Dishing It Out to Allergies

Laurence E. Cheng, MD, PhD[a,b], Michael D. Cabana, MD, MPH[a,c,d]

Allergic diseases encompass a group of disorders common in childhood, including eczema, asthma, and allergic rhinoconjunctivitis (ARC). Though disparate in presentation, these disorders share a common biologic origin,[1] and over the past quarter century this group of disorders has grown from relative obscurity to near ubiquity, with a lifetime prevalence approaching 20% in school-age children in the United States.[2]

The natural question is why these rates have increased so rapidly and steadily. In this issue of *Pediatrics,* Hesselmar and colleagues present their findings from an observational, cross-sectional, questionnaire-based study of families with 7- to 8-year-old children living in 2 geographically distinct areas of Sweden: Kiruna, ~60 miles north of the Arctic Circle, and Mölndal, >750 miles to the south. The authors use principal component analysis and logistic regression models to explore correlations between allergy history and dietary habits of the families of 1029 children. In addition to demographics and habits of food consumption, the authors queried dishwashing practices. Specifically, the authors asked whether families used hand dishwashing or machine dishwashing most of the time.

Although the authors do not present data about all associations within their dataset, they focus on an inverse correlation between allergic diseases (defined as eczema, asthma, or ARC) and the use of handwashing to clean dishes. Univariate analyses demonstrate such trends for all these diseases but significantly lower rates only for eczema. Other food consumption factors, including ingestion of fermented food and purchasing food from a farm, showed no such direct associations. The authors went on to formulate a "traditional cooking" index, combining responses to hand dishwashing with food consumption factors. In this analysis, the authors demonstrate that the variables in the traditional cooking index appeared to have an additive effect, as the prevalence of total allergy decreased with additional components of the index. The data were not broken down by specific disease.

The authors frame their discussion in the context of the hygiene hypothesis, which as originally envisioned suggested that early childhood infections conferred protection from allergic rhinitis.[3] The hypothesis has since been expanded to include the possibility that early-life microbial or infectious exposures prevent the outgrowth of allergic disease, perhaps by shaping the constituents of oral or intestinal microbial communities.

Over the last 2 decades, this idea has gained momentum, with sentinel observations by Loss and colleagues[4] observing decreased rates of asthma in children growing up on farms and subsequent work narrowing the specific aspects of this exposure that modulate allergic disease.[5] These effects appear not to be confined to farm exposure, because first-year exposure to bacterial taxa and concomitant high allergen quantities are associated with lower rates of recurrent wheeze and atopic sensitization in American inner-city children at 3 years of age.[6] The diversity and burden of these bacterial exposures are critical. Data from experimental systems support this

[a]*Department of Pediatrics,* [b]*Sandler Asthma Basic Research Center,* [c]*Department of Epidemiology and Biostatistics, and* [d]*Philip R. Lee Institute for Health Policy Studies, University of California, San Francisco, San Francisco, California*

Opinions expressed in these commentaries are those of the author and not necessarily those of the American Academy of Pediatrics or its Committees.

www.pediatrics.org/cgi/doi/10.1542/peds.2014-3911

DOI: 10.1542/peds.2014-3911

Accepted for publication Dec 19, 2014

Address correspondence to Michael D. Cabana, MD, MPH, 3333 California St, Suite 245, San Francisco, CA 94118. E-mail: michael.cabana@ucsf.edu

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

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FINANCIAL DISCLOSURE: Dr Cabana is a member of the Merck Speakers Bureau and has served as a paid consultant to Genentech and Boerhinger-Ingelheim.

FUNDING: Drs Cheng and Cabana have received funding from the National Institutes of Health. Dr Cheng has received funding from the Sandler Asthma Basic Research Center. Funded by the National Institutes of Health (NIH).

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

COMPANION PAPER: A companion to this article can be found on page e590, online at www.pediatrics.org/cgi/doi/10.1542/peds.2014-2968.

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idea, as inhibition of allergic sensitization in germ-free mice was most closely associated with the diversity of the bacterial constituents administered rather than an individual constituent per se.[7]

These recent findings, coupled with evidence that hand dishwashing is inferior to machine washing in reducing bacterial content on utensils and cutlery, provide a context in which to interpret the findings of the study. However, many questions remain for future consideration. First, why is the effect seen primarily for eczema rather than asthma and ARC? Eczema, asthma, and ARC are considered to be ordered steps along the "atopic march," with asthma and ARC often manifesting later in life.[8] Although the findings may reflect only the sample size, it is possible that the effects are transient or that disparate inputs lead to the outgrowth of individual allergic diseases, as suggested by the GABRIELA study.[5]

Second, exposure to residual microorganisms via utensils seems a much less efficient method compared with direct exposure from foods. Why would the effects of residual microorganisms due to hand dishwashing be as significant as, if not more significant than, the effects of directly ingesting fermented foods or foods from a farm? Examination of the quantity and composition of microbial constituents before and after hand dishwashing or examination of storage techniques after dishwashing (which might promote microbial growth) could begin to get at this question.

Third, the timing of the exposure that was examined in this study does not exactly match the hygiene hypothesis. The subjects in this study were 7-year-old children. However, the hygiene hypothesis suggests that an exposure during a critical window early in life (eg, <6 months of age or even perinatally) is necessary for a protective effect.[9] One would have to assume that the family dishwashing habits and dietary practices described in the studies have been unchanged. In addition, it would be unclear how much direct exposure a young breastfed infant would have to handwashed dishes or utensils in the first 6 months of life.

Finally, with any observational study, the exposure (dishwashing practices) was not randomly distributed, and it is possible that there may be confounding in the reported association. For example, families with atopic family members and sensitive skin may have been more likely to use a dishwashing machine in their household. Atopic families tend to have children with atopic disease. As a result, there may be an observed association with atopic children and household use of a dishwashing machine.

This is an interesting observational study; however, it has definite limits. Given the limitations of this study, it is not clear whether any specific recommendation can yet be gleaned from this work. Much more clinical, translational, and basic studies are needed to elucidate the role of different lifestyle choices (eg, use of a dishwashing machine) and microbial exposures and how those microbial exposures may modulate allergic disease and potentially lead to a primary prevention strategy.

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