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SHORT COMMUNICATION

SENSITIZATION TO STORAGE MITES IN URBAN WORKING ENVIRONMENT

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This paper presents an analysis of a medical history questionnaire, skin prick test and specific IgE to storage mites *Lepidoglyphus destructor* and *Tyrophagus putrescentiae* performed on 26 male paper mill workers and 36 postmen. Positive prick test were considered urticas with the mean diameter of 3 mm or over. Increased specific IgE were considered values of over 0.35 kU/L. Paper mill workers manifested a significantly higher frequency of positive test results, increased specific IgE and positive prick test, to *L. destructor* and *T. putrescentiae* than did the postmen. Paper mill workers with increased specific IgE manifested significantly greater mean skin reactivity to *T. putrescentiae* than to *L. destructor*. Respiratory symptoms were found in 40% of paper mill workers with positive test results to *L. destructor*, and in 53.8% with positive test results to *T. putrescentiae*. All postmen with positive test results to *L. destructor* and 83.3% with positive test results to *T. putrescentiae* had respiratory symptoms.

The study results indicate that it is necessary to monitor sensitization to mites and to establish methods for identification and quantification of mites in the working and general environment.

Key words:
allergy, skin prick test, specific IgE, storage mites, working environment

Beside house dust mites of the pyroglyphid family, there are somewhat anatomically different mites of the tyroglyphid family commonly termed as storage mites, among which the most frequent are the *Glycyphagidae* and the *Acaridae* families. The predominant species in regions with moderate climate are *Lepidoglyphus destructor*, *Tyrophagus putrescentiae* and *Acarus siro*, while genus *Blomia* prevails in the regions with subtropical and tropical climate. Relative humidity approximating 80% and the temperatures between 25 and 30 °C are necessary for their growth and reproduction. Storage mites feed on a variety of substances including fungi and are often found in stored food such as grain, flour, and hay. Moreover, when the relative humidity and temperatures are favourable, storage mites may be found in the house dust (1).

Primarily studied as occupational allergens, storage mites have been described as causing symptoms of allergic rhinitis, conjunctivitis, and brohchial asthma, particularly in a rural working environment. Many studies pointed out the importance of storage mites in causing allergic respiratory symptoms in farmers, grain store workers, or bakers (2–5). The rare epidemiological studies on the sensitization to storage mites showed that the prevalence was higher in a rural than in an urban population (6). The 15% prevalence of sensitized persons to storage mites in the general urban population (7, 8) calls for a logical assumption that the part of it is contributed by occupational exposure.

The aim of this study was to investigate the differences in sensitization to storage mites *Lepidoglyphus destructor* and *Tyrophagus putrescentiae* between recycling paper mill workers and postmen, both from an urban working environment.

SUBJECTS AND METHODS

The study included two groups of workers: 26 male paper mill workers (mean age 41.3 ± 10 years and the mean employment duration 17.4 ±10.8 years) and 36 postmen (mean age of 42.9 ± 6.7 years and the mean employment duration 20.3 ± 7.1 years). Subjects from both groups had lived and worked in the same town (Zagreb). All paper mill workers had handled old and dusty stored paper whereas the job of the postmen entailed predominantly outdoor activities. We assumed that the working environment considerably differed between the groups in relation to dust exposure. At the time of the study, 22 of 26 (84.6%) paper mill workers and 23 of 36 (63.9%) of postmen smoked.

Medical history

All subjects were required to answer a standard questionnaire that paid particular attention to respiratory symptoms of the upper and the lower airways. Nasal itching, nasal congestion, rhinorrhoea, and sneezing were taken as important symptoms of the upper airways, while cough, phlegm, dyspnoea, and wheezing were taken as important symptoms of the lower airways.

Skin testing

A standard method (9) was used for the skin prick test for *L. destructor* (100 BU/ml) and *T. putrescentiae* (100 BU/ml) allergens prepared by ALK-Epipharm, Linz, Austria. The results were evaluated twenty minutes after the skin prick test. The reaction manifesting as an urtica with a mean diameter of 3 mm or over was considered positive. The control of positive and negative skin reactions was performed with histamine hydrochloride (1 mg/ml) and buffer solution on all subjects. The skin reactivity was analysed as the prevalence of positive skin prick test and mean urtica diameter.

Specific IgE

The levels of specific IgE in venous blood samples of all subjects were analysed by enzymo-immunomethod (UNICAP 100, Pharmacia AB Diagnostics, Uppsala, Sweden). Increased were considered the values that surpassed 0.35 kU/L (10). Subjects with simultaneously positive skin prick test and increased specific IgE to storage mites were considered sensitized.

