

THE ENVIRONMENT

Sensitization to *Dermatophagoides*, *Blomia tropicalis*, and Other Mites in Atopic Patients

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Background. House dust mites (HDMs) are important causes of persistent allergic diseases, such as asthma and rhinitis. Various types of mites are found in the house dust of many countries, including Israel. **Objective.** To evaluate the prevalence of sensitization to various HDMs in patients with perennial allergic rhinitis and asthma. **Methods.** Sensitization of 117 patients with persistent rhinitis who attended the Allergy and Asthma Center in Tel Aviv (Israel) was evaluated by a skin prick test (SPT) using standardized allergenic extracts. The tested mites were *Dermatophagoides farinae* (DF), *Dermatophagoides pteronyssinus* (DP), *Lepidoglyphus destructor* (LD), *Blomia tropicalis* (BT), *Tyrophagus putrescentiae* (TP), *Acarus siro* (AS), *Glycyphagus domesticus* (GD), *Blomia kulagini* (BK), and *Tetranychus urticae* (TU). **Results.** Most patients ($n = 95$, 81%) had a positive SPT to at least one mite extract. The three most frequent positive reactions were to DF (78%), DP (75%), and, unexpectedly, BT (77%). The correlation between DF and DP sensitization was higher than the correlation between DF or DP to BT ($r = .78$ versus $r = .60$, $p < .05$). Six patients had positive skin reactions to at least one mite species other than DF, DP or BT, mainly LD ($n = 2$, 2.1%) and BK ($n = 4$, 3.8%). **Conclusions.** The findings of this study identified the most ubiquitous mites to which Israeli patients with allergic rhinitis were sensitized and indicated the importance of BT as an allergen. Extracts of these mites may provide a more accurate diagnosis and effective treatment of respiratory diseases due to mite allergy in Israel and probably in other countries with similar climates.

Keywords: allergy; *Blomia*; *Dermatophagoides*; mites

INTRODUCTION

House dust mites (HDMs) represent the main source of indoor allergens and sensitization to these allergens is a major risk factor for allergic rhinitis and asthma in exposed individuals (1, 2). As humans spend more and more time indoors, a larger proportion of air inhaled is derived from an enclosed environment. Over the past 30 years, case-control, prospective, and population-based studies have demonstrated that between 65% to 95% of children and young adults with asthma and allergic rhinitis are allergic to indoor allergens, especially HDMs (3). The mites belong to the class Arachnida and about 40,000 different species of mites have been identified. Mites found in homes are generally divided into two categories: the pyroglyphid mites, commonly referred to as HDMs, and the nonpyroglyphid mites, commonly referred to as storage mites (4, 5). Although storage mites are mainly pests of stored grain and have been implicated over recent years in occupational allergy among farmers, much attention has been paid to storage mite allergy in nonoccupational environments as well (5, 6). The presence of storage mite in house dust samples throughout the world supports their clinical significance in nonagricultural environments (5–7). The Glycyphagidae and the Acaridae families are predominant among storage mites. *Lepidoglyphus destructor* is the predominant species in Northern and Central Europe (with *Glycyphagus domesticus* and the *Acarus* and *Tyrophagus* genera also being

important), whereas the *Blomia* genus is prevalent in the tropical and subtropical parts of the world (8–10).

The detection of an HDM allergy is very important insofar that it can establish the diagnosis of asthma, allergic rhinitis, atopic dermatitis, or other allergic diseases. It identifies the need for environmental (including occupational) control and is important in decision-making regarding immunotherapy (11, 12).

Sensitization to allergens has recently become one of the mandatory criteria for anti-immunoglobulin E (IgE) treatment, and that is why skin prick tests (SPTs) with extracts of HDM are included in the evaluation of every patient with suspected or established atopic disease (12). The most important allergy-causing HDMs found in homes worldwide are *Dermatophagoides farinae* and *Dermatophagoides pteronyssinus*, but the majority of homes contain multiple species. The most prevalent mite species and allergen in homes differ geographically, between homes within a geographical region, and among areas within a home (8, 9).

