allergen levels in the spring, consistent with findings seen in the classroom. Interestingly, the presence of a basement did not predict higher classroom allergen levels as would be expected and was only associated with higher cafeteria airborne levels.

Similar to previous studies, the reported presence of mice in homes was predictive of higher mouse allergen levels.[5,6] However, home allergen levels were much lower than school levels. Housing type did not predict allergen levels, although detached 1-family homes seemed to have lower levels, consistent with other published findings.[4,10]

Although we found a significant association between visible classroom mouse droppings and higher mouse allergen levels, a substantial amount of allergen was present even when droppings were not seen. Matsui et al[3] reported more days of asthma symptoms, more rescue medication use, and a greater risk of asthma-related health care use in inner-city Baltimore preschool children exposed to more than 0.5 μg/g of Mus m 1 in bedroom settled dust.[3] Our settled mouse allergen levels exceeded this cutoff even in the groups that did not see mouse droppings. If a Mus m 1 level of greater than 0.5 μg/g is indeed associated with an increase in asthma symptoms and healthcare utilization, then actual measurement of allergen levels may be more informative for assessing asthma morbidity outcomes than relying on reported school characteristics as a surrogate for allergen exposure.

This study demonstrated that children with asthma are exposed to significant levels of mouse allergen in inner-city schools. We found that when mouse droppings are seen in the classroom there are much higher levels of settled mouse allergen than if there are no signs of mice. However, even if droppings are not seen, significant levels of mouse allergen, greater than 0.5 μg/g of Mus m 1, a level linked to an increase in asthma symptoms and healthcare utilization, are seen. Based on our findings, objective sampling in schools may be necessary to determine the extent of mouse exposure. Integrated pest management strategies may need to be more intensely applied in the spring, although year-long strategies are likely necessary to tackle this potential public health problem in the school environment.

Supplementary Data

Supplementary data related to this article can be found online at http://dx.doi.org/10.1016/j.anai.2013.07.028

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Update on influenza vaccination of egg allergic patients

The Adverse Reactions to Vaccines Practice Parameter 2012 update,[1] consistent with new recommendations from the Centers for Disease Control's Advisory Committee on Immunization Practices (ACIP),[2] recommended that egg-allergic persons receive injectable inactivated influenza vaccine (IIV) as a single dose without prior vaccine skin testing and be observed for 30 minutes afterwards for any possible allergic reaction. Furthermore, the update recommended that, if the reaction to the ingestion of eggs was hives only, the vaccine could be administered in a primary care setting, whereas if the reaction to the ingestion of eggs was more severe, the vaccine should be administered in an allergist's office.

Since publication of the 2012 update:

1. Examination of Vaccine Adverse Event Reporting System data after the new ACIP recommendations indicated no disproportionate reporting of allergy or anaphylaxis after influenza vaccination.[3]
2. Subsequent studies have been published on the administration of IIV to egg-allergic recipients, including those with severe reactions to the ingestion of egg.
   a. Des Roches et al[4] describe their own study as well as the 26 previously published studies in which collectively 4,172 patients with egg allergy received 4,729 doses of IIV with no cases of anaphylaxis, including 513 with severe allergy who uneventfully received 597 doses.
   b. Greenhawt et al[5] describe a multicenter, combined prospective randomized controlled trial and retrospective study, noting no vaccine-related reactions in an additional 143 patients with severe egg allergy.
   c. Both authors independently concluded that the risk of an adverse reaction to IIV is exceptionally low for any patient

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with any severity of egg allergy and that these patients can be vaccinated safely with a single dose of IIV, without requiring administration by an allergist, which otherwise poses an unnecessary barrier to immunization and is not justified based on available safety data.

3. Two new influenza vaccines not grown in eggs have been approved for patients 18 years and older; Flucelvax,[6] prepared from virus propagated in cell culture, and Flublok,[7] recombinant hemagglutinin proteins produced in an insect cell line.

