Do artificial sweeteners alter post-meal glucose, hunger hormones?

Publish date: March 7, 2023
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Internal Medicine News

FROM "NUTRIENTS"

Drinking a no-or low-calorie non-nutritive sweetened (NNS) beverage was no different from drinking water in terms of effect on 2-hour postprandial levels of glucose and hormones related to appetite or food intake. Drinking a sugar-sweetened beverage (SSB), however, had a different effect on postprandial levels of glucose and the hormones insulin, glucagon-like peptide–1 (GLP-1), gastric inhibitory polypeptide (GIP), peptide YY (PYY), ghrelin, leptin, and glucagon.

These findings are from a new meta-analysis by Roselyn Zhang and colleagues, supported by the non-profit organization Institute for the Advancement of Food and Nutrition Sciences. The study was published recently in Nutrients.

"Non-nutritive sweeteners have no acute metabolic or endocrine effects and they are similar to water in that respect, and they show a different response from caloric sweeteners," study author Tauseef Khan, MBBS, PhD, summarized in an interview following a press briefing from the IAFNS.

"Our study supports that non-nutritive sweeteners are a healthier alternative to sugar-sweetened beverages or caloric beverages," said Dr. Khan, an epidemiologist in the department of nutritional sciences, University of Toronto.

Most participants in the 36 trials included in the meta-analysis were healthy, he noted. However, for certain types of NNS beverages, "we had enough studies for type 2 diabetes to also assess that separately, and the results were the same: Non-nutritive sweeteners were no different from water; however, they were different from caloric sweeteners."

Of note, none of the studies included erythritol – a sugar alcohol (polyol) increasingly used as an artificial sweetener in keto and other types of foods – which was associated with a risk for adverse cardiac events in a paper in Nature Medicine.

Are these NNS drinks largely inert?

"This [meta-analysis] implies that sweeteners are largely inert," in terms of acute postprandial glucose and hormone response, but the review did not include newer reports that differ, Duane Mellor, PhD, RD, RNutr, who was not involved with the research, noted in an email.

"This is possibly," he said, because the study "only reviewed the literature up until January 2022 and therefore it missed the World Health Organization review 'Health Effects of the Use of Non-Sugar Sweeteners' published in April [2022], and a study published in August 2022 in the journal Cell suggesting that some non-nutritive sweeteners may have a minor effect on gut microbiome and glucose response.

"Although there is a place of non-nutritive sweeteners as a way to reduce sugar intake, they are a small part of dietary pattern and lifestyle which can help reduce risk of disease," said Dr. Mellor, a registered dietician and senior teaching fellow at Aston University, Birmingham, England.

“So, although we are clear we need to reduce our intake of sugar-sweetened beverages, switching to non-nutritive sweetened beverages (such as diet sodas) is not necessarily the healthiest option, as unlike water, it seems that some non-nutritive sweeteners may influence glucose responses and levels of related hormones in more recent studies.”

NNS beverages ‘are similar to water’

Dr. Khan pointed out that the meta-analysis addressed two major concerns about NNS beverages.
First, the “sweet uncoupling hypothesis” proposes that low-calorie sweeteners affect sweet taste by separating sweet taste from calories. “The body is confused, and then there is hormonal change. Our study shows that actually that’s not true, and [NNS beverages] are similar to water.”
Second, when no-calorie or low-calorie sweeteners are taken with calories (coupling), a concern is that “then you eat more somehow, or your response is different. However, the results [in this meta-analysis] also show that that is not the case for glucose response, insulin response, and other hormonal markers.”
“The strength is not that low-calorie sweeteners have some benefit per se,” he elaborated. “The advantage is that they replace caloric beverages.

“We are not saying that anybody who is not taking low-calorie sweeteners should start taking [them],” he continued. “What we are saying is somebody who is taking sugar-sweetened beverages and has a problem of taking excess calories, if you replace those calories with low-calorie sweetener, replacement of calories itself may be beneficial, and also they should not be concerned of any [acute] issues with a moderate amount of low-calorie sweeteners.”

Postprandial effect of NNS beverages, SSBs, water

Eight NNS are currently approved by the Food and Drug Administration: aspartame, acesulfame potassium (ace-K), luo han guo (monkfruit) extract, neotame, saccharin, stevia, sucralose, and advantame, the researchers noted.
Ms. Zhang and colleagues searched the literature up until Jan. 15, 2022, for studies of NNS beverages and acute postprandial glycemic and endocrine responses.
Trials were excluded if they involved sugar alcohols (eg, erythritol) or rare sugars (eg, allulose), or if they were shorter than 2 hours, lacked a comparator arm, or did not provide suitable endpoint data.
They identified 36 randomized and nonrandomized clinical trials of 472 predominantly healthy participants: 21 trials (15 reports, n = 266) with NNS consumed alone (uncoupled), 3 trials (3 reports, n = 27) with NNS consumed in a solution containing a carbohydrate (coupled), and 12 trials (7 reports, n = 179) with NNS consumed up to 15 minutes before oral glucose carbohydrate load (delayed coupling).
The four types of beverages were single NNS (ace-K, aspartame, cyclamate, saccharin, stevia, and sucralose), NNS blends (ace-K + aspartame; ace-K + sucralose; ace-K + aspartame + cyclamate; and ace-K + aspartame + sucralose), SSBs (glucose, sucrose, and fructose), and water (control).
In the uncoupled interventions, NNS beverages (single or blends) had no effect on postprandial glucose, insulin, GLP-1, GIP, PYY, ghrelin, and glucagon, with responses similar to water.
In the uncoupled interventions, SSBs sweetened with caloric sugars (glucose and sucrose) increased postprandial glucose, insulin, GLP-1, and GIP responses, with no differences in postprandial ghrelin and glucagon responses.
In the coupled and delayed coupling interventions, NNS beverages had no postprandial glucose and endocrine effects, with responses similar to water.
The studies generally had low to moderate confidence.
The study was supported by an unrestricted grant from IAFNS. Dr. Khan has received research support from the Canadian Institutes of Health Research, the International Life Sciences Institute, and the National Honey Board. He has received honorariums for lectures from the International Food Information Council and the IAFNS. Dr. Mellor has no disclosures.

A version of this article first appeared on Medscape.com.