Previous studies have shown that there are more than 10 species in house dust samples collected throughout Israel (13, 14). Sensitization to a number of species could, therefore, be expected in the allergic population. Although the mite fauna in Israel is well established, no studies on allergen sensitization have been conducted in this country in spite of the importance of knowing which mite species are present in a given geographical area when performing diagnostic testing and prescribing immunotherapy. Most of the commercial panels of allergens that are used by most (if not all) allergists in the USA, Europe, and Israel include only the two main HDMs, *Dermatophagoides pteronyssinus* (DP) and *Dermatophagoides farinae* (DF).

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The present study aimed to determine the sensitization and the clinical relevance of mites other than the *Dermatophagoides* species in patients with perennial allergic rhinitis, living in Mediterranean climate.

METHODS

Participants

Our study population was composed of consecutive, unselected patients with perennial allergic rhinitis and asthma who attended the outpatient clinic of the Allergy and Asthma Center of the Tel Aviv Sourasky Medical Center (TASMC) for routine evaluation and allergy skin tests. TASMC is a large university-affiliated municipal hospital located in the center of Israel near the Mediterranean coast. This study was performed as part of the routine evaluation of patients attending our clinic and was done in accordance to the institutional ethical committee regulations. All patients were evaluated by a physician, and the severity of their rhinitis, asthma, or other allergic manifestation was classified by means of a detailed questionnaire. Patients were included in the study if they had clear evidence of perennial persistent allergic rhinitis.

Antiallergic medications were suspended for 5 days before evaluation. Skin prick testing (SPT) was carried out using glycerinated extracts of DF, DP, *Lepidoglyphus destructor* (LD), *Blomia tropicalis* (BT), *Tyrophagus putrescentiae* (TP), *Acarus siro* (AS), *Glycyphagus domesticus* (GD), *Blomia kulagini* (BK), and *Tetranychus urticae* (TU). All the standardized extracts were from Diater Laboratorios (Spain) in concentrations of 5 HEP (histamine equivalent potency). All tests were performed by an experienced nurse and evaluated by an experienced allergist. The wheal diameters were measured after 20 min, and wheal diameter of 3 mm or more in excess of the negative control was considered a positive test result. Control tests were performed with the diluent alone and with 1% w/v histamine dihydrochloride. All the patients completed a self-administered standardized questionnaire, including a health-related quality of life disease activity score, information on occupational history, exposure to

possible allergens, additional diagnoses and medication usage, family history of allergic disease, and active and passive smoking.

Statistical Analysis

Statistical analysis consisted of nonparametric statistics, including geometric means, parametric two-sample *t* test, and chi-square test analysis. A *p* value of less than .05 was considered statistically significant.

RESULTS

A total of 117 patients who fulfilled the clinical criteria of perennial allergic rhinitis underwent SPT for environmental allergens. Their mean age was 21.3 years (16–44) and 56.4% were males. All patients had persistent perennial allergic rhinitis and, in addition, 29 (24.7%) of them had asthma, 13 (11%) had allergic conjunctivitis, and 12 (10%) had atopic dermatitis. Ninety-five (81%) patients had a positive SPT for at least one mite extract (Figure 1). Fifty-seven (49%) had a positive SPT for at least one tree, grass, or weed pollen, 32 (27%) for cats, 9 (8%) for dogs, 8 (7%) for at least one mould, and 18 (15%) for cockroaches.

The three most frequent positive reactions were to DF (78%), DP (75%), and BT (77%). The correlation between DF and DP sensitization was higher than the correlation between DF or DP to BT ($r = .78$ versus $r = .60$, respectively, $p < .05$). Most patients displayed concomitant sensitization to both BT and *Dermatophagoides* species. Only two patients were sensitized to BT but not to *Dermatophagoides* and only one patient was positive for *Dermatophagoides* but not BT. Six patients (5.7%) had positive skin reactions to at least one mite species other than DF, DP, or BT, mainly to LD (3.1%) and BK (4.2%).

