

FRUCTOSE & TRANS FATS

What is fructose?

- Fructose is a type of sugar that occurs naturally in fruits, vegetables and honey. It is the sweetest of all naturally occurring carbohydrates; it is 1.73 times as sweet as sucrose (table sugar).
- It can exist as either a monosaccharide (free fructose) or a disaccharide (glucose attached to fructose).
- Sources: Fruits, vegetables, honey, crystalline fructose, high fructose corn syrup (HFCS)

What does fructose do in the body?

- Sucrose gets digested in the upper small intestine where it is separated into its two parts: fructose and glucose. Fructose then passes into the blood stream and is taken to the liver.
- In the liver, fructose goes through a number of steps, after which, it may ultimately go in two directions.
 - The first path is to make glycogen. Glycogen is a product stored in the liver and released to make glucose if the body needs it.
 - Once the liver is stocked with glycogen, the fructose can follow the second pathway to make fatty acids and triglycerides.

Why is this important?

- Eating too much fructose can lead to an overproduction of triglycerides in the body.
- Triglycerides are incorporated into molecules called very low-density lipoproteins (VLDLs), which are released from the liver and stored in fat and muscle cells.
- *In other words, when you eat too much fructose, your body will convert and store the excess as body fat.*
- Also, fructose consumption fails to trigger the release of two hormones (insulin and leptin) in your blood that tell your body it's full. Without these signals, you may end up eating more and gain weight.
- Excessive fructose may elevate uric acid level, which may lead to gout and/or metabolic syndrome including hypertension, obesity, and glucose intolerance. Also, it may contribute to fatty liver.

What should you avoid eating?

- Whole fruits and vegetables are a good source of carbohydrate and dietary fiber. Although they contribute to your daily consumption of fructose, they are not the fructose sources to avoid.
- Avoid food products containing high fructose corn syrup (HFCS). It is made from corn and is made up of nearly equal parts fructose and glucose. Although HFCS is the same sweetness as table sugar, it is typically used in higher concentrations in processed foods, therefore increasing your fructose consumption.
- Avoid soft drinks, other sugar-sweetened beverages, processed foods, and snack foods.
- Avoid agave syrup, which is a sweetener made from a Mexican cactus and can be 3 times as sweet as table sugar. When broken down, agave syrup can have ~90% fructose with 10% glucose.
- Try to limit the total consumption of fructose to less than 25 grams daily. Limit fructose from fruit less than 15 grams per day since there may be other hidden sources of fructose in our diet.

Fruit	Serving size	Fructose content (gm)
Cranberries	1 cup	0.7
Prune	1 medium	1.2
Strawberries	1 cup	3.8
Grapefruit	½ medium	4.3
Peach	1 medium	5.9
Orange, navel	1 medium	6.1
Banana	1 medium	7.1
Blueberries	1 cup	7.4
Apple (composite)	1 medium	9.5
Grapes, seedless (red or green)	1 cup	12.4
Mango	½ medium	16.2
Apricots, dried	1 cup	16.4

What are trans fats?

- A trans fat (a.k.a. trans fatty acid) is a certain type of fat formed by a process called hydrogenation. During this process, hydrogen is added to vegetable oil, which increases the shelf life of foods.
- Trans fats are also listed on food labels as “partially hydrogenated oils.”

Where are trans fats found?

- vegetable shortenings
- solid margarines
- pastries
- cookies
- snack foods
- fried foods

What does a trans fat do in the body?

- Trans fats raise your LDL (or “bad”) cholesterol.
- Trans fats also lower your HDL (or “good”) cholesterol.

Why is this important?

- A higher LDL increases your risk for heart disease.
- A lower HDL also increases your risk for heart disease.

What fats should you eat?

- The American Heart Association recommends limiting your intake of trans fats to less than 2 grams per day. Since there is a certain amount of naturally occurring trans fats (in some meat and dairy products), there isn't any room left for manufactured trans fats.
- Read the nutrition label on the foods you buy. Make sure the label reads: trans fats 0g. In addition, make sure the ingredients listed DO NOT include partially hydrogenated oils.

References:

1. AMA finds high fructose syrup unlikely to be more harmful to health than other caloric sweeteners. *Medical News Today*. Jun 2008. Available at: <http://www.medicalnewstoday.com/articles/111897.php>.
2. Conis E. Agave syrup's benefits are in debate. *Los Angeles Times*. 30 Mar 2009. Available at: <http://articles.latimes.com/2009/mar/30/health/he-nutrition30?pg=2>.
3. Mayo Clinic Staff. Artificial sweeteners: a safe alternative to sugar? *MayoClinic.com*. Sep 2008. Available at: www.mayoclinic.com/health/artificialsweeteners/MY00073.
4. Stanhope KL and Havel PJ. Endocrine and metabolic effects of consuming beverages sweetened with fructose, glucose, sucrose, or high-fructose corn syrup. *Am J Clin Nutr*. 2008; 88(suppl):1733S-1737S.
5. Stanhope KL, Schwarz JM, Keim NL, et al. Consuming fructose-sweetened, not glucose-sweetened, beverages increases visceral adiposity and lipids and decreases insulin sensitivity in overweight/obese humans. *J Clin Invest*. 2009; 119(5):1322-1334.
6. Talking about trans fats: what you need to know. *U.S. Food and Drug Administration*. May 2006. Available at: www.fda.gov/Food/ResourcesForYou/Consumers/ucm079609.htm.
7. Trans Fats. *American Heart Association*. Jan 2009. Available at: <http://www.americanheart.org/presenter.jhtml?identifier=3045792>.
8. Nakagawa T, Hu H, Zharikov S, et al. A causal role for uric acid in fructose-induced metabolic syndrome. *Am J Physiol Renal Physiol* 290: F625-F631, 2006.
9. Collision KS, Seleh SM, Bakheet RH, et al. Diabetes of the liver: the link between nonalcoholic fatty liver disease and HFCS-55. *International Journal of Obesity* 2009 Nov; vol.17(11): p.2003-13.
10. Johnson R, Gallow T. *The Sugar Fix: The high-fructose fallout that is making you fat and sick*. New York: Rodale, Inc, 2008.

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