

REFERENCES

1. Hays TL. Infant formulas for primary allergy prevention. *J Allergy Clin Immunol* 2006;117:471-2.
2. Friedman NJ, Zeiger RS. The role of breast-feeding in the development of allergies and asthma. *J Allergy Clin Immunol* 2005;115:1238-48.
3. American Academy of Pediatrics, Committee on Nutrition. Hypoallergenic infant formulas. *Pediatrics* 2000;106:346-9.
4. Osborn DA, Sinn J. Formulas containing hydrolysed protein for prevention of allergy and food intolerance in infants. *Cochrane Database Syst Rev* 2003;4:CD003664.
5. von Berg A, Koletzko S, Grubl A, Filipiak-Pittroff B, Wichmann HE, Bauer CP, et al. The effect of hydrolyzed cow's milk formula for allergy prevention in the first year of life: the German Infant Nutritional Intervention Study, a randomized double-blind trial. *J Allergy Clin Immunol* 2003;111:533-40.

Available online November 14, 2005.
doi:10.1016/j.jaci.2005.09.013

Alternaria alternata antigens in US homes

To the Editor:

We would like to respond to Dr Dreborg's comments by clarifying some of the issues he raised in a recent editorial¹ on our manuscript² which was published in the September 2005 issue of the Journal.

The National Survey of Lead and Allergens in Housing (NSLAH) is a cross-sectional study, not an experimental trial or intervention. Although all cross-sectional studies have limited ability to assess causality, they provide useful information about the prevalence of outcomes and factors associated with that prevalence. Our goal was to identify factors that are important for predicting elevated *Alternaria alternata* antigen levels in US homes. Because the NSLAH was a national study, it did not focus on any particular region or area of the country. The study design was developed with care, considering the primary objectives of the study, desired statistical precision estimates, and logistical issues.

In our article, we chose to present only the most relevant findings, although we obtained information on various household characteristics (eg, air conditioning, smoking in the home). Some of our predictors may be causally related, and some may not have a causal relationship. Dehumidifier use is a good example of a variable that likely does not have a causal relationship with *A alternata* antigen levels. Dehumidifiers help reduce or eliminate excess moisture that may lead to mold problems. Although dehumidifiers may become reservoirs for fungi, it is far more likely that the presence of dehumidifier is simply an indication of an ongoing humidity or moisture problem in the home.² On the other hand, smoking in the home is an example of a variable that may have a more direct association with the antigen levels. *A alternata* is a pathogen that may infect tobacco plants. Although *Alternaria* spores are often present in tobacco leaves, the curing process reduces the amount of spores substantially.³ Nonetheless, *Alternaria* spores have been detected in cigarettes.⁴ We found that *A alternata* antigens were detectable in both tobacco from cigarettes and cigarette ash.⁵ The observed association is biologically plausible, but further research is warranted to evaluate this relationship.

We agree that developing standardized methods for assessing exposures to fungal allergens is important. However, the reference standard of *A alternata* developed in the 1980s by an international collaborative group (International Union of Immunological Societies [IUIS]) has failed to gain wide acceptance by manufacturers, regulatory authorities, clinicians, and research laboratories. Currently, commercially available fungal allergen extracts remain variable and lack standardization, although several fungal allergens have been purified and cloned.⁶

In the NSLAH, concentrations of *A alternata* antigens in dust were measured with a polyclonal anti-*Alternaria* antibody assay, which was the best available assay at the time of the survey (1998-1999). The polyclonal antibodies, obtained from Greer Laboratories (Lenoir, NC), were raised against the cellular antigens derived from whole mycelial extracts of *A alternata*. Thus, the antibodies bind to a variety of antigenic components including, but not limited to, known allergens. All commercial allergenic *Alternaria* extract preparations that Greer Laboratories have examined, including the IUIS preparation, are reactive with this reagent (Dr R. Esch, Personal communication, 2005). The polyclonal rabbit anti-*Alternaria* antibodies used in our study, as well as the antigen standard, are commercially available.

We believe that our study provides valuable new information on *A alternata* exposures despite some limitations, which are clearly addressed in our article.

Päivi M. Salo, PhD^a
Samuel J. Arbes, Jr, DDS, MPH, PhD^a
Richard D. Cohn, PhD^b
Harriet A. Burge, PhD^c
Stephanie J. London, MD, DrPH^a
Darryl C. Zeldin, MD^a

From ^athe National Institute of Environmental Health Sciences/National Institutes of Health, 111 Alexander Drive, Mail Drop D2-01, Research Triangle Park, NC 27709; ^bthe Constella Group, Inc, Durham, NC; and ^cthe EMLab, Inc, San Bruno, Calif.

REFERENCES

1. Dreborg S. Evaluation of allergen exposure. *J Allergy Clin Immunol* 2005; 116:620-2.
2. Salo PM, Yin M, Arbes SJ Jr, Cohn RD, Sever M, Muilenberg M, et al. Dustborne *Alternaria alternata* antigens in US homes: results from the National Survey of Lead and Allergens in Housing. *J Allergy Clin Immunol* 2005;116:623-9.
3. Welty RE, Lucas GB, Fletcher JT, Yang H. Fungi isolated from tobacco leaves and brown-spot lesions before and after flue-curing. *Appl Microbiol* 1968;16:1309-13.
4. Bogden JD, Kemp FW, Buse M, Thind IS, Louria DB, Forgacs J, et al. Composition of tobaccos from countries with high and low incidences of lung cancer. I: selenium, polonium-210, *Alternaria*, tar, and nicotine. *J Natl Cancer Inst* 1981;66:27-31.
5. Salo PM, Arbes SJ Jr, Yin M, Cohn RD, Sever M, Muilenberg M, et al. Dustborne *Alternaria alternata* allergens in US beds: results from the first National Survey of Lead and Allergens in Housing. *Am J Respir Care Med* 2004;169(suppl 7):A368.
6. Esch RE. Manufacturing and standardizing fungal allergen products. *J Allergy Clin Immunol* 2004;113:210-5.

doi:10.1016/j.jaci.2005.10.034