

Position Statement

Environmental allergen avoidance in allergic asthma

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Ad Hoc Working Group on Environmental Allergens and Asthma From the American Academy of Allergy, Asthma and Immunology.*

The statement below is not to be construed as dictating an exclusive course of action nor is it intended to replace the medical judgment of healthcare professionals. The unique circumstances of individual patients and environments are to be taken into account in any diagnosis and treatment plan. The above statement reflects clinical and scientific advances as of the date of publication and is subject to change.

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Asthma morbidity and mortality has increased over the past 2 decades in all age groups but especially in children who live in the inner city.¹⁻⁵ This has occurred despite better understanding of the pathophysiology of the disease and the availability of better treatment modalities. The reasons for these trends are complex but include inappropriate medication use, increased exposure to indoor and outdoor pollutants, poor access to quality medical care, and increased environmental allergen exposure. As a result of this increase in the prevalence of asthma, medical organizations throughout the world have issued guidelines describing optimal asthma management; all of these guidelines include environmental allergen avoidance.^{6,7} Environmental allergen avoidance is one of the 4 primary goals of good asthma management recommended in all asthma guidelines, including the National Asthma Education and Prevention Program sponsored by the National Heart, Lung and Blood Institute of the National Institutes of Health.⁷ It is clear that both physician and patient efforts are needed to implement these guidelines and to make environmental avoidance a reachable goal.⁵⁻¹⁰ The purpose of this article is to inform physicians and patients with asthma about the importance of environmental allergen avoidance in the treatment of allergic asthma.

Relationship of environmental allergens to asthma

The association between environmental allergens, IgE-mediated hypersensitivity, and asthma is supported by the following evidence¹¹:

- Between 60% and 80 % of adults and children with asthma have 1 or more positive immediate wheal-and-flare skin test responses to environmental allergens.¹²⁻¹⁵
- Bronchial challenge studies show that acute asthma can be induced in sensitized asthmatic subjects by inhaling extracts of these aeroallergens.^{16,17}
- Epidemics of asthma have been associated with unusually heavy and widespread exposure to airborne allergens such as soybean debris.¹⁸
- Sensitization, with production of specific IgE antibodies, is a strong risk factor for acute severe asthma, especially when these sensitized persons are exposed to high concentrations of allergen in their homes.¹⁹⁻²⁵
- The severity of chronic asthma and airway hyperresponsiveness correlates with the degree of sensitivity to indoor allergens.^{13,25,26}
- Asthmatic symptoms, peak expiratory flow rate, and bronchial hyperresponsiveness improve when patients avoid environmental allergens to which they are allergic.²⁷⁻³⁴

Case control studies have shown an association between acute asthma exacerbations and IgE-dependent sensitization to indoor allergens. Gelber et al²¹ compared 114 patients with asthma receiving care in an emergency department to 114 age- and sex-matched control patients treated in the emergency department for other reasons. The rate of sensitization to one of 3 indoor allergens was 39% in the patients with asthma and 4% in the control subjects (OR 14, $P < .001$). The risk of sensitization was largely restricted to homes with high levels of allergen. Call et al²² conducted a similar study on 144 children who were cared for in an inner-city emergency department. Fifty-eight percent of children with asthma had IgE antibodies to mite, cockroach, or cat allergens compared with 19% of control patients. Seventy-nine percent of home dust samples contained excessive mite allergen, and 87% contained excessive cockroach allergen; concentrations were similar in the homes of asthmatic and control subjects. Of 35 children with asthma whose homes were sampled, 21 (60%) were both sensitized and exposed to these allergens compared with 3 of 22 (14%) control children (OR 9.5, $P < .001$). Nelson et al²³ compared 29 children, ages 3 to 16 years, first seen in a Florida emergency department with acute asthma with 25 control subjects.²³ They found that sensitization to mites, *Alternaria* spp, and cockroach allergens was associated with acute asthma that required emergency treatment. O'Hollaren et al²⁴ reported a strong association between exposure to high ambient *Alternaria* concentrations and fatal and near-fatal asthma. Taken together, these studies demonstrate that cockroach, mite, cat, *Alternaria* spp, and other allergens are common in homes and that a combination of exposure and sensitization to 1 or more of these allergens markedly increases the risk of morbidity from asthma.

