

Clinical significance and allergenic cross-reactivity of *Euroglyphus maynei* and other nonpyroglyphid and pyroglyphid mites

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The clinical significance and allergenic cross-reactivity of the storage mites Lepidoglyphus destructor and Acarus siro and the house dust mites Dermatophagoides pteronyssinus and Euroglyphus maynei were investigated with specific IgE antibodies by use of the RAST and the RAST-inhibition technique. RAST-positive sera were obtained from 64 Swedish farmers whose test results were positive to at least one of the four mite species. E. maynei was shown to be a common cause of sensitization among the whole farming population with a prevalence of 4.5% of positive RAST reactions. Farmers with asthma alone or in combination with rhinitis were more often sensitized to storage mites and house dust mites than farmers with rhinitis only. No significant correlation was found between positive RAST results to L. destructor and E. maynei on the one hand and L. destructor and D. pteronyssinus on the other. Statistical significance was reached only between RAST results to E. maynei and D. pteronyssinus. However, by RAST-inhibition studies E. maynei was shown to possess its own unique allergen(s). (J ALLERGY CLIN IMMUNOL 1989;83:581-9.)

Several recent studies have shown that the nonpyroglyphid storage mites are important allergens in farmers with symptoms from airways and eyes.¹⁻³ Storage mites include a wide range of families and species, the most important and frequently reported of which are *Lepidoglyphus destructor*, *Glycyphagus domesticus*, *Tyrophagus putrescentiae*, and *Acarus siro*. The pyroglyphid mite *Dermatophagoides pteronyssinus* is considered a common respiratory allergen in subjects with house dust allergy, but also in farmers. However, little information currently exists on the clinical significance and antigenic properties of other nonpyroglyphid and pyroglyphid mites. Fig. 1 shows the acarologic relationships between these mite species. A number of studies⁴⁻¹⁰ indicate that pyroglyphid mites, particularly *D. pteronyssinus* but also *Euro-*

Abbreviations used

BU:	Biologic units
CNBr:	Cyanogen bromide
cpm:	Counts per minute
PRU:	Phadebas RAST units
U:	Arbitrary units

glyphus maynei, dominate the fauna of house dust, where storage mites are found less frequently. In a recent report by Walshaw and Evans¹¹ the pyroglyphid mite *E. maynei* was found to be nearly as common as *D. pteronyssinus* in the homes of individuals with asthma who have a positive skin prick test to *D. pteronyssinus*, a finding that renders further work on this mite important.

The present study, which is part of an epidemiologic investigation of allergic manifestations in farmers on the Swedish island of Gotland in the Baltic Sea, was conducted to investigate the prevalence of specific IgE antibodies measured by RAST¹² to the pyroglyphid mite *E. maynei*. The existence of allergenic cross-reactivity between various mites was also studied by comparison of IgE antibody levels in serum samples from farmers with varying IgE antibody levels against at least one of the four studied mites and by the RAST inhibition technique.

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FAMILY	GENUS	SPECIES
Acaridae	<i>Acarus</i>	<i>A. siro</i>
	<i>Tyrophagus</i>	<i>T. putrescentiae</i>
Glycyphagidae	<i>Lepidoglyphus</i>	<i>L. destructor</i>
	<i>Glycyphagus</i>	<i>G. domesticus</i>
	<i>Dermatophagoides</i>	<i>D. pteronyssinus</i>
Pyroglyphidae	<i>Euroglyphus</i>	<i>E. maynei</i>

FIG. 1. Taxonomic position of different storage and house dust mites.

