



Review

Is refined carbohydrate consumption related to allergic diseases?

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ABSTRACT

Exposure to refined carbohydrates has been found to be associated with disorders such as increased blood pressure, retinopathy, adipose tissue inflammation, glucose intolerance, type 2 diabetes mellitus, poor metabolic profile, esophageal adenocarcinoma, and small intestine, prostate, pleural, and pancreatic cancers. Additionally, recent studies have demonstrated that ingestion of refined carbohydrates is related to secretion of cytokines and chemokines. However, to our knowledge, there is still no data on the relationship between refined carbohydrate consumption and allergic disorders ranging from bronchopulmonary to skin diseases. Therefore, the purpose of this review was to evaluate whether consumption of refined carbohydrates plays a role in allergic diseases.

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Introduction

Several studies have demonstrated that exposure to refined carbohydrates is associated with disorders such as increased blood pressure, retinopathy, adipose tissue inflammation, glucose intolerance, type 2 diabetes mellitus (DM), poor metabolic profile, esophageal adenocarcinoma, and small intestine, prostate, pleural, and pancreatic cancers [1–5].

It has been demonstrated that fresh fruit consumption is closely related to a decrease in wheezing, shortness of breath, and nocturnal and chronic cough (odds ratio [OR], 0.51, 0.37, 0.37, and 0.51, respectively; $P = 0.090$, 0.022 , <0.001 , and $= 0.021$, respectively). Consumption of bread and margarine together, however, was related to wheezing (OR, 2.52; $P = 0.024$). Consumption of margarine for cooking or sauces was not related with wheezing, shortness of breath, or allergic rhinitis ($P < 0.05$) [6]. Despite the neutral effect of margarine on wheezing, the positive effect of margarine with bread on allergic disorders could be related to refined carbohydrate effect. As mentioned, consumption of refined carbohydrates including bread might play a role on allergic respiratory system disorders.

A recent controlled study demonstrated that asthma is associated with increased risk for DM (hazard ratio, 2.11; 95% confidence interval, 1.43–3.13; $P < 0.001$). In this study the follow-up period was about 2 to 13 y. The increased risk for DM remained the same even after it was adjusted for race and ethnicity. Additionally, the incidence of DM has shown linear increase with increasing years of follow-up in patients with asthma [7]. These findings provide important insights for the association of glucose metabolism disorders and allergic diseases.

To our knowledge, no direct evidence proving the relationship between refined carbohydrate consumption and allergic skin lesions have been published. However, there is limited literature on the relationship between carbohydrate consumption and inflammatory skin lesions. In a study conducted in cattle, it was determined that laminitis, an inflammatory skin lesion, is related to carbohydrate overfeeding [8]. Furthermore, in support of this finding, it was demonstrated that after 12 weeks follow-up mean number of total and inflammatory acne lesions was significantly reduced in low-carbohydrate diet group compared to control group [9].

Refined carbohydrate exposure in rats caused increased blood pressure and increased urinary excretion of norepinephrine, dopamine, and epinephrine. After 2 to 3 mo, retinal capillary basement membrane damage, including thickening of capillary basement membranes, loss of homogeneity, and debris inclusions, was observed in rats ingesting large amounts of sucrose. In conclusion these authors suggested that refined

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carbohydrate ingestion led to increased blood pressure via increased catecholamine production and/or release [1]. In relation to this rat study, a recent mice study found that refined carbohydrate consumption is related to adipose tissue inflammation. Mice fed a high refined carbohydrate-containing diet exhibited visceral adiposity, glucose intolerance, decreased insulin sensitivity, hyperlipidemia, and altered circulating levels of adiponectin, resistin, and leptin. After 3 d on the high-carbohydrate diet, the number of macrophages, lymphocytes, and neutrophils of mice adipose tissue increased. Additionally, various cytokine and chemokine levels including tumor necrosis factor- α , interleukin (IL)-6, IL-10, transforming growth factor- β 1, chemokine (CC motif) ligand 2, and chemokine (C-X-C motif) ligand 1 also increased throughout the experimental period [2].

These findings suggest that intake of refined carbohydrates induced the release of cytokines and chemokines, playing an important role for allergic diseases underlying the mechanism. However, studies supporting these publications do not illustrate a direct association between refined carbohydrate intake and allergic diseases in humans. Further studies are needed to investigate this relationship. Overall, in light of recent evidence that includes independent associations between refined carbohydrate ingestion, glucose metabolism disorders, and the release of cytokines, dietary modification may provide benefits for improvement of allergic symptoms in patients with allergic disorders.

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