

Is House Dust Immunotherapy Obsolete?

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ABSTRACT

The traditional practice of immunotherapy includes house dust extract, a complex mixture of substances derived from many indoor and outdoor sources. We have questioned the use of house dust immunotherapy in patients who are sensitive to house dust as well as other indoor allergens. In a retrospective analysis, we studied 80 newly diagnosed atopic individuals to evaluate this association. Skin testing demonstrated that 90% of cockroach-sensitive patients were sensitive to house dust, 95% of dust mite-sensitive patients were sensitive to house dust, and 100% of mold-sensitive patients were sensitive to house dust. In fact, 100% of house dust-allergic patients were also allergic to mold, cockroach, or dust mite. There were no patients with only sensitivity to house dust. This study shows a high association between house dust and other indoor allergens. We feel house dust immunotherapy is unnecessary in the patient who is sensitive to house dust as well as other indoor allergens.

INTRODUCTION

IN 1921, KERN ET AL. demonstrated that house dust extract produced a positive immediate skin test in some patients with asthma.⁽¹⁾ He also reported no relationship between skin test reactions to house dust extract and other allergens.

Many studies have elucidated the various components that constitute house dust.⁽²⁾ In 1987, Hale found that house dust consisted of many indoor and outdoor sources including animal dander, insect parts, mites, cockroach, pollens, molds, food particles, and human dander.⁽²⁾ In 1964, Voorhurst et al. found that the single most important allergen in house dust was mites of the genus *Dermatophagoides*.⁽³⁾ In fact, Voorhurst was able to correlate allergenicity of house dust with content of mite.⁽⁴⁾ Soon researchers found that *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae* were the predominant species of mites that caused the allergenic response in house dust.⁽⁵⁾

House dust extract is nonstandardized. It is comprised of pooled sweepings of the environment within the house. Each distinct allergen in house dust extract can vary widely from batch to batch, from the same manufacturer. This variation in the amount of allergen can cause increased local and systemic reactions when patients' treatment is changed to a new batch, because the new house dust extract can contain a specific allergen at different concentration.

Since house dust extract is a mixture of many specific indoor and outdoor allergens, we have questioned its use in those patients with sensitivity to house dust as well as other indoor allergens. We believe that if

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a correlation does exist, optimal immunotherapy would include the use of individual component therapy and not house dust extract. Therefore, we conducted a retrospective analysis to evaluate the correlation between skin testing sensitivities to specific indoor allergens and house dust.

MATERIALS AND METHODS

Subjects

From 304 patients seen in the new patient allergy clinic at Long Island College Hospital in Brooklyn, New York, 140 charts were selected in a randomized fashion to undergo a retrospective analysis. Of the 140 patient charts reviewed, 80 patients underwent skin testing to investigate the causes of their allergic disease.

Of these 80 patients, 37 were male and 43 were female, with an age distribution of 4–65 years. The predominant presenting diagnoses were asthma and allergic rhinitis. Few patients had eczema or urticaria as their initial diagnosis.

Skin testing

Skin testing procedures included both epicutaneous and intradermal techniques. Prick skin tests were performed on the volar surface of the forearm, while intradermal skin tests were performed on the lateral aspect of the upper arm. Prick skin testing was employed as the initial skin testing procedure. Intradermal skin testing was done to allergens that did not elicit clear positive reactions with epicutaneous skin testing. During intradermal skin testing, the concentration of each allergen was increased until either a positive result was elicited or the highest concentration of each allergen produced a negative result. The highest concentrations of each allergen used in intradermal skin testing were as follows:

Histamine: 0.1 mg/cc
House dust mix: 1000 protein nitrogen units(PNU)/cc
Mold mix #4: 1000 PNU/cc
D. farinae: 100 allergy units(AU)/cc
D. pteronyssinus: 100 AU/cc
Cockroach mix: 1000 PNU/cc
Cat pelt: 100 biological allergy units(BAU)/cc
Dog hair dander: 1000 PNU/cc

For prick skin testing, the following grading system was employed: 0 = no erythema and no wheal; 1+ = erythema < 21 mm and no wheal; 2+ = erythema ≥ 21 mm and no wheal; 3+ = both erythema and wheal present; 4+ = erythema and wheal with pseudopods present.⁽⁶⁾

For intradermal skin tests, the following grading system was used: 0 = erythema < 5 mm and wheal < 5 mm; +/- = erythema and wheal 5–10 mm; 1+ = erythema 11–20 mm and wheal 5–10 mm; 2+ = erythema 21–30 mm and wheal 5–10 mm; 3+ = erythema 31–40 mm and wheal 5–10 mm with or without pseudopods; 4+ = erythema > 40 mm and wheal > 15 mm with or without pseudopods.⁽⁷⁾ A grade of 2+ or greater using either system was considered a positive reaction to that allergen.