METHODS

Subjects

Serum samples from a total of 440 farmers from the island of Gotland were examined with RAST for IgE antibodies against *E. maynei*. The present investigation is part of one of the first extensive studies of the epidemiology of allergy to storage mites.² In the first part of the study a questionnaire was sent to all farmers between 15 and 65 years of age whose main occupation was farming. A total of 2578 farmers, representing more than 90% of the studied population, answered the questionnaire. On the basis of the answers received, 360 farmers with respiratory symptoms and 100 healthy farmers were selected for a medical investigation including case history, physical examination, skin prick testing using common allergens, and blood sampling for IgE determination and RAST analysis. Specific IgE antibodies were measured against pollens, animal danders, and molds and to storage mites and house dust mites. Four hundred forty (95.7%) of the invited farmers attended the medical examination. In the present part of the investigation allergenic cross-reactivity between *E. maynei* and *L. destructor* as well as *A. siro* and *D. pteronyssinus* was first evaluated from the RAST results obtained in 64 farmers whose tests were positive to at least one of the four mites. Sera from four farmers, who were RAST positive with high IgE antibody levels against any of the four studied mites, were then individually submitted to complete checkerboard-cross-RAST inhibition studies. RAST inhibition of the homologous system (where *E. maynei* extract inhibits the positive RAST to *E. maynei* allergen disks) was tested with four more sera. In addition, four sera that were positive in RAST to both *E. maynei* and *D. pteronyssinus* were inhibited with extracts prepared from these two mite species. To demonstrate the presence of a unique allergen(s) in *E. maynei* in comparison with *D. pteronyssinus*, 14 sera were inhibited with both *E. maynei* and *D. pteronyssinus* extract. Some of these sera were obtained from farmers and others from patients attending the Allergy Clinic at the Karolinska Hospital, who were either RAST positive to *E. maynei* and negative to *D. pteronyssinus*, or the reverse. In addition, blood samples were obtained from 100 consecutive atopic patients referred to the Allergy Clinic matched for age and sex with the symptomatic farmers. A total of 86 asymptomatic blood donors were also examined with RAST to

E. maynei. All serum samples had been kept frozen at -20°C until analyzed.

Allergen preparations

L. destructor extract (0.6 mg protein/ml) was prepared as 1:50 wt/vol in 0.15 mol/L NaCl containing 0.02% NaN_3 . This extract was produced from raw material obtained from Allergon AB (Ängelholm, Sweden). A 1:10 wt/vol extract of *A. siro* (0.9 mg protein/ml) was prepared from material from Allergon AB. The *D. pteronyssinus* extract was a Pharmalgen extract, 100,000 BU/ml¹³, obtained from Pharmacia Diagnostics AB, Uppsala, Sweden. Extract of crude *E. maynei* (2.9 mg protein/ml) was prepared as 1:10 wt/vol of material obtained from Allergon AB. The protein content was estimated with the Lowry technique¹⁴ with bovine serum albumin as standard.

Radioallergosorbent test

RAST was performed as described previously^{2,15} for measurement of specific IgE antibodies in serum against the four storage mites, *D. pteronyssinus*, and *E. maynei*. Iodine 125-labeled immunosorbent-purified anti-IgE (Phadebas RAST; Pharmacia Diagnostics AB) of mixed D_e1 and D_e2 specificity¹⁶ was used. The count rates obtained were compared with those of the Phadebas RAST Reference System (Pharmacia Diagnostics AB) and the results expressed in PRU.¹⁷ All sera with RAST values of ≥ 0.20 PRU/ml were retested in duplicate, a positive result being defined as a value ≥ 0.35 PRU/ml. Allergen disks with *A. siro*, *L. destructor*, and *D. pteronyssinus*, d70, d71, and d1, respectively, were obtained from Pharmacia Diagnostics AB. Wheat disks were prepared in the laboratory by coupling 500 μl of an 1:5 wt/vol extract of washed wheat grains to 100 CNBr-activated disks.¹⁸ This extract had been prepared from wheat grains that had been thoroughly washed in saline solution. For *E. maynei* the allergen disks were prepared in the laboratory by coupling 100 μl of the crude allergen extract undiluted to 100 CNBr-activated paper disks. The disks gave no nonspecific uptake (<0.35 PRU/ml) of labeled anti-IgE when tested against nonatopic serum samples with IgE levels of 20 to 4000 U/ml.¹⁹ Serum samples that were positive in RAST against wheat but negative in RAST against storage or house dust mites were used as controls for unspecific wheat (mite growth medium) uptake on the disks. Because disks prepared from the crude *E. maynei* extract showed unspecific wheat uptake, about 2 PRU/ml in RAST, the extract was purified over CNBr-activated Sepharose 4B (Pharmacia Fine Chemicals, Uppsala, Sweden) to which the gamma globulin fraction (18% Na_2SO_4 precipitate) of a rabbit-anti-wheat serum (24 mg/gm gel) had been coupled according to the instructions of the manufacturer. After recycling the extract three times, the unspecific wheat uptake of the disks now prepared from the purified extract (1.5 ml to 100 disks) was about 0.9 PRU/ml to a serum pool, diluted 1:5, which was strongly positive (about 4 PRU/ml) in RAST against wheat disks. The protein content for the purified extract was <0.2 mg. All sera that were positive in RAST to both *E. maynei* and wheat were sub-

