

Fructose Metabolism

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Key Points:

- Fructose is difficult to absorb and may lead to gas, bloating and diarrhea
- Fructose raises blood sugar very slowly
- Fructose uses precious energy when metabolized, taxes the body of vitamins and minerals, and raises triglycerides, a form of fat in the blood

Fructose

Glucose and fructose share the same molecular formula ($C_6H_{12}O_6$), but are arranged differently, resulting in stark differences in their metabolism. Seemingly not a big deal, the arrangement of atoms in similar molecules makes a huge difference in how they are used. Fructose must be metabolized by the liver prior to providing energy for working cells,^{1,2} using energy stores during its metabolism. Alternatively, glucose is the only immediate source of energy for working cells and is metabolized in every cell of the body.

Unlike glucose, which is readily absorbed, fructose is slower to leave the GI tract, thereby slowing the availability of energy.³ Additionally, 50% of the population is unable to fully absorb fructose, while some people can only absorb less than 15 grams of fructose at a given time.^{4,5}

Bloating, gas and diarrhea are common occurrences due to malabsorption. Fructose can also slow digestion in general, leaving an athlete thirsty and running low on fuels. A common misconception regarding the preference of fructose during exercise is that fructose will not stimulate insulin release and will consequently, inhibit the use of fats for fuel in exercise. This is unfounded, as secretion of insulin doesn't occur during exercise.⁶

Furthermore, fructose taxes the body of vitamins, minerals and enzymes during assimilation, as it contains none of the nutrients that are necessary for metabolism.⁷ Fructose is converted into fats more readily than other simple carbohydrates and raises triglycerides, a type of fat in the blood that causes negative health consequences.⁸

In people who tend to have more acidity in their body (diabetics, high stress and high protein turnover [athletes], fructose can lead to increases in blood lactic acid levels. And, in order for fructose to completely metabolize, it actually robs the liver of stored ATP energy.⁸

Fructose metabolizes much slower than other carbohydrates, raises blood sugar much more slowly, and has a low glycemic index. These effects make fructose the promoted sweetener for diabetics, but it isn't a healthy choice for anyone.

Fructose is used by the food industry in its more common form of high fructose corn syrup (HFCS). HFCS is an inexpensive sweetening agent, has a long shelf life and easily mixes with other foods, making it a near ubiquitous agent in processed foods. It is found in many foods, from sauces, bread, bacon and beer, to many so-called "health foods" like sports drinks and energy bars. HFCS has gained much negative attention in recent years.

Excess dietary fructose comes from three synthetic food additives: HFCS, sucrose and processed fructose. While consumption of small amounts of naturally occurring fructose found in fruits is completely acceptable, the side effects of fructose, especially in its processed forms, are reason enough for anyone to avoid it as much as possible.

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⁸Hallfrisch, J. (1993). The Effects of Fructose on Blood Lipid Levels, *American Journal of Clinical Nutrition*, 37 (5), 740-748.