

EXPERTS BRING PERSPECTIVE TO HIGH FRUCTOSE CORN SYRUP IN OBESITY DEBATE

Critical Reviews in Food Science and Nutrition

A Critical Examination of the Evidence Relating High Fructose Corn Syrup and Weight Gain

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Abstract: The use of high fructose corn syrup (HFCS) has increased over the past several decades in the United States while overweight and obesity rates have risen dramatically. Some scientists hypothesize that HFCS consumption has uniquely contributed to the increasing mean body mass index (BMI) of the U.S. population. The Center for Food, Nutrition, and Agriculture Policy convened an expert panel to discuss the published scientific literature examining the relationship between consumption of HFCS or “soft drinks” (proxy for HFCS) and weight gain. The authors conducted original analysis to address certain gaps in the literature. Evidence from ecological studies linking HFCS consumption with rising BMI rates is unreliable. Evidence from epidemiologic studies and randomized controlled trials is inconclusive. Studies analyzing the differences between HFCS and sucrose consumption and their contributions to weight gain do not exist. HFCS and sucrose have similar monosaccharide compositions and sweetness values. The fructose:glucose (F:G) ratio in the U.S. food supply has not appreciably changed since the introduction of HFCS in the 1960s. It is unclear why HFCS would affect satiety or absorption and metabolism of fructose any differently than would sucrose. Based on the currently available evidence, the expert panel concluded that **HFCS does not appear to contribute to overweight and obesity any differently than do other energy sources.** Research recommendations were made to improve our understanding of the association of HFCS and weight gain.

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Food and Chemical Toxicology

Lack of findings for the association between obesity risk and usual sugar-sweetened beverage consumption in adults - A primary analysis of databases of CSFII-1989-1991, CSFII-1994-1998, NHANES III, and combined NHANES 1999-2002

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Abstract: The relationship between obesity risk and sugar-sweetened beverage (SSB) consumption was examined together with multiple lifestyle factors. Statistical analysis was performed using population dietary survey databases of USDA CSFII 1989-1991, CSFII 1994-1996, CDC NHANES III, and combined NHANES 1999-2002. Totally, 38,409 individuals, ages 20-74 years, with accompanying data of dietary intake, lifestyle factors, and anthropometrics were included in the descriptive statistics and risk analysis. Analytical results indicate that obesity risk was significantly and positively associated with gender, age, daily TV/screen watching hours and dietary fat content, and negatively associated with smoking habit, education and physical activity; obesity risk was not significantly associated with SSB consumption pattern, dietary saturated fat content and total calorie intake. No elevated BMI values or increased obesity rates were observed in populations frequently consuming SSB compared to populations infrequently consuming SSB. Additionally, one-day food consumption data was found to overestimate SSB usual intake by up to 38.9% compared to the data of multiple survey days.

Conclusion: Multiple lifestyle factors and higher dietary fat intake were significantly associated with obesity risk. **Populations who frequently consumed SSB, primarily HFCS sweetened beverages, did not have a higher obesity rate or increased obesity risk than that of populations which consumed SSB infrequently.**

Food and Chemical Toxicology 45(8):1523-1536. August 2007

Journal of Nutrition

Weak Association between Sweeteners or Sweetened Beverages and Diabetes

John S. White, White Technical Research, Argenta, IL.

This letter to the editor questions the conclusions of an article published in *The Journal of Nutrition* suggesting a unique causal link between beverages sweetened with high fructose corn syrup and type 2 diabetes by Montonen et al.¹ White notes that the authors fail to acknowledge the compositional similarities between sucrose and high fructose corn syrup as well as the “dominant use of sucrose in caloric beverages outside the United States.”

In closing, White states:

“The hypothesis that fructose, HFCS, and caloric beverages play a unique role in obesity and type 2 diabetes beyond their inherent energy contributions has generated tremendous attention from scientists and the media, but no credible scientific support. The failure of Montonen et al. to demonstrate that higher intake of fructose, glucose, and sweetened beverages, but not sucrose, may increase type 2 diabetes risk offers nothing new in support of this hypothesis.”

1. Montonen J, Jarvinen R, Knekt P, Heliövaara M, Reunanen A. Consumption of sweetened beverages and intakes of fructose and glucose predict type 2 diabetes occurrence. *J Nutr.* 2007;137:1447–54

Journal of Nutrition 138:138, January 2008

American Journal of Clinical Nutrition

Much ado about high-fructose corn syrup in beverages: the meat of the matter

G Harvey Anderson, Department of Nutritional Sciences, University of Toronto, Toronto, ON, Canada.

This editorial by G. Harvey Anderson discusses the rise of the theory that high fructose corn syrup is uniquely obesogenic “because fructose bypasses food intake regulatory systems and favors lipogenesis.” The theory is flawed according to Anderson because it does not take into account that per capita availability of total energy from other sources has also increased. Nor does it take into account that food and beverage manufacturers’ use of high fructose corn syrup displaced sucrose use. He notes “There is no evidence that the ratio of fructose and glucose consumed from sugars has changed

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over the past 4 decades as a result of HFCS replacing sucrose in many applications.”

Further, Anderson points to current research on the impact of milk and beverages sweetened with sucrose or high fructose corn syrup on satiety by Soenen and Westerterp-Plantenga, noting that the study “merits emphasis because it challenges the argument of biologic plausibility that was proposed to support the hypothesis.”