TABLE I. Number of positive RAST tests (≥ 0.35 PRU/ml) against different combinations of storage and house dust mite species among 440 Swedish farmers

	<i>L. destructor</i>	<i>A. siro</i>	<i>E. maynei</i>	<i>D. pteronyssinus</i>
<i>L. destructor</i>	51	24	29	29
<i>A. siro</i>		26	21	22
<i>E. maynei</i>			37	28
<i>D. pteronyssinus</i>				37

jected to RAST inhibition with wheat extract. A serum sample was considered as negative in RAST to the respective mite disks if the inhibition exceeded 90%. In the case of the inhibition of the mite RAST value by wheat of 50% to 90% the PRU values of the mite RAST-positive serum were lowered by the same percentage as the result of the inhibition by wheat.

RAST inhibition

The RAST inhibition studies were performed as previously described in detail.²⁰ In principle, serum was diluted 1:1 to 1:14 to give approximately 5000 cpm in RAST. Seventy microliters of mite extract of various dilutions was mixed with 70 μ l of the appropriate dilution of a serum sample from a subject with IgE antibodies against storage mites or house dust mites for incubation at 4°C for 24 hours. The level of free IgE antibodies was then determined by RAST. The results were expressed in percent of the counts per minute value of the positive serum dilution after inhibition with allergen extract diluent, according to the following formula:

Percent inhibition =

$$100 - \frac{\text{cpm after inhibition with extract}}{\text{cpm after inhibition with diluent}} \times 100$$

A background value (buffer value) averaging 200 cpm was always subtracted from the actual count rate. The potency of the extracts was compared at 50% RAST inhibition. The inhibitory capacity was expressed in U. The highest concentration of an extract used was assigned the value 1000 U/ml. The dilution of the 1000 U/ml solution of each extract was selected so that 50% RAST inhibition of the homologous system (e.g., the *E. maynei* extract inhibiting the positive RAST to *E. maynei* allergen disks) was obtained at an extract concentration of the order of 1 to 10 U/ml. For the *L. destructor* extract the concentration of 1000 U/ml represents 1:100 wt/vol, whereas for *A. siro* and *E. maynei* the corresponding dilution was 1:10 wt/vol. For the *D. pteronyssinus* extract the concentration of 1000 U/ml corresponds to 100,000 BU/ml. To establish the presence of unique allergens inherent in *E. maynei* and *D. pteronyssinus*, the IgE antibody levels against which were sometimes low, a relationship between the serum and extract concentration different from the one described above was necessary. Sera and extracts were mixed in the ratio 19:1 corresponding to a highest final concentration of allergen in the sample of 50 U/ml compared with 500 U/ml obtained

when equal amounts of serum and extract were used. A final concentration of 500 U/ml is the same as an extract concentration of 1000 U/ml.

Statistical analysis

To estimate the strength of the allergenic relationships between the different species of storage mites, Spearman rank correlation coefficients between positive RAST scores (positive to at least one of the two species) were calculated. Estimates of correlation coefficients were tested for a significant departure from zero. For all tests $p < 0.05$ was considered to be significant.

RESULTS

Comparison of disks prepared from crude and purified extracts of *E. maynei*

A total of 41 and 39 farmers, respectively, were RAST positive against the crude and purified *E. maynei* disks before inhibition with wheat extract. After the inhibition with wheat extract, six farmers were considered negative against the crude and two farmers negative against the purified extract. Thus, 35 and 37 farmers were considered RAST positive against crude and purified extracts of *E. maynei*, respectively. The correlation coefficient between RAST scores against disks prepared from crude and purified *E. maynei* extract was 0.68 ($p < 0.001$). In all subsequent calculations only RAST values obtained with *E. maynei* disks prepared from the purified extract were used.

Prevalence of positive RAST

The dominating storage mite with respect to occurrence of positive RAST reactions was *L. destructor*, against which positive RAST values were found in 79.7% of the farmers who were RAST positive against mites. In comparison, 57.8% of mite RAST-positive farmers had a positive RAST score against *E. maynei*. One fifth of the farmers with a positive RAST score to *E. maynei* were negative toward *L. destructor* (Table I).