Nature of environmental aeroallergens

Allergenic proteins are found in component parts of biologic organisms (plant pollens and mold spores) and in the excretions of furred animals, mites, and insects.^{35,36} They become airborne on particles of varying size that are characteristic of the source. For example, most particles carrying house dust mite and cockroach allergens are relatively large (30 μm) and settle quickly, and therefore exposure is largely confined to intimate exposure to fabrics in bedding or carpets.^{36,37} Animal allergens are found on small buoyant particles (1 to 20 μm) that remain airborne and are widely distributed indoors.^{38,39} Pollen and mold spores range from 6 to 150 μm , but they are buoyant and can be found in indoor and outdoor air samples.^{36,40} Thus indoor and outdoor environments contain a complex mixture of particles carrying a variety of allergenic proteins. Assays are available to allow individual allergens to be measured accurately in house dust samples and in indoor and outdoor air samples. These assays make it possible to estimate individual environmental allergen exposure and to assess the effectiveness of environmental allergen abatement programs.

Removal of allergens from the home environment

House dust mite allergen exposure is much greater in bedding than elsewhere in the home. The most effective method to reduce mite allergen levels in bedding is to install impervious covers over the mattress, pillow, and comforter and to wash sheets, pillow cases, blankets, and mattress pads at least weekly. By doing so, mite allergen exposure can be reduced 100- to 1000-fold within a month and will remain low for 6 to 12 months. Washing bedding with cold water reduces house dust mite allergen concentrations by 100-fold, but mite infestation is not affected, and the mite allergens reaccumulate within 2 weeks.^{37,41} At water temperatures of 130 °F or higher, mites are killed, and allergen reaccumulation is slowed.⁴¹ Maintaining indoor humidity below 50% will reduce mite allergen.⁴² Acaracides are less effective in reducing mite numbers and allergen concentration.⁴³ When a cat is removed from a home, allergen concentration decreases steadily over 6 months to 100- to 1000-fold lower levels.⁴⁴ Less is known about cockroach allergen abatement, but in a study done in a cockroach-infested urban dormitory, extermination followed by routine cleaning reduced cockroach allergen levels on the floor by 86%.⁴⁵ In each of these cases, it appears that the use of sensible, feasible abatement strategies will reduce environmental allergen exposure dramatically.

Efficacy of allergen avoidance in asthma

Removing sensitized asthmatic subjects to allergen-free mountain institutions or hospitals results in prolonged improvement in symptoms and bronchial hyperresponsiveness.^{33,34} Clinical trials of house dust mite allergen avoidance in homes suggest that asthma morbidity can be reduced when exposure to a single indoor allergen is reduced, even when exposure to other allergens is not altered. In 5 controlled

clinical trials in which mite populations or allergen concentrations have been reduced at least 100-fold, asthma symptoms or airway hyperresponsiveness were improved.²⁷⁻³² In others, mite allergen levels were not reduced significantly, and symptoms were unchanged.^{30,31} Therefore avoidance measures directed at 1 allergen, without other exposure changes, appear to modify chronic asthma.

Adherence to allergen avoidance advice

Although environmental allergen avoidance is included in both the United States⁷ and international⁶ treatment guidelines, adherence by physicians and patients to these recommendations needs improvement. Patients often report that they are adherent, but home inspection shows much less adherence than patient self-reports.⁸⁻¹⁰ Without formal educational programs, no patient had installed mattress covers.^{8,9} With the usual clinic-based educational efforts, Korsgaard⁹ found that only 17% had installed a mattress cover. Huss et al⁸ found similar figures but also found that the adherence could be increased to 27% with repetitive clinic-based education and to 39% with a computer-based educational program. Adherence to allergen avoidance advice is generally not as good as with medication. For example, in a clinical trial that achieved better than 95% adherence to medication regimens, no more than 48% of families had installed mattress covers.¹⁰ Thus with specific clinic-based education, between 17% and 27% of patients will adhere to recommendations for environmental avoidance, whereas more intensive clinic-based education in highly motivated patients may increase adherence to 48%. With such low rates of adherence, the therapeutic potential demonstrated in clinical trials of allergen avoidance is not likely to be realized in clinical practice without more concerted action on the part of both clinicians and patients. As with other therapies, adherence to allergen avoidance should be improved by providing more concentrated education, simplifying recommendations, and developing a partnership between physician and patient.

Therefore the AAAAI:

- endorses the National Asthma Education Program asthma management guidelines, which recommend that every patient with persistent asthma be evaluated for environmental allergen sensitivity and that patients who have sensitivities receive practical advice on allergen avoidance;
- strongly encourages the creation of a Current Procedural Terminology (CPT) category for environmental counseling;
- urges insurers, HMOs, Medicaid administration, and other third-party payers to reimburse for the costs of impermeable cases for mattresses, comforters, and pillows, as well as other proven therapies designed to reduce allergen exposure;
- supports the development of a public education process to increase the general awareness of the role of environmental allergens in the pathogenesis of allergic asthma, which would be accomplished best by cooperative input from patients, professionals, and industry.

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