modifies risk of allergic diseases such as asthma, allergic rhinitis, and food allergy, although, notably, the investigators did not find an association between vitamin D levels and eczema. Further study is needed to determine whether correction of vitamin D insufficiency would result in decreased food allergy and increased tolerance among those sensitized.

Elizabeth J. Feuille, MD
Anna H. Nowak-Węgrzyn, MD
New York, NY

Maternal and Newborn Vitamin D Status and Its Impact on Food Allergy Development in the German LINA Cohort Study

PURPOSE OF THE STUDY. To investigate the relationship of maternal and cord blood vitamin D levels on atopic outcomes in early childhood.

STUDY POPULATION. A total of 378 mother-infant pairs from Leipzig, Germany, a subgroup of the LINA (Lifestyle and environmental factors and their Influence on Newborns Allergy risk) cohort study, were included. Mothers with immune or infectious disease concerns during the pregnancy were excluded.

METHODS. Blood samples were collected from expectant mothers at the 34th week of gestation and from infant cord blood at delivery for measurement of vitamin D (25(OH)D3). Regulatory T cells were also quantified from cord blood samples. Total IgE and allergen-specific IgE measurements were determined at birth (cord blood) and at 1 and 2 years of age in participating children. During pregnancy and at the children’s first and second birthdays, parents completed questionnaires regarding family history of atopy, housing and environmental conditions, and atopic outcomes of their children (doctor-diagnosed atopic dermatitis and/or food allergy or parental report of symptoms consistent with atopic dermatitis).

RESULTS. A high correlation was observed between maternal and cord blood 25(OH)D3 levels (R = 0.812, P < .001). Most pregnant women included in the study were either 25(OH)D3 deficient (<20 ng/mL; 44%) or insufficient (20–29.9 ng/mL; 25.7%), and few received vitamin D supplementation during pregnancy. Maternal 25(OH)D3 levels were positively associated with children’s risk of diagnosis of food allergy (adjusted odds ratio [aOR]: 3.66; 95% confidence interval [CI]: 1.36–9.87) in the second year of life or within the 2-year lifetime period (aOR: 1.91; 95% CI: 1.09–3.37), and with sensitization to food allergens (aOR: 1.59; 95% CI: 1.04–2.45) in the second year of life. Cord blood 25(OH)D3 levels were associated with diagnosis of food allergy in the second year of life (aOR: 4.65; 95% CI: 1.50–14.48) and negatively correlated with regulatory T-cell numbers (R = −0.168, P = .031).

CONCLUSIONS. Higher vitamin D levels in pregnancy and at birth were associated with a higher risk of food allergy and lower numbers of regulatory T cells.

ENVIRONMENTAL AND DEMOGRAPHIC RISK FACTORS FOR EGG ALLERGY IN A POPULATION-BASED STUDY OF INFANTS

PURPOSE OF THE STUDY. To determine the influence of a variety of environmental and demographic factors on the development of challenge-confirmed egg allergy in infants.

STUDY POPULATION. The study included 5276 infants presenting for their 12-month immunizations in Melbourne, Australia, with a focus on 453 infants with egg allergy confirmed by oral food challenge.

METHODS. At the time of initial testing, parents completed a questionnaire regarding a variety of environmental exposures and demographic factors. Infants underwent skin-prick testing (SPT) to egg regardless of history of reaction. Infants with a positive SPT then underwent additional testing, including allergen-specific immunoglobulin E testing by ImmunoCAP and an oral food challenge to egg. Infants with SPT > 2 mm and positive challenge were deemed egg allergic. Multivariable logistic regression was used to determine factors associated with challenge-confirmed egg allergy. Adjustment was made for multiple confounding variables.

RESULTS. Factors that demonstrated a low risk for the development of egg allergy included having older siblings and having a dog in the house. Having siblings < 6 years of age and having multiple siblings showed an even
greater risk reduction. Factors associated with higher risk of developing egg allergy in infancy included a parent and/or sibling with a history of allergic disease and parents born in East Asia. Factors that showed no significant association included mode of delivery, antibiotic use during infancy, day care attendance, and maternal age.

CONCLUSIONS. This study demonstrates a lower risk for the development of egg allergy at age 1 year by having siblings and dogs in the home. Children with an immediate family history of allergic disease and having parents of East Asian (as opposed to Australian) origin show an increased risk.

