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Season of birth and food-induced anaphylaxis in Boston

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Keywords

food-induced anaphylaxis; season of birth; ultraviolet light B; vitamin D

Atopic diseases are a growing problem worldwide. Several lines of evidence link ultraviolet light B (UVB) sunlight exposure and/or vitamin D status to atopic disorders, such as asthma (1) and atopic dermatitis (2). A complete model of the risk factors and pathogenesis of food allergy remains elusive. In 2007, Camargo and colleagues proposed that vitamin D status might influence risk of food-induced anaphylaxis (FIA) after observing a strong north–south gradient in epinephrine autoinjector prescription rates in the United States (3). Because UVB exposure and vitamin D status are strongly related to season at higher latitudes (4), with lowest levels of both observed during the late fall and winter seasons, we hypothesized that a higher percentage of Boston patients with FIA would be born in the fall and winter seasons. To examine this hypothesis, we investigated (i) whether season of birth might be associated with risk of FIA in a broad group of patients and (ii) if such an association was identified, would it differ by age.

Children in Boston with food-induced anaphylaxis are more often born in fall or winter.

We identified all patients with FIA receiving care at Massachusetts General Hospital (MGH) between 1 January 2000 and 31 December 2008. MGH is a large academic medical centre in Boston (latitude 42°N) with extensive outpatient and inpatient services for both children and adults. We screened hospital databases for relevant International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes (995.60–995.69, anaphylactic shock because of unspecified and specified food) that have been identified by our group as effective and accurate in identifying FIA in hospital databases (5). For analytical purposes, months of birth were grouped by season: spring (March/April/May), summer (June/July/August), fall (September/October/November) and winter (December/January/February).

We identified 3792 unique patients with FIA. The ages ranged from 1 month to 86 years, 55% were women and 73% were white. We found that birth in fall or winter was more common among children aged <18 years but not in older patients (Fig. 1). Among 1719 children aged <18 y, the seasonal distribution of births was spring 21%, summer 25%, fall 26% and winter 28%. Thus, compared to spring, fall and winter births were 25% and 32% more common, respectively. Combined, births in fall/winter were more common than births in spring/summer (54% vs 46%, respectively; $P < 0.001$). These seasonal differences are not explained by overall national or state census season of birth patterns which display a consistent peak in late summer (http://www.cdc.gov/nchs/data_access/vitalstats/Vital-Stats_Births.htm). A predominance of births in fall/winter months and nadir of births in

spring months were found in all age ranges under 18 y. Fall/winter births were not more common among 2073 patients with FIA aged 18 y or older (49% vs 51%, $P = 0.29$).

The association between season of birth and FIA expands on the known risk factors associated with development of FIA and suggests that dysfunction during early periods of immune system maturation may contribute to the development of food allergies. Although the excess in fall/winter births is modest, this finding may illuminate an unrecognized and important component of the pathogenesis of food allergy in children. We speculate that vitamin D may be the factor that mediates the observed association between season of birth and childhood FIA as there is inadequate UVB intensity for synthesis of active vitamin between the months of November and April in Boston (6). Although we are confident of the veracity of this season of birth–FIA association, we acknowledge that many other factors (such as infections, dietary patterns and indoor pollutants) may contribute to FIA pathogenesis and the observed seasonal patterns. Further studies on the vitamin D deficiency – food allergy hypothesis are required before recommending vitamin D supplementation and/or sun exposure for the specific purpose of food allergy prevention.

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Figure 1.
Seasons of birth of Boston children with food-induced anaphylaxis.