Extracts

Extracts used were from two different pharmaceutical companies. The following was from Hollister Stier: house dust mix in 0.4% phenol, mold mix #4 (*Alternaria tenuis*, *aspergillus* mix, *Hormodendrum*, *Cladosporium*, and *Penicillium* mix) in 0.4% phenol, standardized mite of *Dermatophagoides farinae* and *D. pteronyssinus* in 50% glycerin, dog hair dander in 50% glycerin, and cockroach mix (American, German, and Oriental types) in 0.4% phenol. The standardized cat pelt in 50% glycerin was from Center Laboratories.

RESULTS

Figure 1 demonstrates the incidence of specific allergen skin test reactivity in our population. Sixty-one percent of our patients demonstrated allergy to house dust. Fifty-nine percent showed allergy to dust mites. Since our population resides in an urban environment, there is high level of cockroach exposure and thus 56% of patients demonstrated sensitivity to cockroach. Overall, our population demonstrates skin test reactivities reported previously for other urban populations.

Using standard statistical techniques we compared the incidence of each of the specific indoor allergen sensitivities with that of house dust. In our population there was a very high correlation between sensitivity to specific indoor allergens and house dust. Figure 2 shows the percentage of patients with specific allergen sensitivity who also had sensitivity to house dust. We found that 100% of the mold-sensitive patients were sensitive to house dust. Ninety-five percent of the dust mite-sensitive patients were sensitive to house dust and 90% of the cockroach-sensitive patients were sensitive to dust. In fact, in our study population there were no patients with sensitivity to house dust and no other allergen.

DISCUSSION

Through the last 25 years much information has been obtained regarding house dust extract. We now know that house dust extract is a complex mixture of specific indoor and outdoor allergens that differ in concentration from batch to batch.⁽²⁾ Our study found a very strong correlation between specific indoor allergen sensitivities and house dust sensitivity. We found that 95% of the mite-allergic patients also had an allergy to house dust. It is likely that these patients were allergic to the dust mite component of crude house dust. The same can be said about cockroach, mold, dog, and cat. There was a very high correlation between specific individual allergen sensitivity for each and that of house dust. It can thus be said that patients with

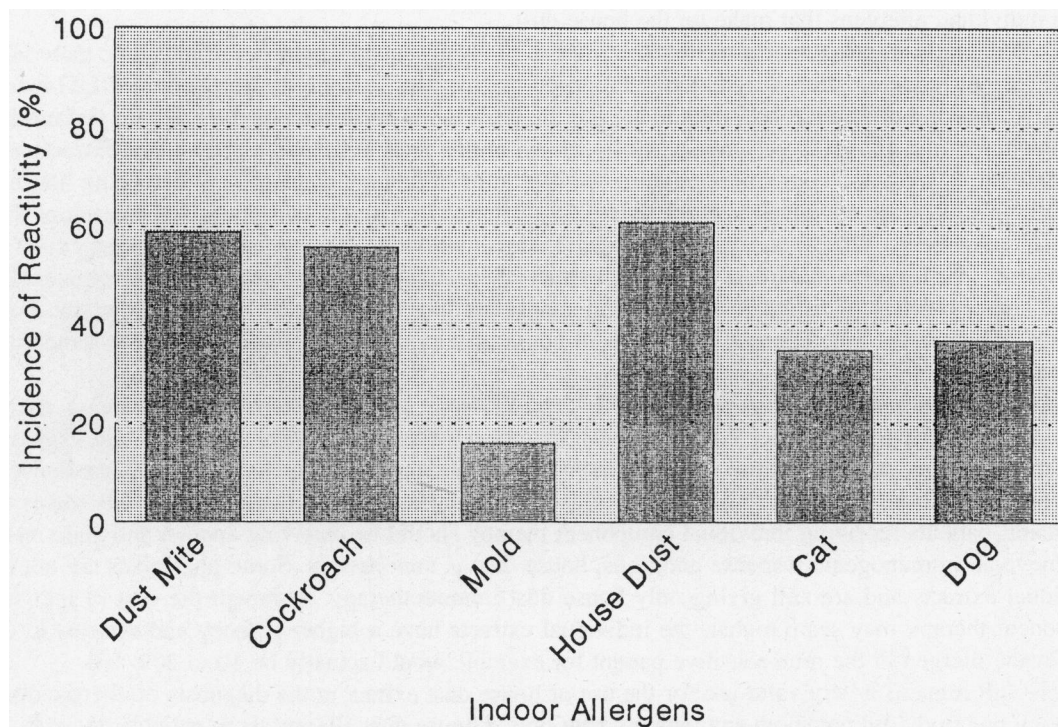


FIG. 1. Incidence of skin test sensitivity to indoor allergens.

