

LETTER TO THE EDITOR

Excess free fructose and childhood asthma

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I read the article that appeared in your March 2015 issue titled, 'Associations of sugar-containing beverages with asthma prevalence in 11-year-old children: the PIAMA birth cohort'¹ with great interest. Further insights could be gained if Berentzen *et al.* would be able to elaborate on their research by separating intake frequencies of apple juice (AJ) and orange juice (OJ) in their regression analyses. In their study, researchers suggested that the association between sugar-containing beverage (SCB) intake and childhood asthma might be explained by the 'sugar hypothesis'—that an inflammatory pathway initiated by the sugar in SCB might explain the correlation with asthma.¹ Results of other recently published research do not support a role for the 'sugar hypothesis' in association with childhood asthma.

By conducting separate analyses of these two juices, Berentzen *et al.* would be able to distinguish between two very distinct types of sugars in 100% juices. Specifically, per 100 g, the amount of total sugars in AJ and OJ are comparable; AJ contains 9.6 g and OJ contains 8.8 g of total sugars.² Whereas analysis of their excess free fructose (EFF) contents suggests these juices are very different from one another. Specifically, per 100 g, AJ contains 3.1 g of EFF and OJ contains 0.2 g of EFF. Therefore, per 100 g, AJ contains 16 times more EFF than OJ.²

Recently, collaborators and I conducted a similar cross-sectional epidemiology study titled, 'Intakes of apple juice, fruit drinks and soda are associated with prevalent asthma in US children aged 2–9 y'. The study was published in the April 2015 issue of *Public Health Nutrition*.³ Results of the study showed a statistically significant correlation between intakes of high EFF beverages, including AJ, fruit drinks (FD) and non-diet soda (ndSD), and prevalent asthma in US children. In the analyses of OJ, results suggested OJ was inversely correlated with childhood asthma. The study tested the hypothesis that intakes of high EFF beverages are correlated with asthma, independent of covariates.³

The study was designed to epidemiologically test a mechanistic hypothesis I put forth in 2012 to explain how consumption of high fructose corn syrup—a high EFF sweetener—could be associated with aberrant respiratory symptomatology. In the 'intestinal enFruAGE hypothesis', fructose malabsorption (FM) underlies the association between EFF intake and childhood asthma. Unabsorbed fructose leads to the intestinal *in situ* formation of advanced glycation end products (enFruAGEs). Upon absorption, enFruAGEs enter the systemic circulation, travel to the lungs—a tissue with high receptor for advanced glycation end product concentration—and activate asthma-associated pro-inflammatory signaling.⁴

According to existing FM research, FM affects people, particularly children, after eating foods high in fructose relative to

glucose (that is, high EFF) but not after consumption of sucrose (that is, table sugar) or equivalent amounts of fructose and glucose monomers.^{5–9} The results of our epidemiology research indicated that AJ—a high EFF beverage that contains a 2:1 ratio of fructose and glucose monomers²—was significantly associated with pediatric asthma;³ whereas OJ, a non-EFF beverage that contains a 1:1 ratio of fructose and glucose monomers,² was inversely correlated with asthma. When we held AJ, FD and ndSD constant, OJ appeared protective against asthma.³ This suggests that it is the absence of EFF intake by OJ consumers that is attributable for the inverse correlation between OJ consumption and asthma. Results suggest a nexus exists between EFF intake, FM and childhood asthma.

I hope it is possible that Berentzen *et al.* could conduct further analyses.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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