REVIEWER COMMENTS. This is the first large population-based study of its type using the gold standard of oral food challenge. It is not entirely surprising that sibling and dog exposure in the first year of life may be protective against the development of egg allergy. Other studies have shown that first-born children (with no older siblings) may be more likely to develop allergy. Also, pet exposure in early life might reduce the risk for respiratory allergies. These findings have been controversial, perhaps because of many confounding variables. Australian-born infants with parents of East Asian origin may represent a gene-environment interaction in which feeding habits could play a role. It is important to note that this study analyzes egg allergy at age 1. It is important to note that the authors have previously demonstrated, in the same patient population, that delayed introduction of egg (>6 months old) is a significant risk factor in development of pediatric allergy regardless of family history. Timing of introduction was adjusted for in this current study. It would be interesting to see if the same factors increase/decrease risk for egg allergy as this population matures.

Timing of Infant Feeding in Relation to Childhood Asthma and Allergic Diseases


PURPOSE OF THE STUDY. To evaluate the association between duration of breastfeeding (BF) and introduction of complementary foods on the development of asthma and other allergic conditions by the age of 5 years.

STUDY POPULATION. The study population consisted of 3781 Finnish children already enrolled in the Finnish Type 1 Diabetes Prediction and Prevention study, a multicenter, prospective, population-based cohort study that recruited children with HLA-conferred susceptibility to type 1 diabetes mellitus. Those who were still actively participating in the dietary study at age 5 years were invited to participate in the allergy study.

METHODS. Parents were asked to complete age-specific dietary questionnaires that assessed pattern of BF, use of infant formula, cow’s milk, dietary supplements, and other complementary foods consumed at ages 3, 6, and 12 months, respectively. Additionally, an “age at introduction of new foods form” was kept by parents and recorded dietary history up to age 2 years. Then at age 5 years, children were assessed for asthma or other allergic diseases using a modified form of the International Study of Asthma and Allergies in Childhood questionnaire, as well as clinical history of physician-diagnosed asthma, allergic rhinitis (AR), and/or atopic dermatitis (AD). Additionally, specific immunoglobulin E testing (via ImmunoCAP analysis) was performed to a select number of food and inhalant allergens with atopic sensitization defined as a serum level >0.35 kU/L to each allergen tested.

RESULTS. Of 3781 children in the study, 6.2% had asthma, 37.0% had AD, and 14.0% had AR, with 38.0% sensitized to any allergen. The median duration of exclusive BF was 1.4 months (0.2–3.5 months), with total duration of BF of 7 months (4–11 months). A total time of BF of ≥9.5 months showed an increased risk of nonatopic asthma. The introduction of cow’s milk (median age 1.8 months), as well as cereals, including maize, rice, millet, and buckwheat, by 4 months of age, was associated with the development of AD. Introduction of wheat, rye, oat, and barley cereals by 5.0 to 5.5 months was inversely associated with atopic disease, including asthma, AR, and atopic sensitization. Introduction of egg (<11 months) was inversely associated with asthma, AR, and atopic sensitization, whereas introduction of fish (<9 months) was inversely associated with AR and atopic sensitization.

CONCLUSIONS. Results indicate that a longer duration of BF appears to be protective against the development of nonatopic asthma. Overall, early introduction of certain cereals (wheat, rye, oat, barley), fish, and egg appears to offer protection from asthma and atopic disease by age 5 years.

REVIEWER COMMENTS. This study confirms the importance of BF in reducing risks of atopy, and it also shows a new finding that total BF rather than exclusive BF may be most important. The results also underscore the value of continued study of mucosal immunity in infants and the role of early dietary introduction of specific foods.
# Environmental and Demographic Risk Factors for Egg Allergy in a Population-Based Study of Infants


*Pediatrics* 2013;132;S8

DOI: 10.1542/peds.2013-2294K

<table>
<thead>
<tr>
<th>Updated Information &amp; Services</th>
<th>including high resolution figures, can be found at:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissions &amp; Licensing</td>
<td>Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:</td>
</tr>
<tr>
<td>Reprints</td>
<td>Information about ordering reprints can be found online:</td>
</tr>
</tbody>
</table>

Updated Information & Services including high resolution figures, can be found at: /content/132/Supplement_1/S8.2.full.html

Permissions & Licensing Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: /site/misc/Permissions.xhtml

Reprints Information about ordering reprints can be found online: /site/misc/reprints.xhtml

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2013 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.
Environmental and Demographic Risk Factors for Egg Allergy in a Population-Based Study of Infants

Pediatrics 2013;132;S8
DOI: 10.1542/peds.2013-2294K

The online version of this article, along with updated information and services, is located on the World Wide Web at:
/content/132/Supplement_1/S8.2.full.html