Among the various species of storage mites, *L. destructor* gave the highest prevalence of positive RAST (6.8%) in the whole population of examined farmers. The other nonpyroglyphid mite *A. siro*

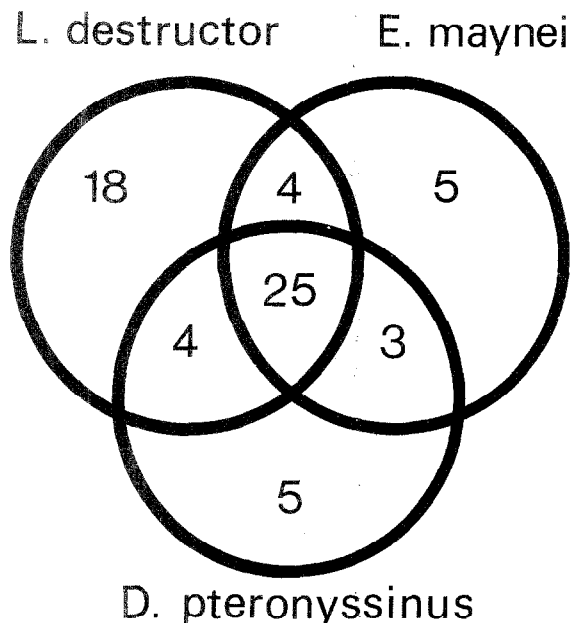


FIG. 2. Distribution of positive (≥ 0.35 PRU/ml) tests against *L. destructor*, *D. pteronyssinus*, and *E. maynei* among farmers in study.

showed a lower prevalence figure, 3.3%. The prevalence figures for the pyroglyphid mites *E. maynei* and *D. pteronyssinus* were quite similar (4.5% and 5.2%). A positive RAST to the nonpyroglyphid mite *L. destructor* and the pyroglyphid mite *E. maynei* was most frequently found among farmers with hypersensitivity symptoms from airways and eyes, prevalence figures being 15.4% and 11.3%, respectively. However, farmers with asthma alone or asthma in combination with rhinoconjunctivitis were even more often sensitized to storage mites and house dust mites than farmers with rhinoconjunctivitis as the only hypersensitivity manifestation.

When only farmers who were RAST positive to at least one of the three mites *L. destructor*, *D. pteronyssinus*, and *E. maynei* were considered, it appeared that 39.1% of these farmers had a positive RAST to all three species. On the other hand, 18 farmers (28.1%) were positive in RAST only against *L. destructor*, five (7.8%) only against *D. pteronyssinus*, and five (7.8%) solely against *E. maynei* (Fig. 2). In comparison, seven patients (7%) who had been referred to the Allergy Clinic were positive in RAST to *E. maynei*, six of whom were also positive to *D. pteronyssinus*, whereas IgE antibodies to *E. maynei* were not detected in any of the blood donors tested.

RAST correlation

No significant correlation was found between positive RAST tests against *L. destructor* and *D. pteronyssinus* ($r = 0.22$, not significant) or be-

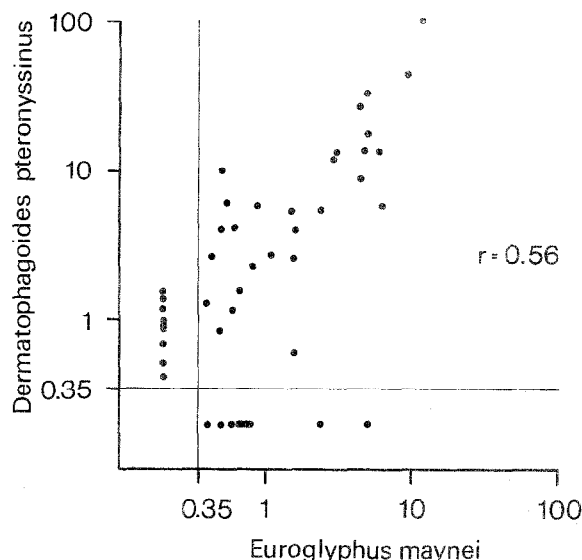


FIG. 3. RAST scores to *D. pteronyssinus* and *E. maynei*. Correlation coefficient ($r = 0.56$) was calculated for all farmers with a positive RAST (≥ 0.35 PRU/ml) to at least one of the two mites.

tween *L. destructor* and *E. maynei* ($r = 0.05$, not significant). Fig. 3 shows the relationship between RAST scores against *E. maynei* and *D. pteronyssinus*. The correlation coefficient between the RAST scores was fairly high ($r = 0.56$, $p < 0.001$). However, the presence of a substantial number of patients with IgE antibodies to the mite *E. maynei* or *D. pteronyssinus* only (Fig. 2 and Fig. 3) indicates that these two mites possess their own unique allergen or allergens as well as allergens in common.