There was no significant correlation between the reported severity of symptoms or the presence of asthma, conjunctivitis, and atopic dermatitis and the wheal size of the positive aeroallergen reactions ($r = -.12-.18$, $p > .05$ for each allergen taken separately). This finding also held true when the SPT wheal diameter was adjusted to the

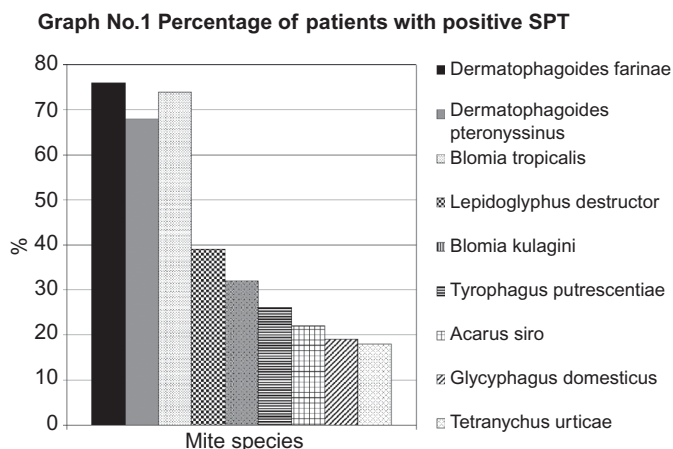


FIGURE 1.—Graphic representation of the percentage of patients (total tested subjects = 95) with positive skin prick test (SPT) results to dust mites.

histamine response (by calculating the ratio between the histamine weal to each allergen weal). The self-reported symptom severity was also not significantly correlated with the number of aeroallergens that yielded a positive reaction ($r = .1, p = .55$).

DISCUSSION

The current study was designed to examine the rate of sensitization to various house and storage mites among Israeli patients with perennial respiratory allergy. The prevalence of the sensitization to most of the non-DP DF mites was relatively low, ranging from 18% to 40% of the patients. In contrast, the prevalence of sensitization to BT was high in our patient population. That latter finding was not surprising because the major factors governing mite propagation are warm temperatures and high levels of humidity. Environmental conditions influence not only mite growth but also the species of mites found in a given environment (9). *B. tropicalis* occurs in a significant percentage of homes in tropical and subtropical regions of South America and Asia, as well as in the southeastern United States and Europe (15). Many patients with allergic disease in those areas have positive SPTs to *B. tropicalis* (up to 90%) (16), and sensitization to this mite has been shown to be a clinically important in patients with allergic diseases, such as asthma and rhinitis (17–21).

Israel has a Mediterranean climate characterized by long, hot, rainless summers and relatively short, cool, rainy winters. Most of the population of Israel lives in subtropical climates and the humidity tends to be high all year round. These conditions can theoretically favor the growth of BT such as that described in tropical or subtropical areas throughout the world (9). Mumcuoglu et al. (13) characterized the HDM fauna in homes in Israel and found that *Dermatophagoides* sp. mites comprise 95% of mite fauna and that storage mites constituted 5% of mite fauna. The relative frequency of *Blomia* sp. was 6.2% of dust samples from which mites were isolated. *Blomia* sp. was recently isolated from 2.3% of samples from Israeli patients' clothes and bedding (14). The concentration of the storage mites that were found in those studies is considered as being high enough to cause sensitization and influence the severity of allergic rhinitis and asthma (9, 22). Both mite bodies and feces extracts contain multiple antigens and allergens, and at least 23 IgE-binding components have been demonstrated for BT, in which the main allergens are Blo1 and Blo5 (23, 24).

Although many of the *Blomia*-sensitized patients appear to be concurrently sensitized to *Dermatophagoides* sp., the extent of cross-reactivity between *B. tropicalis* and *Dermatophagoides* sp. in the tropics was reportedly low (18–40%), and only minor cross-reactivity has been observed in RAST inhibition and immunoblotting inhibition studies among *B. tropicalis*, *D. pteronyssinus*, and *D. farinae* or other mites (15, 25–27).

We addressed the question about the degree of sensitization and correlation of the skin response to various

mites other than those of the *Dermatophagoides* species in a population of adult Israelis diagnosed as having perennial allergic rhinitis. The finding of a high level of sensitization to other than *Dermatophagoides* species mite, specifically BT, both in terms of prevalence and intensity, may be of considerable importance for defining an etiological approach to manage the condition, based on prevention and allergen-specific immunotherapy. Our data point to the value of including BT and the other mites in the diagnostic panel for the evaluation of allergic disorders in Israel and countries with similar climates, but additional studies are required to better characterize the clinical relevance of our results.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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