

High Fructose Corn Syrup

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The blogosphere is awash in posts that suggest high fructose corn syrup (HFCS) is dangerous to your health. What is HFCS, and why is it causing such hysteria?

Let's begin with basic sugar facts. Sucrose (table sugar) is a disaccharide-- it's a glucose molecule and a fructose molecule, linked together. When we eat sucrose, we digest it into the two monosaccharides, glucose and fructose, and we absorb these to burn for energy or to store for later use. Glucose is an important fuel for the body. It is the primary energy source for the brain. It is about 70% as sweet as sucrose. Fructose ("fruit sugar") is also an important source of energy in a balanced diet. Fructose is about 30% sweeter than sucrose. The human body can convert fructose to glucose, and vice versa. All three of these sugars provide about 4 calories per gram.

What is HFCS? Most of the carbohydrates in corn are in the form of starch, a polymer of glucose. Treatment of the corn starch with an enzyme breaks the starch down to glucose, in the form of corn syrup. Treatment of corn syrup with a second enzyme converts much of the glucose to fructose, which is sweeter.^[1] The corn syrup used for most sweetening applications is 55% fructose, 45% glucose. This isn't very different from the result when sucrose is digested. In fact, in carbonated soft drinks made with sucrose, the acid present breaks down much of the sucrose to produce a 50-50 mixture of glucose plus fructose.

Why is HFCS used instead of sucrose in the USA? A combination of tariffs and quotas keeps the price of sucrose artificially high, and farm subsidies for corn help to lower the price of corn syrup, making HFCS the less expensive ingredient in this country.

So why all the angst about HFCS in the US diet? Over the past thirty years or so, HFCS has become widely used to sweeten foods, and, over the same period of time, we have seen a significant increase in obesity. Is HFCS the cause of the obesity? A critical reading of the evidence indicates that the real cause is overconsumption of calories, and it does not matter whether those calories come from sucrose or HFCS or fats and oils.^[2] In fact, the increase in obesity is happening in industrialized nations of Europe and South America, where corn syrup is rarely used.

References:

1. Hanover, L.M.; White, J.S. Manufacturing, composition, and applications of fructose. *Amer. J. Clin. Nutr.* 58:724S-732S (1993).
2. Forshee, R.A.; Storey, M.L.; Allison, D.B.; Glinsmann, W.H.; Hein, G.L.; Lineback, D.R.; Miller, S.A.; Nicklas, T.A.; Weaver, G.A.; White, J.S. A critical examination of the evidence relating HFCS and weight gain. *Critical Rev. Food Sci. Nutr.* 47:561-582 (2007).