RAST inhibition

The inhibitory capacities of extracts of the house dust mites *D. pteronyssinus* and *E. maynei* are illustrated in Figs. 4 through 8. More than 20 to 40 times as much *E. maynei* extract was needed to inhibit the *D. pteronyssinus* system (a positive RAST to *D. pteronyssinus* allergen disk) and the *L. destructor* system, respectively, compared with the amount required in the homologous system (a positive RAST to *E. maynei*) (Fig. 4, A). The *A. siro* system was only inhibited to a very low degree by the *E. maynei* extract.

A similar amount of *D. pteronyssinus* extract was needed to inhibit both the *E. maynei* and the homologous system (Fig. 4, B). The *D. pteronyssinus* extract could not produce a 50% inhibition of either the *L. destructor* or *A. siro* systems. In comparison with the *D. pteronyssinus* extract, the *E. maynei* extract was able to achieve a higher degree of inhibition of the *L. destructor* system.

The *L. destructor* extract showed a very low degree

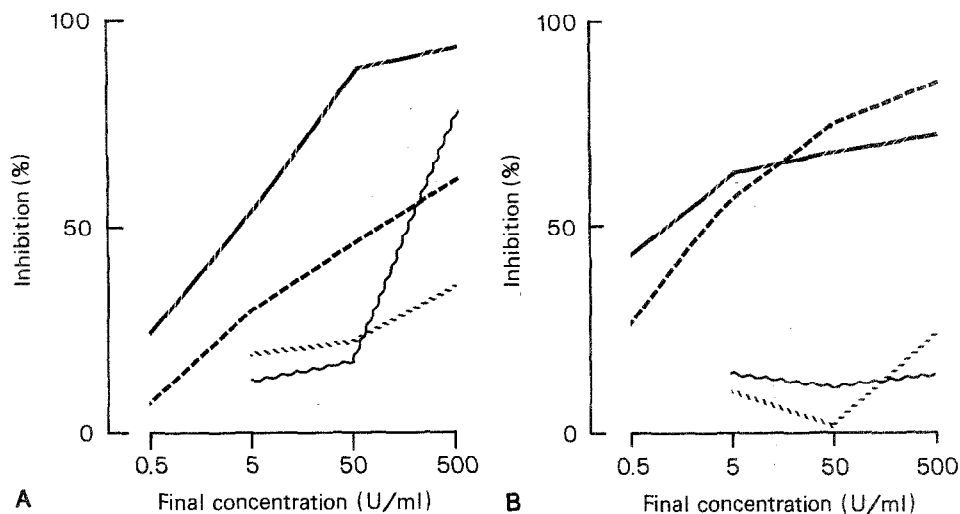


FIG. 4. A, Inhibiting effect of extracts of *E. maynei* and B, *D. pteronyssinus* on a positive RAST to disks coated with allergens of the two storage mites *L. destructor* (~~~~~) and *A. siro* (----) and the two house dust mites *D. pteronyssinus* (----) and *E. maynei* (_____).

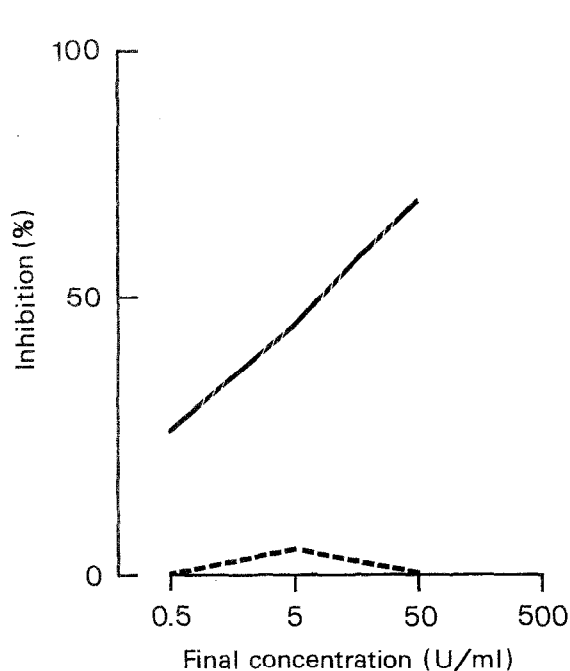


FIG. 5. Inhibiting effect of extracts of *E. maynei* (_____) and *D. pteronyssinus* (----) on a serum sample that is RAST positive to *E. maynei* and negative to *D. pteronyssinus*. Disks were coated with *E. maynei*.

