

Sensitization to Non-Pyroglyphid Mites in Urban Population of Croatia

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Aim. Determination of prevalence of sensitization to *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae* (pyroglyphid mites), *Lepidoglyphus destructor*, and *Tyrophagus putrescentiae* (non-pyroglyphid mites) in urban continental Croatia.

Methods. Specific IgE (sIgE) and skin prick test (SPT) for *D. pteronyssinus*, *D. farinae*, *L. destructor*, and *T. putrescentiae* were performed in 67 men. SPT was performed with Epipharm-ALK allergens. A urtica (D+d)/2 of 3 mm or greater was considered a positive skin reaction. SIgE was measured by immunoCAP technology (UNI CAP). Values <0.35 kU_A/L were considered nonspecific and >0.35 kU_A/L increased.

Results. The prevalence of subjects with positive SPT was 35.8% for *T. putrescentiae*, 26.8% for *L. destructor* (26.8%), and 22.4% for *D. pteronyssinus* and *D. farinae*. The prevalence of increased sIgE for *D. pteronyssinus* and *D. farinae* was 23.9%, followed by *T. putrescentiae* (22.4%), and *L. destructor* (14.9%). Among subjects with increased IgE to *D. pteronyssinus* there were also increased IgE for *D. farinae* in 94%, for *T. putrescentiae* in 75%, and for *L. destructor* in 50%. Mean urtica diameter differed only for *L. destructor* between nonspecific and increased sIgE values in subjects with positive SPT (3.7±0.7 mm vs. 6.2±2.8 mm; p=0.004). Sensitization to storage mites was accompanied by respiratory symptoms in similar proportions as that to house dust mites (51.8% and 54.5%, respectively; p=0.8527).

Conclusion. Sensitization to non-pyroglyphid mites is present in the general urban population of Croatia in similar proportions as to pyroglyphid mites, with the same range of respiratory symptoms. Testing with storage mites should be considered routine allergological diagnostic procedure.

Key words: allergens, dust; atopic hypersensitivity; Croatia; housedust; hypersensitivity, immediate; IgE; skin test

Numerous studies have shown that sensitization to dust mites is significantly increasing all over the world (1). Sensitization is caused by a number of anatomically different mites, particularly from the *Pyroglyphidae*, *Glycyphagidae* and *Acaridae* families (2). For the last 20 years, pyroglyphid mites, such as *Dermatophagoides* genus have been shown to be ubiquitous and major allergen components of house dust (the so-called house dust mites) (3). Non-pyroglyphid mites were firstly studied only as rural occupational allergens in dust samples from stored food products like hay, grain, and flour (so-called storage mites) (4). However, recent studies have shown that non-pyroglyphid mites can also be found in house dust samples from urban as well as rural regions and can constitute about 15-20% of mite fauna in house dust (5,6). Sensitization to dust mites manifests clinically as rhinitis, conjunctivitis, dermatitis, and bronchial asthma. Different studies have shown that sensitization to dust mites is an independent risk factor for asthma (1,3).

The aim of this study was to investigate the prevalence of sensitization to house-dust mites (*Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*) and storage mites (*Lepidoglyphus destructor* and *Tyrophagus putrescentiae*) in a random sample from the continental, urban region of Croatia on the basis of skin prick test and specific IgE levels.

Subjects and Methods

The geographic position of Croatia has two main regions: continental and mediterranean. The continental region, with an annual mean temperature ranging from 6.6 °C to 26.6 °C and mean relative humidity ranging from 35% to 98% is considered a moderate climate region (7).

Subjects

The study included a random sample of 67 men (mean age 40.6±7.7 years; smokers 43/67=64.2%) from the continental, urban region of Croatia. A standard questionnaire was completed for all subjects, with particular attention to respiratory symptoms of upper

(sneezing, rhinorrhea, nasal itching, and congestion) and lower (productive and nonproductive cough, wheezing, and dyspnea) airways.

Skin Testing

Skin prick test was performed by standard method with Epipharm-ALK (Copenhagen, Denmark) allergens: *D. pteronyssinus*, *D. farinae*, *L. destructor*, and *T. putrescentiae* (100 BU/mL; BU=Biological Unit) (8). Histamine hydrochloride (1 mg/mL) and buffer solution were tested as controls of positive and negative skin reaction, respectively. An urtica with (D+d)/2 of 3 mm or more (D – largest diameter, d – diameter perpendicular to the largest diameter) was considered a positive test.

Specific IgE

Specific IgE for *D. pteronyssinus*, *D. farinae*, *L. destructor*, and *T. putrescentiae* was measured by immuno CAP technology – UNI CAP 100 (Pharmacia AB Diagnostics, Uppsala, Sweden). Values below 0.35 kU_A/L were considered nonspecific and values higher than 0.35 kU_A/L increased (9).

Statistical Analysis

Chi-square test was used for testing differences in the prevalence of positive skin prick tests and increased specific IgE, and t-test for testing differences between mean skin reactivity in the examined groups. A value of $p < 0.05$ was considered statistically significant.

Results

The results of the specific IgE levels and skin test reactions were analyzed separately and in relation to respiratory symptoms.

