an increased diagnosis of atopic dermatitis ($P = .007$). The majority of these atopic dermatitis patients with positive results from SPTs at 1 year of age were sensitized to food (91.6%), most commonly eggs (83%).

CONCLUSIONS. There is poor agreement between the results of SPTs and SSIgE tests in early childhood, particularly in testing for sensitivity to food allergens and in testing at a younger age; therefore, these 2 tests cannot be used interchangeably. At least 1 SPT with positive results for sensitivity to an aeroallergen or food allergen at 1 year of age was predictive of the occurrence of atopic dermatitis during the follow-up period lasting up to 6 years of age.

REVIEWER COMMENTS. This birth cohort study is unique in that it evaluates for consistency between the results of SPTs and SSIgE levels over time in the early childhood population. Exploration in a more diverse population that is not limited to the rural setting and in a larger cohort would be beneficial because a low number of subjects in this study had positive SPT results. The poor correlation between SPT and SSIgE test results seen in this study provides additional insight regarding the development and natural course of sensitization in early childhood and suggests that correlation with clinical outcomes remains essential.

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Thumb-Sucking, Nail-Biting, and Atopic Sensitization, Asthma, and Hay Fever

Lynch SJ, Sears MR, Hancox RJ. *Pediatrics*. 2016;138(2): e20160443

PURPOSE OF THE STUDY. Thumb-sucking and nail-biting are common behaviors in children that likely increase exposure to microbes. The hygiene hypothesis suggests that children with early exposure to a more diverse array of microbes may have a decreased risk of developing atopic diseases. The authors of this study examine the relationship between thumb-sucking and nail-biting habits in children and the development of atopy.

STUDY POPULATION. This was a population-based birth cohort with 1037 subjects born in Dunedin, New Zealand. Subjects were managed to age 38 years.

METHODS. Parents were asked to report their children's thumb-sucking and nail-biting behaviors at ages 5, 7, 9, and 11 years. Skin prick testing for common aeroallergens was completed at age 13 years and again at age 32 years. Participants were regarded as having atopic sensitization if they had 1 or more positive skin prick test results. Asthma status was based on reported diagnosis and symptoms. The presence of hay fever was based on self-report at age 13 and 32 years. Logistic regression analysis of thumb-sucking and nail-biting behaviors and atopic sensitization, asthma, and hay fever was performed for subjects at ages 13 and 32 years.

RESULTS. Thumb-sucking and/or nail-biting was reported in 317 of 1013 children (31%). Skin prick testing was completed in 724 children at age 13 years. Atopic sensitization was significantly less prevalent in those with either or both thumb-sucking or nail-biting behaviors compared with those without those behaviors at both 13 (odds ratio 0.67; 95% confidence interval 0.48–0.92) and 32 years of age (odds ratio 0.61; 95% confidence interval 0.46–0.81). The prevalence of atopic sensitization was 49% in children with neither behavior, 40% in those with 1 behavior, and 31% in those with both behaviors. Children with a history of either behavior had fewer total positive skin prick test results and smaller wheal sizes at age 13 and 32 years. However, there was no significant difference in the prevalence of asthma or hay fever among those with thumb-sucking or nail-biting behaviors compared with participants without those habits.

CONCLUSIONS. The authors concluded that thumb-sucking and nail-biting behaviors in early childhood were associated with a decreased risk of atopic sensitization at age 13 years, with continuation of this effect through age 32 years. There was no protective effect of these behaviors on the development of asthma or hay fever. The authors suggested that this could be due to factors besides atopy that contribute to the development of asthma and hay fever. They also attributed this to the subjective nature of the assessment of asthma and hay fever in this study. The authors concluded that their study supports the notion of the hygiene hypothesis in the development of allergies. Although they suggest a beneficial effect of thumb-sucking and nail-biting habits, they do not recommend encouraging these behaviors in children.

REVIEWER COMMENTS. Perhaps parents everywhere don't need to yell, "Get your hands out of your mouth!" quite so often. The authors of this fascinating article study the association of common childhood behaviors that likely increase oral exposure to bacteria in early childhood with the development of atopy. Although a long-lasting association of less atopic sensitization was identified, there was no similar effect on the actual development of atopic diseases, such as asthma and hay fever. This limits the clinical applicability of these study results, similar to multiple other studies identifying lower allergic sensitization associated with prenatal and/or early life exposures but not necessarily less allergic disease. Adverse effects of thumb-sucking and/or nail-biting, such as infection and dental malocclusion, must also be considered before we advise parents to encourage these behaviors in the hopes of preventing allergies later in life. Although these data further support the hygiene hypothesis, the determination

of onset of allergic disease remains a complicated amalgam of genetic and environmental contributions that have yet to be fully understood.