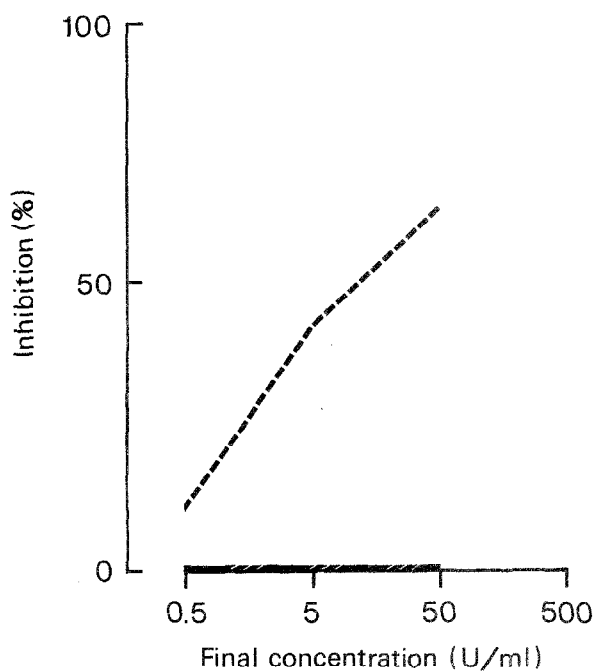


FIG. 6. Inhibitory effect of extracts of *E. maynei* (_____) and *D. pteronyssinus* (----) on a serum sample that is RAST negative to *E. maynei* and positive to *D. pteronyssinus*. Disks were coated with *D. pteronyssinus*.

of inhibition of the *E. maynei*, *D. pteronyssinus*, and *A. siro* systems. Fifty percent inhibition was not achieved even at the strongest concentration added, 1000 U/ml.

The RAST inhibiting relation of *D. pteronyssinus* and *E. maynei* can also be illustrated in a slightly different way. Figs. 5 through 8 show the inhibitory capacity of *E. maynei* and *D. pteronyssinus* extracts

on a positive RAST to disks coated with *E. maynei* (Figs. 5 and 7, A) and *D. pteronyssinus* (Figs. 6 and 7, B). Sera from four farmers who were positive in RAST to *E. maynei* and negative to *D. pteronyssinus* were studied. In comparison with the homologous system, the *D. pteronyssinus* extract was clearly unable

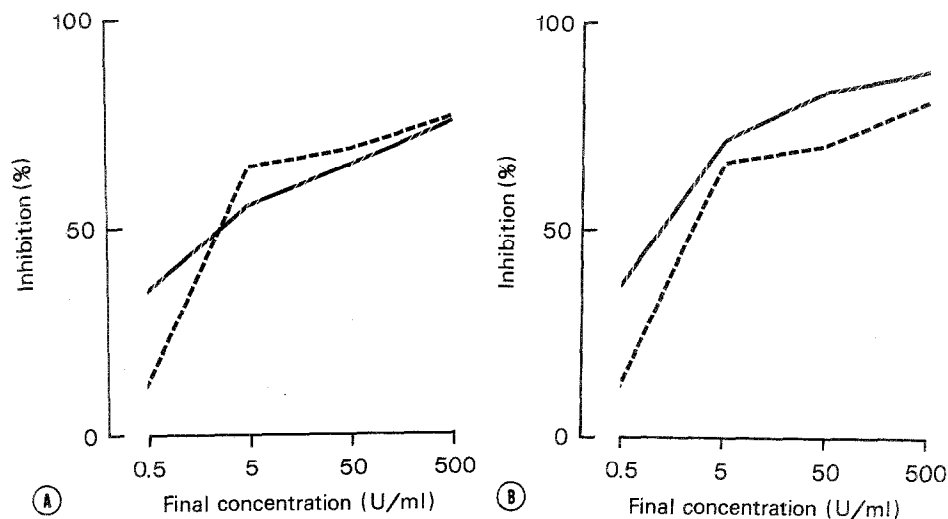


FIG. 7. Inhibitory effect of extracts of *E. maynei* (—) and *D. pteronyssinus* (---) on a serum sample that is RAST positive to both *E. maynei* and *D. pteronyssinus*. Disks were coated with *E. maynei* (A) and *D. pteronyssinus* (B).