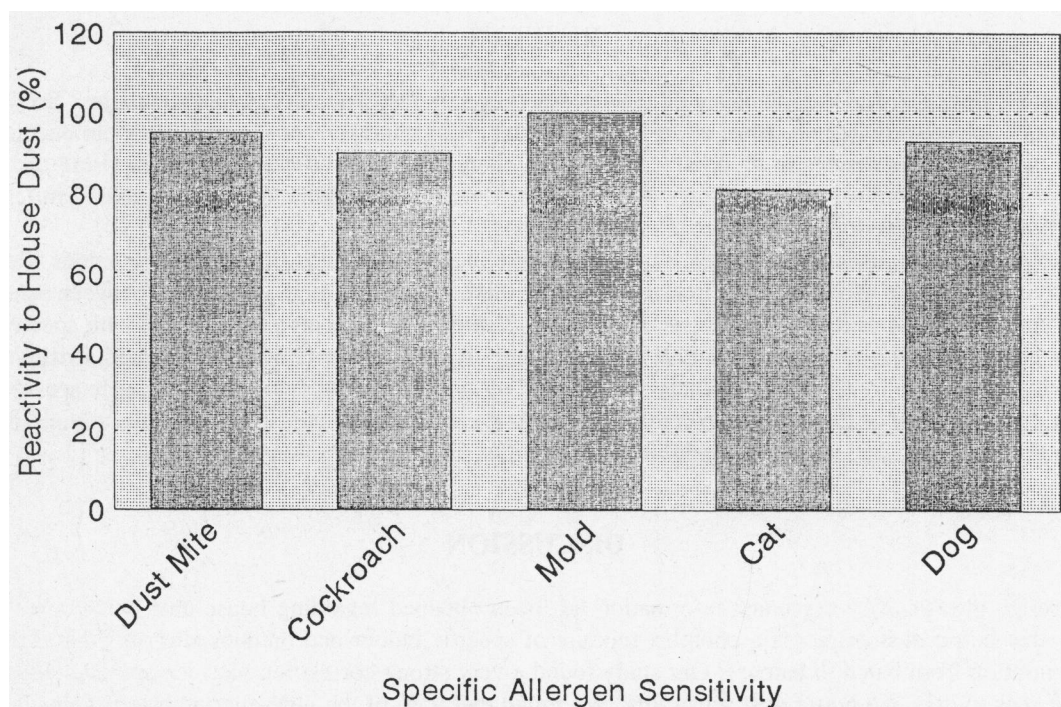


FIG. 2. Percentage of patients with a specific allergen sensitivity who also have an allergy to house dust.

individual or multiple specific indoor allergen sensitivity as well as sensitivity to house dust are reacting to the individual allergens that make up the house dust.

Immunotherapy employs subcutaneous injections of gradually increasing doses of antigenic materials for the purpose of reducing allergic symptoms. Proposed mechanisms include the production of IgG-blocking antibody, lowering of specific IgE antibodies, and the decrease in sensitivity of the basophil and mast cell. The potency of the extract is very important in achieving this goal. It has been shown that extracts with a high amount of antigenic component produce the best immunotherapy results.^(8,9) When using house dust in immunotherapy, the antigenicity of the extract is attributed to variable concentrations of each of the individual components. When house dust is separated into its individual components, the antigenicity of each component is far less than that of the individual extracts themselves. Therefore the individual extracts should have a higher potency of antigenic material and should produce better results in immunotherapy. For example, the quantity of mite allergen in samples of house dust extract is far lower than that of standard dust mite extract.

Finally, the elimination of crude house dust extract from immunotherapy could decrease the cost. Pharmaceutical companies report that house dust extract remains one of their biggest selling extracts. At present, physicians are using house dust extract in immunotherapy in various ways. Some use house dust extract as well as the individual components of house dust in treating the same patient. This seems to be redundant: patients receiving individual component therapy should be receiving enough antigenic material to achieve an immunogenic response and, thus, house dust is unnecessary. Some physicians are not using individual extracts and are still giving only house dust immunotherapy. Although the cost of individual-component therapy may seem higher, the individual extracts have a higher potency and the cost in terms of relevant allergen in the mite-sensitive patient for example would actually be 10 to 20% less.

There still remains a very valid use for the use of house dust extract in the diagnosis of allergic disease. Although our study did not show any patients with only a house dust allergy, these patients do exist. They may have a sensitivity to a component of house dust for which skin testing was not conducted. For example, the patient may have a sensitivity to a specific mold not tested for on a given panel, or a food antigen

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in dust that the patient was unaware of. The patient who has only a sensitivity to crude house dust presents an indication for further testing to find the specific cause of his or her allergic disease.

Further investigation in this area is still needed. It is important to document patients with only house dust sensitivity in order to proceed with additional skin testing to elucidate the cause of the allergic disease in this unusual group. Although the benefit of individual allergen therapy over crude house dust seems evident, a cost-benefit analysis is needed to establish this. Finally, it is important to evaluate pediatric and adult populations separately to see if the results of this study are independent of age.

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