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Is There a March From Early Food Sensitization to Later Childhood Allergic Airway Disease? Results From Two Prospective Birth Cohort Studies

Alduraywish SA, Standl M, Lodge CJ, et al. *Pediatr Allergy Immunol*. 2017;28(1):30–37

PURPOSE OF THE STUDY. To investigate the association between food sensitization in the first 2 years of life and subsequent asthma and allergic rhinitis (AR) by age 10 to 12 years.

STUDY POPULATION. The study consisted of 2 independent cohorts, with 620 subjects from the high-risk (first-degree relative with atopy) Melbourne Atopic Cohort Study (MACS) and 3094 subjects from the German population-based birth cohort study called LISAplus. Both studies were conducted in countries with relatively high income and high rates of food sensitization and allergic diseases.

METHODS. For both cohorts, researchers assessed sensitization to common aeroallergens and food allergens, with researchers in the MACS doing so at 6, 12, and 24 months via skin prick tests (wheal size ≥2 mm) and researchers in the LISAplus doing so at 2 years of age via serum-specific immunoglobulin E antibody level (≥0.35 kU_A/l). Allergic outcomes were defined by questionnaire responses at 10 (LISAplus) and 12 (MACS) years. Logistic regression analysis was performed to calculate odds ratios that were adjusted (aORs) for confounding factors (eczema and/or wheeze by the age at which sensitization was assessed).

RESULTS. Sensitization to food only, compared with non-sensitized children, at 12 months in the MACS and 24 months in the LISAplus was associated with an increased risk of current asthma (aOR = 2.2 in the MACS; aOR = 4.9 in the LISAplus), with similar results for AR. Cosensitization to food and aeroallergens was a stronger predictor of asthma and AR at any tested point in both cohorts (at 24 months: asthma aOR = 8.3 in the MACS and aOR = 14.4 in the LISAplus; AR aOR = 3.9 in the MACS and aOR = 7.6 in the LISAplus).

CONCLUSIONS. The findings of these prospective birth cohort studies suggest that food sensitization in the first 2 years of life leads to an increased risk of the subsequent development of asthma and AR.

REVIEWER COMMENTS. The role of food sensitization in the atopic march from eczema to allergic airway disease is not fully clear. The authors of this study establish a link between early food sensitization and asthma and AR at age 10 to 12 years, even while controlling for confounding factors such as aeroallergen sensitization and early-life eczema and/or wheeze. This association is increasingly relevant in light of recent evidence that early peanut introduction can successfully prevent peanut allergy. With this study, the authors raise the as-of-yet unanswered question of whether such interventions could potentially impact not only the incidence of food allergy but also the subsequent development of allergic rhinitis and asthma.

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Fish Intake During Pregnancy or Infancy and Allergic Outcomes in Children: A Systematic Review and Meta-analysis

Zhang GQ, Liu B, Li J, et al. *Pediatr Allergy Immunol*. 2017;28(2):152–161

PURPOSE OF THE STUDY. To review the effect of fish intake during pregnancy or infancy on allergic outcomes.

STUDY POPULATION. This was a meta-analysis of 1 randomized controlled trial (RCT) and 13 prospective cohort studies. The researchers conducting the RCT enrolled infants at risk for atopy (at least 1 first-degree relative affected by atopy, asthma, or allergy by self-report). The researchers conducting the cohort studies enrolled healthy pregnant women or infants without selection for atopic disease. Studies were conducted in North America, Europe, and Asia.

METHODS. PubMed, Embase, and the Cochrane Central Register of Controlled Trials were searched for records reporting the effect of dietary fish intake during pregnancy or infancy on clinical outcomes of allergic disease or sensitization in children. In all studies, the primary intervention was high versus low or no fish intake during pregnancy or infancy. Outcomes of interest were atopic dermatitis (AD), allergic rhinitis (AR), wheezing, asthma, and food allergy defined by parental report of symptoms or physician diagnosis (direct or by parental report), and sensitization (positive skin prick test result or elevated specific immunoglobulin E) to any food or inhalant allergen. Statistical analysis was performed with attempts to control for confounding factors, family history of allergic disease, and early signs of atopy.

RESULTS. In 1 RCT, researchers enrolled 123 mother-child pairs to receive 300 g of farmed salmon per week or a habitual diet low in oily fish starting at 20 weeks' gestation. Eighty-six infants were evaluated at 6 months,

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