Based on this additional information, the following are recommended:

1. As per the 2012 update, all patients with egg allergy of any severity, including anaphylaxis, should receive IIV annually, using any age-approved brand of IIV in an age-appropriate dose. Such patients can receive the vaccine as a single dose without prior vaccine skin testing.
2. For egg-allergic patients 18 years of age and older, either egg-based or egg-free IIV can be used.
3. Special precautions regarding medical setting and waiting periods after administration of IIV to egg-allergic recipients beyond those recommended for any vaccine are not warranted. As per ACIP General Recommendations on Immunization,[8] providers should be aware that "Although anaphylactic reactions are rare after vaccination, their immediate onset and life-threatening nature require that all personnel and facilities providing vaccinations have procedures in place for anaphylaxis management." For IIV, language that describes egg-allergic recipients as being at increased risk compared with non–egg-allergic recipients or requiring special precautions should be removed from guidelines and product labeling.

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A familial study of filaggrin mutation in atopic dermatitis

Filaggrin is an epidermal structural protein critical for the development of a functional skin barrier. People who have null mutations in the *FLG* gene are at increased susceptibility of atopic dermatitis (AD), peanut allergy, and asthma associated with AD.[1–4] AD has a high familial occurrence evidenced by concordance rates of 0.72 to 0.77 in monozygotic and 0.15 to 0.23 in dizygotic twin pairs.[5] These studies were primarily carried out in Northern Europe, particularly in large cohorts in Ireland, where there is a high prevalence of *FLG* mutations in AD.

The identification of a genetic defect as a key event in the pathophysiology of AD and allergic sensitization has brought up many clinical questions among sufferers. On reading "Filaggrin Mutations Associated with Skin and Allergic Diseases" by Irvine, McLean, and Leung, published in 2011 *The New England Journal of Medicine*, a 91-year-old physician who suffered from lifelong atopic disease contacted the authors to determine whether *FLG* mutation could predict which of his 4 generations of family members were prone to AD or asthma and whether any environmental factors increased or decreased the risk of developing disease. Only early life cat exposure and exposure to other children have shown an additional interactive risk of AD in patients with *FLG* mutation.[6–8] These studies were birth cohort studies, and no family pedigree study has been used to study gene–environment interactions for *FLG* mutation.

The patient is a 91-year-old man with a history of early-onset, severe, persistent AD, asthma, food allergy, and skin cancer. He was of Scottish–Irish decent, and lived in Colorado his entire life. Members of the family regardless of atopic status were genotyped for 5 *FLG* gene mutations (R501X, 2282del4, R2447X, S3247X, and 3702delG). Additionally, members of the family who enrolled in this study were genotyped and filled out a questionnaire assessing for history of asthma, allergic rhinitis, AD, food allergy, history of skin cancer, pet exposure, mold exposure, and dust mite exposure (eFig 1). The study was approved by the National Jewish Health Institutional Review Board with consent and assent obtained from each subject before enrollment. We assessed the relationship between *FLG* mutation and AD using Fisher's exact test.

The family pedigree is shown in Figure 1. Demographics and clinical data are shown in eTable 1. Twenty-two family members across 4 generations were genotyped and completed questionnaires. All 22 family members were Caucasian, mainly of Scottish/Irish decent. Sixteen members of this family had an *FLG* mutation, 11 males and 5 females. Four females and 2 males had wild-type (WT) genotype. There were 15 heterozygous and 1 compound heterozygous mutations (11 R501X/WT, 4 2282del4/WT, 1 R501X/2282del4). Carrying an *FLG* mutation was significantly associated with having AD ($P = .02$), but did not increase the risk of developing other atopic disease (asthma, allergic rhinitis, food allergy) ($P = .14$). Of the 16 family members who had an *FLG* mutation, 9 developed AD in early childhood, whereas 7 had no history of AD. Of those that had AD, all reported early-onset disease, and only 1 family member outgrew their disease whereas 8 others reported persistent AD into

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