Why Does Australia Appear to Have the Highest Rates of Food Allergy?

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KEYWORDS

• Peanut allergy • Prevalence • Hygiene hypothesis • Microbial exposure • Migration • Food allergy • Vitamin D

KEY POINTS

- Food allergy is on the rise in developed countries and has been well-described in Australia using challenge-proven outcomes. It is believed to be linked to the modern-day lifestyle.
- The 3 key hypotheses for the rise in food allergy in the 21st century are currently (1) the hygiene hypothesis (which includes microbial diversity); (2) the dual allergen exposure (or Lack) hypothesis, and (3) the vitamin D hypothesis. There are as yet few published data with regard to other factors pertaining to food allergy as an outcome, although there are many studies in progress.
- High rates of food allergy in infants of Asian migrants provide a unique opportunity to explore possible explanations for this modern day phenomenon.

INTRODUCTION

Food allergy appears to have risen in many developed countries around the world but none more so than in Australia.[1–4] We reported in 2011 that in a population cohort of more than 5000 1-year-old infants, more than 10% had evidence of challenge-proven food allergy.[1] Although there are now many hypotheses as to why food allergy appears to be rising worldwide, until recently there has been little direct evidence formally

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evaluating risk factors in populations in which the rise has been demonstrated. The current leading hypotheses of postnatal modifiable factors for the rise in food allergy are (1) the "dual allergen exposure" or Lack hypothesis, (2) the vitamin D hypothesis, and (3) the hygiene hypothesis (which includes factors associated with microbial diversity and the modern lifestyle). This review will present insights from the one of the first large-scale studies, the Healthnuts study, to formally assess these hypotheses using challenge-confirmed food allergy undertaken in all food-sensitized infants. By reviewing the literature, particularly in reference to studies that use the gold standard of oral food challenge, this article aims to understand potential lifestyle and environmental factors that might be driving the Australian epidemic and reviews other potential hypotheses that are as yet unstudied but may also contribute to this perplexing phenomenon of the 21st century.

HOW CONVINCING IS THE EVIDENCE FOR A 10% PREVALENCE OF FOOD ALLERGY IN AUSTRALIA?

The Healthnuts study provided evidence of unexpectedly high rates of challenge-proven immunoglobulin (Ig)E-mediated food allergy in infants in Melbourne, Australia, an urban population in Australia's most southern mainland city.[1] These findings may not be generalizable to other more rural areas of the state of Victoria because of differences in distribution of potentially protective factors, such as microbial exposure linked to contact with livestock or other rural factors. However, the prevalence of peanut allergy in Healthnuts (3%) is similar to the overall Victorian prevalence reported in the Longitudinal Study of Australian Children of 2.9% parent-reported peanut allergy in a cohort of more than 4000 children aged 6 to 7 years.[5] Because peanut allergy is uncommonly outgrown and peanut allergy is invariably IgE-mediated, this similarity between the 2 Victorian-based cohorts is reassuring. Findings from Healthnuts are also not necessarily applicable to other Australian states because there is evidence of a latitude gradient of food allergy prevalence in Australia, as there is for North America and Chile, with those living farthest from the equator in the south of Australia (including Victoria) having higher rates than those living farther north.[5,6]

Although higher than initially expected when the study was mounted, the high prevalence of food allergy found in Australia is not particularly surprising when viewed in the context of Australian hospital admission figures for food-induced anaphylaxis, which have risen fivefold in young children from the mid-1990s to the mid-2000s,[7] with similar increases in allergy waiting lists, which are now more than 12 months for most specialty clinics around the country. To date, these observations are limited to young children with only modest increases of anaphylaxis admissions for older children and adults[7] and no formal reports of rising rates in the adult population. A high food allergy prevalence in Australian infants is also consistent with the country having one of the highest rates of asthma and eczema in the world, perhaps suggesting a second-wave epidemic of allergic disease.[8]

One last factor to consider is that the Healthnuts study used raw egg for its oral food challenges, which may have overestimated clinically relevant egg allergy, a large determinant of the high prevalence of positive challenges. Countering this, however, is the observation that a history of acute allergic reactions to egg were reported by 6.5% of those exposed to dietary egg by age 1 year (K.J. Allen and J.J. Koplin, personal communication, 2011). As Lack observed, the prevalence of baked egg allergy (the most severe egg allergy phenotype) was 2% in Healthnuts, which is much more in line with prevalence rates published of challenge-proven semicooked egg allergy in the United Kingdom.[9]