Statistical analysis

The chi-square test was used to determine the differences between the prevalence of positive skin reactions and the increased levels of the specific IgE, while the t-test was used for the differences in the mean skin reactivity in the examined groups. Statistically significant was considered the value of $P<0.05$.

RESULTS

Paper mill workers manifested a significantly higher prevalence of positive prick tests and increased specific IgE than did the postmen, that is, 38.5% vs. 8.3% for *L. destructor*, respectively, $P<0.005$; and 50% vs. 16.6% for *T. putrescentiae*, respectively, $P<0.005$ (Figure 1).

Forty per cent of paper mill workers with positive prick test and increased specific IgE to *L. destructor*, and 53.8% with positive prick test and increased specific IgE to *T. putrescentiae* complained to have respiratory symptoms as follows; symptoms of the lower airways were present in 20% of paper mill workers with positive reactions to *L. destructor* and in 38.5% with positive reactions to *T. putrescentiae*.

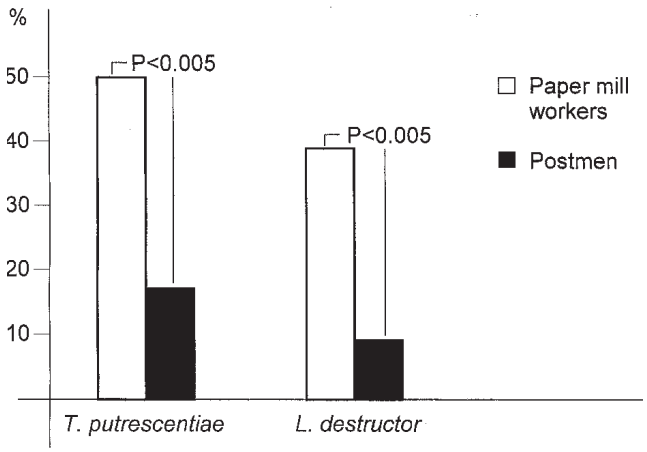

Figure 1 *Prevalence of subjects with positive prick test and increased specific IgE to T. putrescentiae and L. destructor*

All postmen with positive prick test and increased specific IgE to *L. destructor* and 83.3% with positive prick test and increased specific IgE to *T. putrescentiae* complained of respiratory symptoms exclusively of the lower airways (Figure 2).

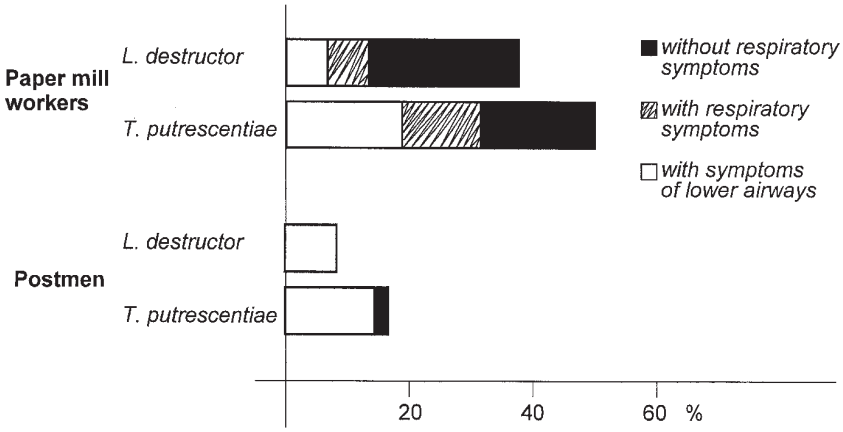

Figure 2 *Prevalence of respiratory symptoms in subjects with positive prick test and increased specific IgE to T. putrescentiae and L. destructor*

Paper mill workers with increased specific IgE manifested a significantly higher mean skin reactivity to *T. putrescentiae* than to *L. destructor* (6.31 ± 2.31 vs. 3.11 ± 1.53, respectively, $P<0.001$). No such difference was found in postmen (Figure 3).

