

Findings call into question recommendations that imply all sources of fructose-containing sugars carry the same risk

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The role of sugars in public health continues to be urgently debated among nutrition scientists and health professionals—yet the science

behind the effects of various fructose-containing sugars (e.g., sucrose/table sugar, high-fructose corn syrup, fructose/fruit sugar) on overweight and obesity has been unclear. A new comprehensive review, "[Important food sources of fructose-containing sugars and adiposity: a systematic review and meta-analysis of controlled feeding trials](#)," recently published in *The American Journal of Clinical Nutrition*, elevates the importance of focusing on the types of foods and diets consumed, as well as total calories, when associating consumption of sugars with weight gain.

Evolving evidence has indicated that the effect of fructose-containing sugars on adiposity may vary among [food sources](#). For example, research has consistently shown that consuming [sugar-sweetened beverages](#) (SSBs) at excess calorie levels leads to increased body weight and elevated obesity risk. Yet, evidence is unclear about the potential impact on adiposity related to the consumption of other food sources of fructose-containing sugars such as fruit, which are associated with numerous health-promoting benefits. To help inform evidence-based [public health](#) recommendations, the American Society for Nutrition commissioned this [systematic review](#) and meta-analysis of controlled trials to better understand the effect of different food sources of fructose-containing sugars at various levels of energy control on body weight and other measures of adiposity, using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach.

The systematic review and meta-analysis examined 169 clinical trials among 10,357 adults with or without obesity who had or were at risk for cardiometabolic diseases. The review included the effects of 14 different food sources of fructose-containing sugars on the individuals: SSBs; sweetened milk; sweetened dairy alternative (soy); 100% [fruit juice](#); fruit drink; fruit; dried fruit; mixed fruit forms; sweetened cereal grains and bars; sweets and desserts; honey; added nutritive (caloric) sweetener; mixed sources with SSBs; and mixed sources without SSBs.

Researchers assessed intake levels with a median dose of 9% to 20% of [total energy](#) across four different levels of energy control, with median follow-up of 6-18 weeks.

The review demonstrated that the effect of fructose-containing sugars on adiposity may be mediated by controlling calories consumed (energy) and that the effect varies among the types of fructose-containing food sources. Excess energy intake at high doses (≥ 100 g/d) of SSBs, fruit drinks, and mixed sources with SSBs generally leads to increases in adiposity. Most other food sources consumed at high doses (≥ 100 g/d) show no harmful effects on adiposity irrespective of energy control, with some sources even showing generally moderate beneficial effects, including fruit, 100% fruit juice, dried fruit, and honey at doses of 50 g per day or less. GRADE was generally moderate signifying the research provides a good indication of the likely effect.

"This review reinforces the need for more nuance in public health recommendations related to sugars," said senior author John Sievenpiper, MD, Ph.D., FRCPC, Associate Professor, University of Toronto.

"Research continues to illustrate the complexity of the food matrix, indicating that components, such as fructose-containing sugars, may affect health differently in various food sources. Public health guidance has evolved to increasingly focus on an individual's overall dietary pattern and the role of foods, rather than specific nutrients. However, our research indicates that more specific guidelines regarding added sugars may be needed for different food sources of fructose-containing sugars. Ultimately, calories count, as does the food source of sugars."

To conduct the comprehensive review, authors searched MEDLINE, Embase, and Cochrane Library through April 2022 for controlled trials lasting at least two weeks. The team prespecified four trial designs by energy control: substitution (energy-matched replacement of sugars), addition (energy from sugars added), subtraction (energy from sugars

subtracted), and *ad libitum* ([energy](#) from sugars freely replaced). The primary outcome was [body weight](#), with secondary outcomes including other adiposity measures. GRADE was then used to assess the certainty of the evidence and outline conclusions.

"While more research is needed exploring a broader variety of food sources of fructose-containing sugars, this comprehensive review is timely as the 2025 Dietary Guidelines Advisory Committee currently assesses the latest science to inform updated evidence-based recommendations," noted lead author Laura Chiavaroli, MSc, Ph.D., Assistant Professor, University of Toronto. "There is an opportunity for more food-based guidance around sugars to help ensure Americans don't inadvertently eat less health-promoting foods containing fructose—especially at a time when most people don't eat enough of all forms of fruit, which offer significant health benefits."

The authors acknowledge more research is needed to inform future dietary guidance related to consumption of sugars, with an emphasis on the need for more large, high-quality randomized trials assessing a broader variety of food sources of fructose-containing sugars.

More information: Laura Chiavaroli et al, Important food sources of fructose-containing sugars and adiposity: A systematic review and meta-analysis of controlled feeding trials, *The American Journal of Clinical Nutrition* (2023). [DOI: 10.1016/j.ajcnut.2023.01.023](https://doi.org/10.1016/j.ajcnut.2023.01.023)

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