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LETTER

Positive association between artificially sweetened beverage consumption and incidence of diabetes

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Abbreviations
ASB Artificially sweetened beverages
SSB Sugar-sweetened beverages

To the Editor: O'Connor and colleagues are to be applauded for evaluating the effects of sweetened and unsweetened non-alcoholic beverage intake on the incidence of type 2 diabetes in 24,653 individuals [1]. In addition to the large cohort size, the study participants were followed for almost 11 years. The finding that intake of sugar-sweetened beverages (SSB, soda and milk) was strongly associated with the eventual development of type 2 diabetes is very important and not unexpected. However, we believe that another finding is particularly noteworthy, namely, intake of artificially sweetened beverages (ASB) was an equally strong predictor of type 2 diabetes.

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When corrected for BMI and waist circumference, the significant association between sugar-sweetened soft drinks and type 2 diabetes persisted whereas the relationship between ASB intake and type 2 diabetes was attenuated, pointing to obesity as an important link between ASB and type 2 diabetes. In fact, the prevalence of obesity was strikingly higher in the ASB cohort than among the SSB consumers, despite the fact that their energy intakes were similar (ASB consumers: BMI 27.2±4.2 kg/m^2, obesity prevalence 20.3%, energy intake 7,899±2,046 kJ/day; SSB consumers: BMI 26.2±3.9 kg/m^2, obesity prevalence 14.4%, energy intake 8,389±2,071 kJ/day). The authors state that the positive association between ASB intake and type 2 diabetes may be an artefact of reverse causality, meaning that heavier individuals consume more beverages containing artificial sweeteners to prevent additional weight gain or even promote weight loss. In our opinion, a direct detrimental effect of artificial sweeteners on metabolic health warrants further consideration, especially in light of recent findings in animal [2, 3] and human [2, 4, 5] studies. These findings include interference of artificial sweeteners with learned signals linking sweet taste to its post-ingestive consequences [3] and induction of changes in the gut microbiome [2]. Both may impair blood glucose regulation and enhance metabolic efficiency. In addition, stimulation of insulin secretion by artificial sweeteners, as observed in in vitro studies [6] and in a recent human study evaluating acute ASB consumption [4], offers another plausible mechanism that could explain the relationship between ASB and greater adiposity.

Based on mathematical modelling, O'Connor and colleagues [1] predict that replacing SSB with ASB would not reduce the diabetes risk. This supports the notion that even if artificial sweeteners reduce overall energy intake, they may exert adverse metabolic effects, especially by increasing weight and adiposity. These findings have important implications for individuals of all ages, including children, whose

schools increasingly replace SSB with diet and low-energy beverages in their vending machines [7].

It should also be noted that if ASB contribute to weight gain and increased adiposity, statistical adjustments for these factors in studies of the effects of ASB on disease risk may be equivalent to 'throwing the baby out with the bathwater'. Evidence from prospective cohort studies has indicated that ASB consumption may directly contribute to significant increases in waist circumference independently of changes in BMI [5], as well as to significant increases in BMI [8]. As a result, O'Connor's data add to a growing number of studies which document that ASB consumption fails to mitigate the risk of obesity-related negative health outcomes and may instead increase their likelihood.

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