

More Trouble with Fructose

by **David Mendosa**

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We knew that the trouble with fructose is how hard it hits our the liver and how much it raises our triglyceride levels, which increases our risks for heart attacks. High-fructose diets also lead us to secrete more insulin, which in turn leads to more insulin resistance.

Now we are learning that this deceptively low-glycemic sweetener can cause even more trouble. The trouble with fructose isn't just insulin resistance and heart attacks, as serious as they are. And it's not even just because of the massive amounts of high-fructose corn syrup that most people in the developed world added to their diets in the past 30 years or so.

The trouble is with fructose comes from even much smaller amounts. Even from the fructose in most fruit and in some vegetables.

I used to write off those relatively small amounts of fructose. Two years ago I argued here that what I considered the trivial amounts of fructose in food don't matter. The experts, like Dr. John Bantle, a professor of medicine in the division of endocrinology and diabetes at the University of Minnesota, told me so.

But we were overlooking research that shows that even these supposedly trivial amounts of fructose didn't matter. After all, the experts in the American medical establishment have been telling us for years that we need our daily servings.

The key study came out in an obscure professional journal six years ago. But I missed it until Dr. Michael Eades brought it to my attention. Dr. Eades, who with his wife Dr. Mary Dan Eades, wrote one of the low-carb bibles, *Protein Power*, as well as another half dozen books, also has one of the best wellness blogs, "Health & Nutrition."

His recent article, "Vegetarians AGE Faster," shows that vegetarians have significantly higher rates of advanced glycation end products (AGE) than do omnivores. It's not just a coincidence that the acronym for advanced glycation end products is AGE. As our bodies accumulate more and more glycated proteins, our bodies do grow older than our chronological years.

Glycated proteins in our bodies are simply proteins attached to sugars, but they don't work well there. I have tried to expose the problems with AGEs for years, and back in 2002 I first wrote about the trouble with AGEs for my "Diabetes Update" newsletter. More recently I wrote here about AGEs in May 2006, in June 2006, in September 2006, and in April 2007. But until now I failed to appreciate that natural fructose could be one of the devils in the AGE details.

The obscure study that Dr. Eades found finally convinced me that we need to limit not only high fructose corn syrup and other artificial fructose but also the naturally occurring fructose. My friend Joe Anderson has been arguing this case for years. But I thought that he was going too far.

He wasn't. I wasn't going far enough.

The researchers studied 19 vegetarian and 19 omnivore subjects recruited from the region around Bratislava, Slovak Republic. Three of the researchers worked at the Institute of Preventive and Clinical Medicine in Bratislava. One of them worked at the Institute of Physiological Chemistry of the University of Würzburg in Würzburg, Germany, where I happened to have studied for a year.

The omnivores actually ate a higher carb diet than the vegetarians and cooked their food at higher temperatures than the vegetarians did. But the vegetarians ate more fruits and vegetables, giving them significantly more fructose in their diet. The researchers found that the vegetarians had significantly more AGEs.

The research report, "Advanced Glycation End Products and Nutrition," by M. Krajčovičová-Kudlačková, K. Šebeková, R. Schinzel, and J. Klvanová, appeared in the journal *Physiological Research*. The full-text of the article is online.

But even if you accept that natural fructose can cause the formation of AGEs, as I do now, we still have a big problem. How much fructose is too much? The authors of this research report don't say.

So I turned back to Joe Anderson, who until now has been a voice in the wilderness of fructose. By email he tells me that his recommendation, based in part on Nancy Appleton's book, *Lick the Sugar Habit* (Avery, second edition, 1996), is to eat no more than 4 grams of fructose per day. In practice he doesn't eat fruit that provides more than 2 grams of fructose per serving.

"That isn't much fruit!" Joe exclaims. "We were not evolved to eat much fruit! Modern fruit have been bred for high sugar content, among other things. Older fruit varieties are less sweet and succulent. Proto-fruits were typically sour or nearly so. Think crab apples vs. Fujis."

This prompted me to search the USDA National Nutrient Database, which is online. But that's a slow way to search for a lot of different foods. Fortunately, the USDA also makes it available to download to your computer -- if you have a Windows PC or PDA instead of a Mac. That's one of the few reasons why I kept my old PC when I got my first Mac four years ago.

So, arbitrarily defining a serving as one cup, do all fruit servings have more than 2 grams? Fortunately not.

But before we can pinpoint which are the good fruits, we still have a couple tricky things to keep in mind. The first is that the dividing line between what we call a fruit and a vegetable is different botanically than it is gastronomically. What this means for present purposes is that we also need to consider the fructose in the vegetables that we eat.

The second tricky thing to remember when we search the USDA's tables for fructose is that they show only the fructose as such. We need to remember to add half of its sucrose, because sucrose is half fructose and half glucose.

Still, several fruits are low in fructose, both as such and as sucrose. Avocados are the outstanding example. Their low fructose content is one more reason why avocados have become a regular part of my diet.

Lemons and limes are also low in fructose. But not their cousins oranges and grapefruit.

Sweet green peppers are indeed a fruit botanically. And they are a good fruit too in terms of their low fructose level.

Sadly, one of my favorite fruits, tomatoes, barely missed making the cut. A cup of a raw tomato has 2.5 grams of fructose.

Not long ago I wrote here about the "Good Veggies." But in light of what I now know about fructose not all of them are all that good.

Most of those "good veggies" really are good for us. But carrots have too much fructose for us to think of them any more as being good for us. "Carrots are fructose sticks," Joe says.

The other formerly good veggie is the botanical fruit, sweet red pepper. Unlike sweet green peppers, the red ones are high in fructose.

Not listed among the good veggies but relevant to this discussion are Jerusalem artichokes (also known nowadays as sunchokes). By whatever name you know them, they are bigger fructose sticks than carrots are.

Onions too have more fructose than is good for us. "One of the most disappointing days in my life was when I learned how high in fructose that onions are," Joe wrote me. They actually have about 2.6 grams of fructose per cup. "I miss them, but will occasionally use small amounts of them as a condiment."

That's the way to think about those fruits and vegetables that are a little too high in their levels of fructose. And remember that we still have a lot of wonderful foods to choose from. Particularly if we are omnivores.