

Switching sugar for starch leads to less fatty liver in kids

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Credit: University of California, San Francisco

A nine-day experimental diet that cut out the type of sugar in soft drinks, fruit juices and most processed foods significantly reversed the buildup of liver fat in children and adolescents – a condition strongly linked to type 2 diabetes and cardiovascular disease.

The study, led by scientists at Touro University in Vallejo, Calif., and UC San Francisco, examined the effects of a diet reduced in fructose – the [sugar](#) that is added to sodas and many snack foods. The researchers found that liver fat decreased by more than 20 percent on average in this

short time period, demonstrating a strategy to slow the spiraling global increase in chronic [metabolic diseases](#).

The prevalence of fatty liver disease in adolescents has more than doubled in the past 20 years and is thought to cause a range of disorders by increasing insulin resistance, which dampens the body's ability to control blood sugar, leading to type 2 diabetes and other metabolic diseases.

"Our study clearly shows that sugar is turned into fat, which may explain the epidemic of fatty liver in children consuming soda and food with added sugar. And we find that fatty liver is reversed by removing added fructose from our diet," says lead author of the study, Jean-Marc Schwarz, PhD, professor in the Department of Biochemistry at Touro University and professor in the Department of Medicine at UCSF.

Liver Fat Reduction 'Unprecedented'

"Such a significant liver fat reduction in just nine days of fructose reduction is unprecedented," says co-lead author, Susan Noworolski, PhD, associate professor of radiology and biomedical imaging at UCSF. "The results provide exciting hope for a strategy to combat the metabolic problems associated with [fatty liver disease](#)."

Crucial to the research, the scientists found that study participants lost very little weight on the diet – less than 1 percent, mainly attributable to water loss. The improvement in fatty liver, they say, was not due to weight loss, as some researchers suspected, but specific to reducing fructose in the diet.

"Many people think that fructose provides empty calories," says Robert Lustig, MD, professor of pediatric endocrinology at UCSF Benioff Children's Hospital San Francisco, and one of the study's senior authors.

"But no, they are toxic calories because they are metabolized only in the liver, and the liver turns the excess into fat."

The findings are in the journal *Gastroenterology*, publishing on Aug. 28, 2017.

In the experimental diet, the calories from fructose were replaced by glucose-rich, starchy foods. Calorie intake was designed to equal pre-study levels.

Glucose, found in grains and some vegetables, is the body's principal source of energy. It is essential for metabolism and can be turned into energy in all of our cells. The sugar fructose is plentiful in fruit juice and added to a wide variety of commercial food products. It is normally metabolized only in the liver, where much of it is converted to fat.

Sugar Intake Higher in Latinos, African-Americans

Sugar consumption among Latino and African-American teens is about 50 percent higher than that of Caucasians and Asians, research shows. This study recruited obese non-diabetic Latino and African-American children and teens, ages 9 to 18. All participants had at least one physiological marker for insulin resistance and they all reported habitual high sugar consumption.

Participants received an MRI at the start and end of the study to measure their liver fat. Over the nine-day diet, prepared meals were provided with no added sugar, so that the percentage of sugar in their food was reduced from 28 percent to 10 percent of calories. In addition to the average reduction in liver fat of more than 20 percent, the participants' insulin sensitivity and other metabolic measures also improved greatly, the researchers reported.

"Such increases in insulin sensitivity potentially reduce the risk of diabetes and other disorders associated with the metabolic syndrome," says Kathleen Mulligan, PhD, faculty member at UCSF and Touro University, and co-senior author of the study.

Whether the study's striking improvements in fatty [liver](#) would be maintained – or even further improved – over the long term is unknown, the scientists say, and they call for larger studies in adults with metabolic syndrome. Even if longer-term studies confirm the new findings, they said the jury is still out as to whether people will stick to a diet low in added sugar, in a society overrun with soda and snack food options.

The low-fructose diet results are supported by findings in a new model projecting the health and cost benefits that would result from different levels of reduced sugar consumption in the U.S. The model's projections, based on known patterns of metabolic disease histories, found that a 20 percent drop in fructose consumption would cut the prevalence of a range of metabolic diseases by about 5 percent and save \$10 billion a year in medical costs. A 50 percent decrease in [sugar consumption](#) would cut disease by four times that amount and save \$32 billion annually.

The model, developed by a team of UCSF scientists, was published in *BMJ Open* in the August issue. The research was led by Rick A. Vreman, a UCSF graduate student in epidemiology and biostatistics.

More information: Jean-Marc Schwarz et al. Effects of Dietary Fructose Restriction on Liver Fat, De Novo Lipogenesis, and Insulin Kinetics in Children With Obesity, *Gastroenterology* (2017). [DOI: 10.1053/j.gastro.2017.05.043](https://doi.org/10.1053/j.gastro.2017.05.043)

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