The highest prevalence of increased specific IgE was found for *D. pteronyssinus* and *D. farinae* (16/67, 23.9%), followed by *L. destructor* (10/67, 14.9%) and *T. putrescentiae* (15/67, 22.4%). Among subjects with increased specific IgE for *D. pteronyssinus* and *D. farinae* skin prick tests were positive in 10 out of 16 subjects (62.5%), for *L. destructor* in 9 out of 10 subjects (90%), and for *T. putrescentiae* in 14 out of 15 subjects (93.3%) (Fig. 1).

The highest prevalence of positive skin prick test was found for *T. putrescentiae* (24/67, 35.8%) followed by *L. destructor* (18/67, 26.8%), and *D. pteronyssinus* and *D. farinae* (15/67, 22.4%). Among subjects with positive skin prick test for *D. pteronyssinus* and *D. farinae* specific IgE was increased in 10 out of 15 subjects (66.7%), for *L. destructor* in 10 out of 18 subjects (55.5%), and for *T. putrescentiae* in 14 out of 24 subjects (58.3%) (Fig. 2).

Respiratory symptoms were present in 46.3% of subjects. The prevalence of respiratory symptoms in subjects with positive skin prick test for house dust mites and those with positive skin prick test for storage mites was similar (54.5% and 51.8%, respectively; $p = 0.8527$) and also in subjects with increased sIgE (41.2% and 53.7%, respectively; $p = 0.4851$) (Fig. 3).

The significant difference of mean skin reactivity in skin prick test positive reactions between nonspecific and increased specific IgE values was found only for *L. destructor* (3.6 ± 0.7 mm vs. 6.2 ± 2.8 mm; $p = 0.004$) and not for other tested mites (Fig. 4).

Among 16 subjects with increased specific IgE for *D. pteronyssinus* 15 had increased specific IgE to *D. farinae*, 8 to *L. destructor* and 12 to *T. putrescentiae*. Among 15 subjects with positive skin prick test for *D. pteronyssinus* 8 had positive skin prick test to *D. farinae*, and 11 to *L. destructor* and *T. putrescentiae*. In 16 subjects with increased specific IgE for *D. pteronyssinus* 8 had increased specific IgE for all tested mites, as well as

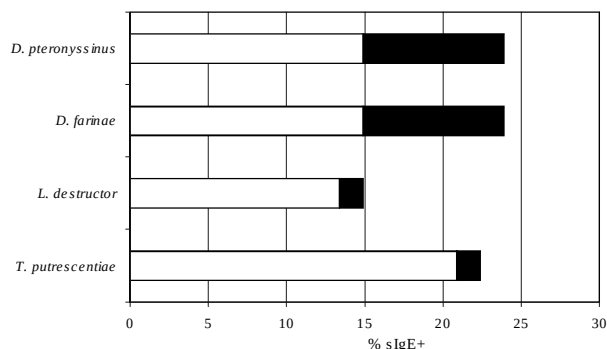


Figure 1. Prevalence of subjects with increased specific IgE (sIgE+). Open columns, subjects with positive skin prick test. Closed columns, subjects with negative skin prick test.

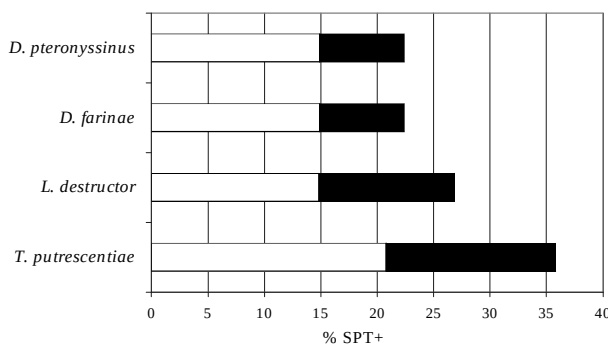


Figure 2. Prevalence of subjects with positive skin prick test (SPT+). Open columns, subjects with specific IgE > 0.35 kU_A/L. Closed columns, subjects with specific IgE < 0.35 kU_A/L.

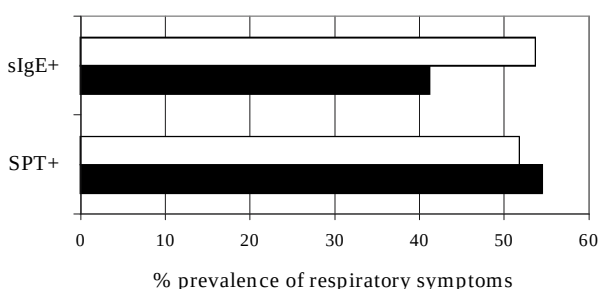


Figure 3. Prevalence of respiratory symptoms in subjects (N=67) with positive prick test (SPT+) and increased specific IgE (sIgE+). Open columns, storage mites. Closed columns, house dust mites.

7 out of 15 subjects with positive skin prick test for *D. pteronyssinus* (Fig. 5).

