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Response to comment on "Relation of fruit juice with adiposity and diabetes depends on how fruit juice is defined: a re-analysis of the EFSA draft scientific opinion on the tolerable upper intake level for dietary sugars" by Chen et al. 2023

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TO THE EDITOR:

We would like to thank Martínez et al. for their insightful comments [1] and for bringing to our attention the publication of the final version of the European Food Safety Authority (EFSA)'s Scientific Opinion on the Tolerable Upper Intake Level for dietary sugars [2]. We appreciate that the authors have included the EPIC-InterAct study [3] in the final version to reflect the totality of evidence and have concluded on fruit juice in general, rather than specifically on 100% fruit juice, to address the issue of misclassification. However, we note that an analysis separated by fruit juice type (100% fruit juice vs. non-specified fruit juice) is still missing. Although EFSA combined the analyses for 100% fruit juice and total fruit juice (including sugar-sweetened fruit juice) due to the similarity in their content of free sugars [2], this approach may not provide an accurate picture of the risk associated with each juice type. Large evidence syntheses of randomized controlled trials and prospective cohort studies have shown that the impact of fructose-containing sugars on cardiometabolic outcomes may depend on the food source [4, 5]. For example, harm is observed for sugar-sweetened beverages while benefit is observed for fruit. The beneficial nutrients and bioactive compounds found in natural fruit are often retained in 100% fruit juice but are either absent or present in only small amounts in fruit drinks. These nutrients and bioactive compounds may counteract any effect of free sugars in 100% fruit juice for cardiometabolic outcomes. For example, a recent systematic review and meta-analysis of controlled trials demonstrated that 100% fruit juice when providing less than 10% of calories decreased body weight and BMI, while fruit drinks increased body weight, BMI and body fat [6]. Similarly, systematic reviews and meta-analyses of prospective cohort studies have also demonstrated a benefit at low to moderate doses, showing a U-shaped association between 100% fruit juice intake and various cardiometabolic outcomes including hypertension [7], metabolic syndrome [4] and cardiovascular event risk [8]; however, this was not the case for non-specified fruit juice. Therefore, we emphasize the importance of conducting a stratified analysis by fruit juice type [9].

Martínez et al. also identified the low number and heterogeneity of the included studies as barriers to conducting a quantitative analysis. While we agree that more studies are needed to improve the certainty of the evidence, two studies are considered sufficient to perform a quantitative meta-analysis [10]. We addressed some of the heterogeneity by conducting separate analyses for children and adults, pooling only data that assessed the same outcomes (e.g., incident abdominal obesity was reported separately from change in body weight) and adjusting for the study period (e.g., studies including data on change in BMI over a study period different than 1-year were adjusted to per 1-year). We also provided separate conclusions based upon these populations and endpoints. Although EFSA's final version of the scientific opinion on fruit juice has greatly improved from the draft version, our comprehensive and granular analysis based on fruit juice type provides additional information that is not present in EFSA's final version. Therefore, our perspective piece should be seen as complementing EFSA's scientific opinion and not detracting from it. Our study stands as a more comprehensive analysis of the work done by EFSA when relating to fruit juice type and adiposity and diabetes outcomes.

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DATA AVAILABILITY

All data generated or analyzed during this study are included in this published article.

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AUTHOR CONTRIBUTIONS

VC, TAK, LC, AA, DL, CWCK and JLS interpreted the data. VC and TAK drafted the manuscript. TAK and JLS provided supervision. All authors critically revised the manuscript and approved the final version of the manuscript.

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COMPETING INTERESTS

VC has received research support from a University of Toronto Department of Nutritional Sciences Fellowship, the Toronto 3D Knowledge Synthesis and Clinical Trials foundation and Banting and Best Diabetes Centre. TAK has received research support from the Canadian Institutes of Health Research (CIHR), the International Life Science Institute (ILSI), and National Honey Board. He has received honorarium from Calorie Control Council Annual meeting and Arab Beverage Association for invited talks. He has received funding from the Toronto 3D Knowledge Synthesis and Clinical Trials foundation. LC was a Mitacs-Elevate post-doctoral fellow jointly funded by the Government of Canada and the Canadian Sugar Institute (Sep 2019–Aug 2021). AA has received research support from the Toronto 3D Knowledge Synthesis and Clinical Trials foundation. 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He has received travel support and/or honoraria from the Barilla, California Walnut Commission, Canola Council of Canada, General Mills, International Nut and Dried Fruit Council, International Pasta Organization, Lantmannen, Loblaw Brands Ltd, Nutrition Foundation of Italy, Oldways Preservation Trust, Paramount Farms, the Peanut Institute, Pulse Canada, Sun-Maid, Tate & Lyle, Unilever and WhiteWave Foods/Danone. He has served on the scientific advisory board for the International Tree Nut Council, International Pasta Organization, McCormick Science Institute and Oldways Preservation Trust. He is a founding member of the International Carbohydrate Quality Consortium (ICQC), Executive Board Member of the Diabetes and Nutrition Study Group (DNSG) of the European Association for the Study of Diabetes (EASD), is on the Clinical Practice Guidelines Expert Committee for Nutrition Therapy of the EASD and is a Director of the Toronto 3D Knowledge Synthesis and Clinical Trials foundation. JLS has received research support from the Canadian Foundation for Innovation, Ontario Research Fund, Province of Ontario Ministry of Research and Innovation and Science, Canadian Institutes of Health Research (CIHR), Diabetes Canada, American Society for Nutrition (ASN), International Nut and Dried Fruit Council (INC) Foundation, National Honey Board (U.S. Department of Agriculture [USDA] honey "Checkoff" program), Institute for the Advancement of Food and Nutrition Sciences (IAFNS; formerly ILSI North America), Pulse Canada, Quaker Oats Center of Excellence, The United Soybean Board (USDA soy "Checkoff" program), The Tate and Lyle Nutritional Research Fund at the University of Toronto, The Glycemic Control and Cardiovascular Disease in Type 2 Diabetes Fund at the University of Toronto (a fund established by the Alberta Pulse Growers), The Plant Protein Fund at the University of Toronto (a fund which has received contributions from IFF), and The Nutrition Trialists Network Research Fund at the University of Toronto (a fund established by an inaugural donation from the Calorie Control Council). 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He is on the Clinical Practice Guidelines Expert Committees of Diabetes Canada, European Association for the study of Diabetes (EASD), Canadian Cardiovascular Society (CCS), and Obesity Canada/Canadian Association of Bariatric physicians and Surgeons. He serves as an unpaid member of the Board of Trustees and formerly served as an unpaid scientific advisor for the Carbohydrates Committee of IAFNS. He is a Director at Large of the Canadian Nutrition Society (CNS), founding member of the International Carbohydrate Quality Consortium (ICQC), Executive Board Member of the Diabetes and Nutrition Study Group (DNSG) of the EASD, and Director of the Toronto 3D Knowledge Synthesis and Clinical Trials foundation. His spouse is an employee of AB InBev.

ADDITIONAL INFORMATION

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