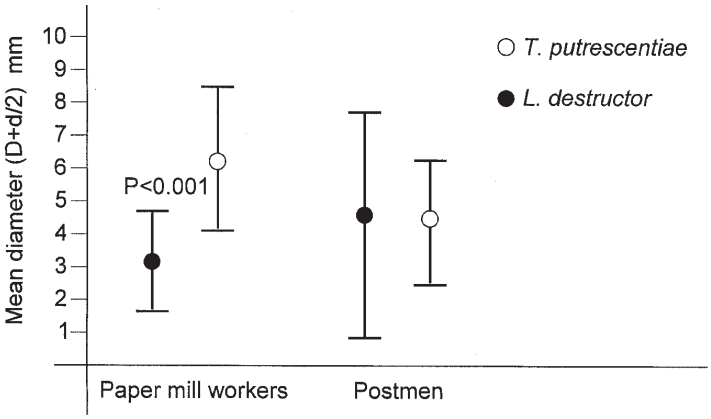

Figure 3 *Mean skin reactivity in subjects with increased specific IgE to T. putrescentiae and L. destructor*

DISCUSSION

This is the first study on the prevalence of occupational sensitization to storage mites in Croatia. Our preliminary data on the sensitization to storage mites in the urban adult population of the continental Croatia show a 14.9% prevalence for *L. destructor* and a 22.3% prevalence for *T. putrescentiae* (8), which is similar to the sensitization prevalence to house dust mite *Dermatophagoides pteronyssinus* found in the same population sample (23.9%). The results of this study show a significantly higher sensitization prevalence to storage mites in paper mill workers than in postmen ($P<0.005$). Namely, as we expected, the postmen, who work outdoors, manifested results similar to those of the general population in Croatia (8.3% vs. 14.9% for *L. destructor* and 16.6% vs. 22.3% for *T. putrescentiae*, respectively). Furthermore, our previous study on sensitization prevalence to *D. pteronyssinus* in population from several industries showed that the sensitization prevalence in paper mill workers was not significantly different from the general population (21% vs. 13%, respectively) (11). The comparison of the above data suggests that while the exposure to *D. pteronyssinus* is evenly distributed, the occupational exposure to storage mites, at least in paper mill workers, is far greater than in the general population or in outdoor occupations.

It is worth noticing that about half of the paper mill workers sensitized to storage mites were found asymptomatic, while practically all sensitized postmen complained of the lower airways symptoms. The smoking habit was comparable in both groups and cannot explain this finding. These results raise a question about the clinical relevance of asymptomatic sensitized persons (12).

The significantly higher mean skin reactivity to *T. putrescentiae* than to *L. destructor* in paper mill workers with the increased specific IgE and the higher prevalence of respiratory symptoms in workers sensitized to *T. putrescentiae* than in those sensitized to *L. destructor* suggest that the exposure to *T. putrescentiae* is greater than to *L. destructor* in a paper mill.

To conclude, the first step in prevention of occupational allergic respiratory diseases is to identify all mite species present in a specific working environment and concurrently detect and control sensitized workers at pre-employment or regular medical examinations. In other words, it is necessary to establish methods for identification and quantification of mites in Croatia.

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Sažetak

SENZIBILIZACIJA NA SKLADIŠNE GRINJE U GRADSKOJ RADNOJ POPULACIJI

Anamnestički podaci, prick kožno testiranje i specifični IgE na skladišne grinje *Lepidoglyphus destructor* i *Tyrophagus putrescentiae* analizirani su u 26 radnika tvornice recikliranog papira i u 36 poštara. Prick test je izvođen s Epipharm-ALK alergenima, a promjer urtike od 3 mm i više smatrali smo pozitivnom kožnom reakcijom. Specifični IgE mjeren je imunoCAP tehnologijom (Pharmacia AB Diagnostics). Vrijednosti >0,35 kU/L smatrali smo povišenima. Rezultati su pokazali značajno veće prevalencije osoba s pozitivnim prick testom i povišenim specifičnim IgE na *L. destructor* i *T. putrescentiae* u radnika tvornice papira nego u poštara (38,5%: 8,3%; P<0,005 za *L. destructor*, te 50%: 16,6%; P<0,005 za *T. putrescentiae*). U radnika tvornice papira s povišenim specifičnim IgE nađen je značajno veći srednji promjer urtika u kožnom testu za *T. putrescentiae* nego za *L. destructor* (6,31±2,31: 3,11±1,53; P<0,001). Takva razlika nije nađena u poštara. Prevalencija respiratornih simptoma u osoba s pozitivnim prick testom i povišenim specifičnim IgE iznosila je u radnika tvornice papira 40% za *L. destructor* i 53,8% za *T. putrescentiae*, dok je u poštara bila 100% za *L. destructor* i 83,3% za *T. putrescentiae*.

Rezultati upozoravaju na značajno veću prevalenciju senzibilizacije dišnog sustava na skladišne grinje *L. destructor* i *T. putrescentiae* u radnika tvornice papira nego u poštara, te potrebu otkrivanja broja i vrsta grinja u radnom okolišu, kao i otkrivanje i praćenje zdravstvenog stanja senzibiliziranih radnika tijekom prethodnih i periodičnih pregleda.

Ključne riječi:
alergija, prick test, radni okoliš, skladišne grinje, specifični IgE

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