Anderson continues by noting that obesity is caused by a number of factors and targeting one component of the food supply is unlikely to succeed in reducing its prevalence. In closing, Anderson states:

“Unfortunately the recent focus on HFCS has done little to resolve the role of sugars in contributing to energy imbalance. **The hypothesis that the replacement of sucrose with HFCS in beverages plays a causative role in obesity is not supported on the basis of its composition, biologic actions, or short-term effects on food intake.** Had the hypothesis been phrased in the converse, namely that replacing HFCS with sucrose in beverages would be a solution for the obesity epidemic, its merit would have been seen more clearly. Put simply, a proposal that a return to sucrose-containing beverages would be a credible solution to the obesity epidemic would have been met with outright dismissal. In many countries where trade barriers have prevented the replacement of sucrose with HFCS, the prevalence of obesity is high. Therefore, what role HFCS in beverages plays in the etiology of obesity, as in *Much Ado about Nothing*¹, may simply be a play on words.

Claudio: Now you talk of a sheet of paper, I remember a pretty jest your daughter told us of.

Leonato: O, when she had writ it and was reading it over, she found Benedick and Beatrice between the sheet¹.”

1. Shakespeare W. *Much ado about nothing*. Ed: Zitner SP. Oxford, United Kingdom: Oxford University Press, 1993:97-202.

American Journal of Clinical Nutrition, Vol. 86, No. 6, 1577-1578, December 2007

Nutrition Today

High Fructose Corn Syrups, Part 1: Composition, Consumption, and Metabolism

Schorin, Marilyn D. PhD, RD, FADA

Abstract: High fructose corn syrup, as used in foods, is similar in composition and sweetness to sucrose. Absorption and metabolism of high fructose corn syrup is also similar to that of sucrose. Although introduced into the food supply in 1968, popularity of high fructose corn syrup as a sweetener grew after the Food and Drug Administration's 1983 decision that high fructose corn syrup is Generally Recognized as Safe (GRAS). Part 1 of this article explains the composition, consumption patterns, and metabolism of HFCS. Part 2 explores the health impact of high fructose corn syrup consumption.

Nutrition Today. 40(6):248-252, November/December 2005

Nutrition Today

High Fructose Corn Syrups, Part 2: Health Effects

Schorin, Marilyn D. PhD, RD, FADA

Abstract: High fructose corn syrup use in food gradually increased from its introduction in 1980 until the late 1990s. The monosaccharide components of high fructose corn syrup and sucrose are identical. Part 2 of this article explores the health effects of high fructose corn syrup, including obesity, type 2 diabetes, blood lipids, and dental caries.

Sweet foods and beverages have traditionally been part of Western dietary patterns. The Old Testament refers to “the land of milk and honey” to convey sweetness and comfort. Enjoyment of sweets is inborn and so ingrained in us that even infants respond positively when tasting something sweet. But nutrition professionals are wondering if the recent shift in sweetener use in the United States from sucrose to high fructose corn syrup (HFCS) has specific good or ill health effects.

High fructose corn syrup is similar in composition and sweetness to sucrose (table sugar). It is absorbed and metabolized like sucrose. Introduced into the food supply in 1968, high fructose corn syrup gained rapid acceptance by both the food industry and consumers after 1980. Consumption of high fructose corn syrup has stabilized since the late 1990s. This article reviews research relating the health effects of high fructose corn syrup to obesity, appetite, glycemic control, and hyperlipidemia. The term health effects is used, rather than adverse effects, because consumption of high fructose corn syrup includes some beneficial characteristics; for example, sugars provide energy that may be essential in some diets.

Dr. Schorin concludes, “Given what we know about the metabolism of orally ingested sugars, it is difficult to identify a plausible physiological explanation for how approximately equal amounts of fructose and glucose should have differential effects when chemically bonded (such as in sucrose) or not (such as in HFCS). **Thus, the current evidence does not support claims of a specific unique effect of HFCS on health.**”

Nutrition Today. 41(2):70-77, March/April 2006

Nutrition Today

Highs and Lows of High Fructose Corn Syrup: A Report From the Center for Food and Nutrition Policy and Its Ceres® Workshop

Hein, Gayle L. BS; Storey, Maureen L. PhD; White, John S. PhD; Lineback, David R. PhD

Abstract: Since the early 1980s, the prevalence of overweight/obesity in the US population, as well as per capita consumption of high fructose corn syrup (HFCS), has increased. Although some public health researchers and administrators hypothesize that these 2 trends are directly related, **current research published in the scientific literature does not support a cause-effect relationship between high fructose corn syrup consumption and overweight/obesity rates.** Some explanations for the popularity of these unsupported hypotheses may be due to confusion concerning the compositional differences, or lack thereof, between high fructose corn syrup, sucrose, and other sweeteners. In addition, failure among individuals in the scientific community to distinguish between high fructose corn syrup and “corn syrup” may exacerbate the confusion. Before any relationship between high fructose corn syrup consumption and overweight/obesity can be examined, more information concerning current levels of high fructose corn syrup in the food supply, as well as individual-level HFCS consumption, must be established.

Nutrition Today. 40(6):253-256, November/December 2005