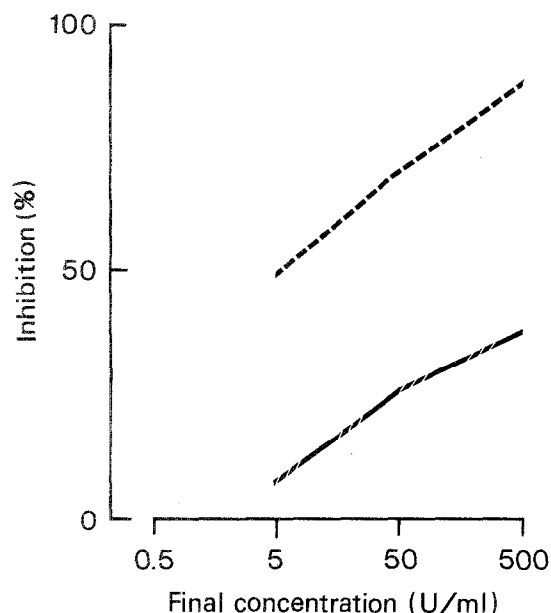


FIG. 8. Inhibitory effect of extracts of *E. maynei* (—) and *D. pteronyssinus* (---) on a serum sample that is RAST negative to *E. maynei* and positive to *D. pteronyssinus*. Disks were coated with *D. pteronyssinus*.

to inhibit the *E. maynei* system (less than 10% inhibition at 50 U/ml) (Fig. 5). The inhibitory capacity of *E. maynei* and *D. pteronyssinus* extracts on sera that were positive in RAST solely to *D. pteronyssinus* were studied. In the *D. pteronyssinus* system three sera were inhibited by the *D. pteronyssinus* but not by the *E. maynei* extract (Fig. 6). Moreover, sera from four subjects who were RAST positive to both

E. maynei and *D. pteronyssinus* were inhibited by *E. maynei* extract as well as *D. pteronyssinus* extract (Figs. 7, A and B). Seven sera differed from the pattern above. They were partially inhibited in the *D. pteronyssinus* system (less than 40% inhibition at 500 U/ml) by the *E. maynei* extract (Fig. 8), despite being RAST negative to *E. maynei*.

In four subjects one concentration only of the extracts of *E. maynei* and *D. pteronyssinus* was added to achieve a 50% inhibition of the homologous system. The simplified inhibition studies supported the findings of our detailed RAST inhibition studies of *E. maynei* and *D. pteronyssinus* using serial dilutions of the extracts.

DISCUSSION

House dust has long been recognized as an important cause of allergic rhinoconjunctivitis and asthma. Voorhorst et al.²¹ reported that house dust contained several species of mites, the most important of which seemed to be *D. pteronyssinus*. Several investigations carried out since the mid 1960s have confirmed the importance of these observations.^{5, 22} However, in North America the commonest species is *Dermatophagoides farinae*.^{23, 24} Other mites, such as storage mites, were also found in dust surveys from the United Kingdom²² and the Netherlands.²⁵

The importance of storage mites as a cause of allergic manifestations from airways and eyes in farming environments was discovered only in recent years, however.¹⁻³ IgE-mediated hypersensitivity to storage mites has been shown to be common by skin prick tests,²⁶ by bronchial provocation testing,²⁷ and by

RAST.² In fact, our study² indicates that storage mites may be the major cause of sensitization in people working in or living close to an agricultural environment.

Several species of storage mites have been found in rural surroundings, the most frequently observed genera being *Lepidoglyphus*, *Tyrophagus*, *Acarus*, *Glycyphagus*, *Tarsonemus*, and *Tydeus*.^{26, 28-31} Farmers handling hay, straw, and grain, as well as grain workers, are exposed to significant numbers of mites, which are also encountered in livestock feeding facilities.^{26, 28, 32} Furthermore, storage mites are indicated to play an important role for people living in very damp houses where growth of molds may promote the development of *Glycyphagus domesticus*, in particular.³³

We have previously shown that the prevalence of immediate types of hypersensitivity symptoms was high, 40.0%, in the farming population of Gotland.² Rhinoconjunctivitis was the most common type of symptom, 25.9%. Asthma alone (3.5%) was also found quite often. In contrast to the rather low prevalence figures for positive RAST to common allergens such as birch pollen, animal danders, and molds (0.1% to 1.7%), positive RAST to storage mites was found to be very common (6.8%).³⁴ The corresponding prevalence among farmers with hypersensitivity symptoms was 15.4%, and it was even more common among those with possible IgE-mediated hypersensitivity (37.8%).

