurts, retaining moisture in breakfast bars and cereals, making high fiber baked goods and cereals more palatable, maintaining consistent flavors in beverages and keeping ingredients evenly mixed in salad dressings. Sugar is used in foods for these same purposes as well.

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MYTH: There are studies that show HFCS differs from sucrose in its metabolic effects

While headlines in the popular media may proclaim this, studies directly comparing HFCS and sucrose consistently have found no differences. The misperception exists because results of studies using pure fructose are being mistakenly applied to HFCS. In the human diet, we do not eat pure fructose. Fructose is always found in combination with glucose in fruits, vegetables and sweeteners like sucrose, honey and HFCS. In addition, extremely high levels of HFCS, far in excess of those consumed in the

typical diet, are extrapolated to high fructose corn syrup consumed in normal amounts as part of a mixed diet.

In a 2010 Princeton study, rats were fed HFCS in amounts equivalent to a human consuming 3000 calories of HFCS/day without comparing them with sucrose controls.⁽⁹⁾ According to Karen Teff, PhD, Associate Director, Institute for Diabetes, Obesity & Metabolism at the University of Pennsylvania School of Medicine, "This study is poorly designed and poorly controlled and does not prove or even suggest that HFCS is more likely to lead to obesity than sucrose."

Another study compared glucose-sweetened beverages to fructose-sweetened ones yet results were applied to HFCS vs. sucrose-sweetened beverages.⁽¹⁰⁾

In conclusion, high fructose corn syrup is basically the same as sucrose in its composition and metabolic effects. The key is to consume all sugars in moderation as part of a nutrient-rich diet based on current dietary guidelines with appropriate portions sizes and calorie intake balanced with adequate physical activity.

1. <http://berkeley.news21.com/theration/2011/07/27/infographic-where-do-americans-get-their-calories/> ("Mouse" across the graphic from left to right to see the changes in calorie intake from 1970 to 2008)

2. "Effects of high-fructose corn syrup and sucrose consumption on circulating glucose, insulin, leptin, and ghrelin and on appetite in normal-weight women" *Nutrition*, 2007; 23:103-112 www.ncbi.nlm.nih.gov/pubmed/17234503

3. "The Effect of High-Fructose Corn Syrup Consumption on Triglycerides and Uric Acid" *The Journal of Nutrition*, 2009, 139:1242S–1245S <http://jn.nutrition.org/content/139/6/1242S.full.pdf+html>

4. Academy of Nutrition and Dietetics Evidence Analysis Library, Nutritive and Non-Nutritive Sweeteners Project www.adaevidencelibrary.com/conclusion.cfm?conclusion_statement_id=251370

5. "Effects of glucose-to-fructose ratios in solutions on subjective satiety, food intake, and satiety hormones in young men" *American Journal of Clinical Nutrition*. 2007; 86:1354-63 <http://www.ajcn.org/content/86/5/1354.full.pdf>

6. "No differences in satiety or energy intake after high-fructose corn syrup, sucrose, or milk preloads" *American Journal of Clinical Nutrition* 2007; 86:1586-94 www.ajcn.org/content/86/6/1586.full.pdf+html

7. "Sugars and satiety: does the type of sweetener make a difference?" *American Journal of Clinical Nutrition*, 2007; 86:116-123 www.ajcn.org/content/86/1/116.full.pdf

8. "Does High Fructose Corn Syrup Affect Appetite?" *Journal of the Academy of Nutrition and Dietetics* 2006; 106:A33 [http://www.journals.elsevierhealth.com/periodicals/yjada/article/S0002-8223\(06\)01054-6/fulltext](http://www.journals.elsevierhealth.com/periodicals/yjada/article/S0002-8223(06)01054-6/fulltext)

9. "High-fructose corn syrup causes characteristics of obesity in rats: Increased body weight, body fat and triglyceride levels" *Pharmacol Biochem Behav*, 2010 97:101-6 <http://www.sciencedirect.com/science/article/pii/S0091305710000614>

10. "Endocrine and metabolic effects of consuming fructose- and glucose-sweetened beverages with meals in obese men and women: influence of insulin resistance on plasma triglyceride responses" *The Journal of Clinical Endocrinology & Metabolism*, 2009; vol. 94: 1562-1569

<http://jcem.endojournals.org/content/94/5/1562.abstract?sid=bba5ef58-03a4-4abd-ad10-0320be75c1da>