Discussion

The prevalence of sensitization to different species of dust mites in urban house environments has not been sufficiently investigated (10). A few recent studies have focused on sensitization to some species of storage mites, particularly *L. destructor* and *T. putrescentiae* in different urban populations (6,11,12).

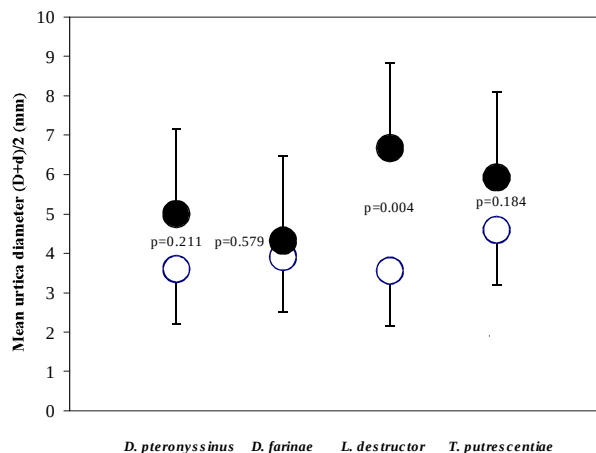


Figure 4. Mean skin reactivity in subjects with positive skin prick test. Open circles, subjects with specific IgE < 0.35 kU_A/L. Closed circles, subjects with specific IgE > 0.35 kU_A/L.

Clinical relevance of positive skin test reactions and/or increased specific IgE values for more than one species of dust mites is difficult to assess.

The prevalence of positive skin prick test reactions and/or increased specific IgE values for *Dermatophagoides* species has been investigated in numerous studies for moderate climate regions, where it ranged between 5% and 30% (1,3). Data for storage mites in urban populations ranged between 12% and 61.5%, depending on the used sample and criteria. However, the majority are around 15% (5,12-14). The results of this study are within the above ranges. In our previous study (15), the prevalence of positive skin prick test reactions to *D. pteronyssinus* in the general, adult population of Croatia was 13%. In this study the prevalence is higher (22.4%), indicating an increase of sensitization to *D. pteronyssinus* in the general population of Croatia over the last 4 years.

In this study, significant difference of mean skin reactivity in prick test positive reactions between nonspecific and increased specific IgE values was found only for *L. destructor* and not for *T. putrescentiae* (Fig. 4). These results indicate that skin prick test with *T. putrescentiae* shows more nonspecific positive reactions and that specific IgE measuring is a more reliable method for establishing sensitization to this mite.

Sensitization to storage mites in this study was accompanied by respiratory symptoms in similar proportions as in those sensitized to house dust mites (about 50%). This means that about half of the sensitized subjects to all tested dust mites are asymptomatic, suggesting the need for additional diagnostic procedures, such as specific nasal or bronchial challenges and measurement of mites allergen levels in the dust. Such procedures could help in determination of present or future clinical relevance of sensitization to dust mites. Some studies have shown that relevant clinical manifestations in sensitized patients to a specific dust mite are connected only with sufficient environmental exposure to that dust mite (11,16). Positive skin prick test and increased specific IgE levels in the majority of studies showed lack of correlation with clinical manifestation of sensitization (10).

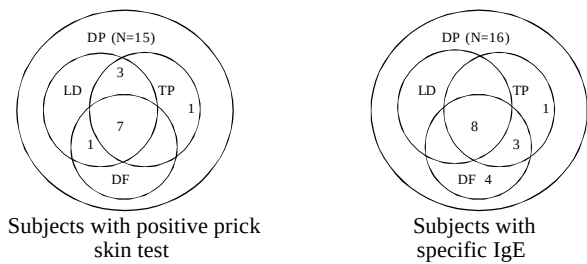


Figure 5. Cosensitization between house dust and storage mites in sensitized subjects. DP, *Dermatophagoides pteronyssinus*; DF, *Dermatophagoides farinae*; LD, *Lepidoglyphus destructor*; TP, *Tyrophagus putrescentiae*.

... from literature confirm that house dust and storage mites possess specific, unique antigens (5,10,17). On the other hand, there is some evidence of cross-reactivity between some antigens on pyroglyphid and non-pyroglyphid mites (12,18). The majority of authors agree that multiple sensitization is more dominant than cross-reactivity. In our study, 7 out of 15 subjects with positive skin prick test for *D. pteronyssinus* had a positive skin prick test to all other tested mites. Similar results were shown for *in vitro* testing (8 out of 16 subjects). These results indicate cosensitization between storage and house dust mites in about 50% of sensitized persons by *in vivo* and *in vitro* criterion, confirming other reports (13,17,19).

In conclusion, sensitization to non-pyroglyphid (storage) mites is present in the general urban population of Croatia in similar proportions as to pyroglyphid (house dust) mites, and is accompanied by the same range of respiratory symptoms. These findings indicate that *in vivo* and/or *in vitro* testing for sensitization to storage mites should be considered in routine allergological diagnostic procedures. The clinical relevance of sensitization established by the skin prick testing and specific IgE measurement should be confirmed with additional examinations, including determination of specific mite allergen levels in patients' environments and specific challenge tests.

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