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Editorial
CLINICAL TRIALS: BEHAVIOR, PHARMACOTHERAPY, DEVICES, SURGERY

Obesity

Can Non-Nutritive Sweeteners Enhance Outcomes of Weight Loss Interventions?

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With obesity reaching epidemic proportions in many countries around the world, the search for the causes of and potential solutions for this condition continues. It is noteworthy that the increase in the consumption of added or discretionary sugars has mirrored the dramatic rise in the prevalence of obesity over the past few decades. Although certainly not the only factor contributing to the obesity epidemic, a large body of evidence now exists indicating that consumption of sugar (sucrose) sweetened beverages promotes weight gain in both children and adults (1). Moreover, some experts have recently argued that there is now sufficient scientific evidence to conclude that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases (2). Accordingly, the potential value of replacing sucrose with low-calorie sweeteners, also known as non-nutritive sweeteners (NNS), for promoting weight loss has become a topic of increasing scientific interest.

To date, research has produced mixed findings regarding the effects of NNS on body weight. Although many studies have found that the consumption of NNS is associated with weight loss, other studies have found that some NNS may actually stimulate appetite and ultimately lead to weight gain. In a 2009 review (3), Mattes & Popkin concluded that "The addition of NNS to diets poses no benefit for weight loss or reduced weight gain without energy restriction." However, the authors also specified that "If non-nutritive sweeteners are used as substitutes for higher energy yielding sweeteners, they have the potential to aid in weight management." Given that consumption of foods and beverages containing NNS has significantly increased during the past decade (3), it is critical to understand the potential impact that use of NNS may have on body weight, as well as the potential role that NNS may have in weight loss interventions.

This important question was recently explored in a prospective, randomized trial in which consumption of water versus NNS beverages was compared within the context of a behavioral weight loss program. In this large-scale trial conducted by Peters and colleagues (4), a total of 303 overweight and obese (Class I and II) participants were assigned to one of two treatment conditions (1) NNS, in which participants were instructed to consume 24 ounces of NNS beverages per day (water consumption was not restricted) or (2) Water group, in which participants were instructed to consume at least 24 ounces of water per day and not drink any NNS beverages. Participants in this condition were, however, allowed to consume NNS in foods. Both groups received a one year community based lifestyle intervention (i.e. The Colorado Weigh) in which equal emphasis was placed on diet and physical activity changes. Participants' energy intake targets were set to equal their resting metabolic rate (RMR), with these targets adjusted as needed by group leaders so as to produce a weight loss of 1-2 pounds per week.

The recent article by Peters et al. (2014) (4) reports the findings from the first 12 weeks of this intervention, with the key finding being that participants in the NNS beverage treatment group lost significantly more weight than participants in the water treatment group (5.5 kg versus 3.8 kg). Weekly hungers scores also decreased to a greater extent among participants in the NNS group compared to participants in the Water group; however, the absolute magnitude of this reduction was small. Participants in the NNS treatment group also had greater reductions in total and LDL cholesterol, which the authors note may have been due to the greater weight loss observed in this group. Sedentary behavior decreased significantly in the Water group over time but not in the NNS group; however, there were no differences in changes in physical activity or sedentary behavior between groups.

The authors are to be commended on conducting this large-scale and comprehensive trial. Several notable strengths of this study are worth mentioning. First, the study was conducted at two research sites (i.e., Colorado and Temple), increasing confidence in the generalizability of the study findings. Second, both sexes were included, and there was a similar distribution of men and women in both treatment sites (approximately 80% women in both groups). Minority individuals were also well represented with approximately 27% of the participants being African American. Additionally, adherence to both the NNS and Water interventions was excellent (>95% in both groups), as was participant retention, with 92% of the participants who started treatment completing the 12-week follow-up assessments.

Although this clinical trial had a number of strengths and represents an important contribution to the literature, there are a few important questions that are left unanswered by this study. First, twelve weeks is a short period of observation, really just a preliminary look at the outcome. We look forward to reports of at least a year, which will provide the critical information needed to more fully evaluate the effects of NNS on weight loss outcomes.

Second, intake of NNS does not appear to have been well controlled since participants in both conditions were allowed to consume NNS, with the only restriction being that participants in the water group

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could not consume NNS in beverages. Since all enrolled participants were required to consume three or more NNS beverages per week to be eligible to participate in this study, many participants in the NNS group may have already been consuming NNS beverages at the levels tested in this study. Although adherence to NNS beverage consumption was high (97%), no information is provided on the actual amount of NNS consumed through either beverages or food prior to study enrollment or during study participation. Thus, it is difficult to know to what extent participants in the NNS treatment group increased the amount of NNS consumed, if at all, during study participation. Similarly, it is unknown whether participants in the Water group decreased consumption of NNS since participants in this group were allowed to consume NNS in foods.

Another important issue that was not answered by this article is the potential mechanism through which the NNS beverage consumption may have produced greater weight loss, in comparison to water consumption. Since the two treatment groups did not differ in their changes in physical activity or sedentary behavior, the findings of this study would suggest that the greater weight loss observed among the participants in the NNS group was due to larger reductions in caloric intake. Unfortunately, no information is provided on participant's caloric intake or adherence to dietary recommendations. Without this critical information, it is difficult to know if dietary intake differed between groups or if another potential mechanism may be responsible for the observed weight loss outcomes. A third group in which participants received the same instructions for NNS consumption without a comprehensive behavioral weight loss intervention could help clarify the potential mechanism(s) for the observed effects.

Another critical issue that was not addressed in this study is whether the different types of NNS have the same or differential effects on weight loss and metabolic outcomes. In the Peters et al study (4), participants were allowed to consume any type of NNS (examples include aspartame, NutraSweet or Equal, sucralose-Splenda, stevia-Truvia, as well as diet creamers). Previous studies suggest, however, that not all NNS have the same metabolic effects. For example, intake of the NNS, stevia, has been found to produce a smaller postprandial release of glucose and insulin compared to the NNS, aspartame, even when caloric content of meals are held constant (5). At present, the long-term effects of these different NNS on body weight, food intake, and other metabolic outcomes are currently unknown.

In summary, the findings of the Peters et al. (2014) study (4) provide an important contribution to the literature and strongly suggest that individuals who consume NNS should not be discouraged from continuing to consume these beverages during weight loss efforts. These findings, however, should be interpreted with caution since longer term outcomes are needed to confirm these results and the potential mechanism(s) for the superior effects of NNS on weight loss outcomes observed in this study is currently unknown. Additionally, the generalizability of these findings is limited to individuals who regularly consume NNS, and it is unknown if similar effects would be observed among individuals who do not regularly consume NNS. Future studies are also needed to determine if all NNS have similar metabolic effects or if these effects differ between the different types of NNS. Until such data become available, it is advised that NNS are not widely recommended in weight loss programs, particularly for individuals who do not regularly consume them. O

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