

## Original Article

# The Prevalence of Food Sensitization Appears Not to Have Changed between 2 Melbourne Cohorts of High-Risk Infants Recruited 15 Years Apart

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**What is already known about this topic?** Recent reports suggest that the prevalence of food sensitization in the general population of older children has not changed over the last 2 decades, which is surprising considering the apparent increase in food allergy reported from multiple sources.

**What does this article add to our knowledge?** This article suggests that the prevalence of food sensitization has remained stable between 1990-1994 and 2007-2011 among infants at high risk of food allergy with a family history of allergic disease, even though anaphylaxis hospital admission rates have increased markedly over this same period.

**How does this study impact current management guidelines?** These findings suggest that because the prevalence of food sensitization has not changed, the increase in food allergy could be due to an increase in the proportion of high-risk infants within the total population, an increase in food allergy in the low-risk group, or changes in the relationship between food sensitization and food allergy. An alternative explanation is that food allergy may not be on the rise and any apparent increase is due to increased awareness, informal self-reported diagnosis, formal diagnosis by health professionals, or increased number and/or severity of reactions, particularly anaphylaxis.

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*Abbreviations used**CI- Confidence interval**MACS- Melbourne Atopy Cohort Study**PPV- Positive predictive value**SPT- Skin prick test*

**BACKGROUND:** Although food allergy has probably risen over recent decades, recent reports suggest that the prevalence of food sensitization in the general population has not changed. However, this has not been analyzed in infants at high risk of food allergy.

**OBJECTIVE:** The objective of this study was to compare the prevalence of food sensitization in high-risk infants from 2 cohorts recruited 15 years apart in the same region.

**METHODS:** This study includes 620 high-risk infants with a family history of allergy (Melbourne Atopy Cohort Study [MACS]) born 1990-1994, and a subgroup of high-risk infants from the population-based HealthNuts study ( $n = 3,661/5,276$ ), born 2006-2010. Both studies undertook skin prick tests (SPT) to peanut, egg, and milk at age 12 months. A logistic regression model generated adjusted prevalences to account for differences in sampling frame. SPT  $\geq 95\%$  positive predictive values (PPVs) for food allergy were used as proxies for food allergy.

**RESULTS:** The adjusted prevalence of sensitization in MACS was similar to the observed prevalence of sensitization in the high-risk subgroup of HealthNuts: 7.9% (95% confidence interval 6.8-8.9) and 7.9% (7.0-8.8) respectively for peanut, 15.0% (13.4-16.6) and 14.5% (13.4-15.7) respectively for egg, and 2.4% (1.6-3.1) and 2.6% (2.0-3.4) respectively for cow's milk. The prevalence of SPT  $\geq 95\%$  PPVs was similar between the 2 studies.

**CONCLUSIONS:** The prevalence of food sensitization among high-risk infants has remained stable in Australia since the 1990s, despite the reported increase in food-related anaphylaxis in the same period. This discrepancy could be due to increased food allergy in the low-risk population, increased conversion of food sensitization to allergy, or increased number of high-risk infants. Alternatively, increased awareness or severity of reactions may have led to an apparent increase in food allergy. © 2017 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2017;■:■-■)

**Key words:** Cow's milk allergy; Egg allergy; Food allergy; Food sensitization; Peanut allergy; Time trends

It has been suggested that the prevalence of food allergy has risen over the last 2 decades, representing a "second wave" of the allergy epidemic.<sup>1</sup> Data to support this increased prevalence come from published reports of increased hospital admissions for anaphylaxis, auto-injector adrenaline prescriptions, referrals for allergy services, and reports of doctor-diagnosed food allergies.<sup>2-10</sup> Repeated cross-sectional studies are needed to establish an increase in prevalence; there is, however, only one such food allergy prevalence study in the same region using oral food challenge-proven outcomes. In that study, the prevalence of food allergy in 0- to 2-year olds from Chongqing, China, increased from 3.5% in 1999 ( $n = 314$ ) to 7.7% in 2009 ( $n = 401$ ,  $P = .017$ ).<sup>11</sup>

A related measure is food sensitization, an immunological biomarker of a predisposition to food allergy. Food sensitization is a necessary, but not sufficient condition for food allergy: only a proportion of those with detectable food-specific IgE will develop clinically provable food allergy, with the remainder being sensitized yet able to tolerate the food. Nevertheless, the prevalence of food sensitization remains an indicator of the prevalence of food allergy.

In the Chinese study, the prevalence of food sensitization rose from 9.9% in 1999 to 18.0% in 2009.<sup>11</sup> In contrast, 2 recent reports from substantially larger repeated cross-sectional studies have demonstrated that the prevalence of food sensitization has remained stable over a similar time period. In the United States, the prevalence of sensitization to peanut, egg, and milk among 6- to 19-year olds remained stable between 1988-1994 and 2005-2006, although there was a trend towards increased high-level peanut sensitization, but only among non-Hispanic black children, whereas the prevalence of shrimp sensitization decreased.<sup>12</sup> Egg and milk allergy are common food allergies in infancy that frequently resolve in early childhood, so the older children in these cohorts may not be the optimal age to assess time trends in prevalence of egg and milk sensitization. In the UK, peanut sensitization in 2 birth cohorts recruited 12 years apart (1989 and 2001-2002) was nearly identical at age 1 year. Although peanut sensitization was higher in the more recent cohort between ages 2 and 10 years, this difference was not statistically significant. The prevalence of peanut allergy at age 10 years was also higher in the more recent cohort 1.5% versus 0.58% although this difference did not quite reach statistical significance ( $P = .09$ ).<sup>13</sup>

Changes in the prevalence of food sensitization in Australia, which has the highest reported prevalence of challenge-confirmed food allergy internationally, have not previously been investigated using data collected from repeated cross-sectional studies.<sup>14</sup> Moreover, the above studies did not assess changes in the prevalence of food sensitization stratified for risk determined by the family history of allergic disease. Here we investigated the prevalence of food sensitization among high-risk infants with a family history of allergic disease between 2 cohorts of infants recruited in Melbourne, Australia, 15 years apart.

## METHODS

Data used in the present analysis include 620 infants with a family history of allergy from the Melbourne Atopy Cohort Study (MACS) recruited between 1990 and 1994, and 5,276 infants from the population-based HealthNuts study, born in 2006-2010 and recruited at age 12 months (2007-2011). Both studies undertook skin prick tests (SPT) to common food allergens (egg, peanut, and milk) at 12 months of age using the same lancet device.<sup>15,16</sup> Sensitization was defined at SPT  $\geq 2$  mm and the 95% positive predictive value (PPV) for clinical food allergy was defined at SPT  $\geq 8$  mm for peanut and milk and SPT  $\geq 4$  mm for egg.<sup>17</sup>

## Melbourne Atopy Cohort Study

MACS is a high-risk longitudinal birth cohort of 620 infants and their families who were recruited between 1990 and 1994. Expectant mothers were approached during routine antenatal care and invited to enrol in the study if the unborn child had a parent or older sibling with a history of allergic disease (asthma, eczema, allergic rhinitis, or food allergy). The MACS infants were followed up 18 times in the first 2 years of life by use of a nurse-administered

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