We have also studied the direct relationship between asthma, positive RAST to *L. destructor*, and exposure to storage mites. All farmers with asthma and a positive skin prick test and RAST to *L. destructor* obtained a positive response (>20% fall in FEV₁) after bronchial inhalation of *L. destructor* extract.³⁵ This gives further support to the importance of storage mites as a cause of asthma in farmers. To establish the significance of *L. destructor* culture medium, four farmers with asthma, two of whom were positive and two negative in RAST to the culture medium, were challenged with this extract. None had an early or late reaction. Gotland is a rather small island with a damp climate that is likely to favor the growth of mites. Further investigation is needed to establish whether the high prevalence of allergy to storage mites applies to other parts of Sweden and to outside countries.

The present study indicates that *E. maynei* is a common cause of sensitization in a farming population. Thus, a positive RAST to *E. maynei* and to the well-known pyroglyphid mite *D. pteronyssinus* was observed with similar frequency. Among farmers with hypersensitivity symptoms from airways and eyes the

prevalence of positive RAST against *E. maynei* was 11.3%. Farmers with asthma alone or in combination with rhinitis were more often sensitized to *E. maynei* than farmers with rhinitis only. Despite the close acarologic relationship among the studied mites, a substantial proportion of subjects who had positive RAST values to *E. maynei* were RAST negative against *D. pteronyssinus*. The fairly high correlation coefficient between the individual RAST values primarily indicates that *D. pteronyssinus* and *E. maynei* are both present in the same environment, whereas no firm conclusion can be derived from RAST correlation figures with respect to allergenic cross-reactivity. However, the existence of subjects with positive RAST values only against *D. pteronyssinus* or *E. maynei* strongly supports the presence of a unique allergen(s) in both mite species. The RAST inhibition studies, on the other hand, suggest that *D. pteronyssinus* possesses some allergenic components inherent in *E. maynei*, whereas *E. maynei* seems to be deficient in some allergenic determinants of *D. pteronyssinus*. This apparent lack of allergen(s) in *E. maynei* could be a result of the mode of sensitization. If *D. pteronyssinus* is the most prevalent sensitizer in this farming population it could be difficult to detect IgE to *E. maynei*—unique allergen(s).

Regarding nonpyroglyphid mites, no significant inhibition was obtained with *E. maynei*, indicating that *E. maynei* is lacking nonpyroglyphid specific allergen or allergens. Nevertheless, *E. maynei* showed a higher inhibitory capacity on the *L. destructor* system compared with *D. pteronyssinus*. However, in a previous study we have reported a lack of allergenic cross-reactivity between *L. destructor* and *D. pteronyssinus*.²⁰

Four out of 41 subjects who were initially considered to be RAST positive against *E. maynei* with the crude extract were subsequently RAST negative with the purified extract. Presumably this was caused by loss of some minor allergens in the purification process. The finding of six farmers, on the other hand, who were RAST negative to the crude extract and positive to the purified extract probably reflects a higher sensitivity of the allergen disks with purified extract.

Previous studies of *E. maynei* have focused on mite counting in house dust. A total of 9% to 33% of the mite fauna have been reported to consist of *E. maynei*.^{5-7, 22, 25} In a recent study, however, Walshaw and Evans¹¹ showed that *E. maynei* was the predominant species in 48% of beds examined and represented 37% of the total number of counted mites including adult specimens. In a large group of subjects with allergic asthma, rhinitis, or both, Mumcuoglu³⁶ showed that

the most frequent and severe skin test reactions were caused by extracts of *E. maynei* (85%), followed by *D. pteronyssinus* and *D. farinae*, despite the fact that *E. maynei* was found less frequently. Because some patients were skin prick positive only to *E. maynei* and others only to *D. pteronyssinus*, Mumcuoglu concluded that *E. maynei* presumably contains specific allergens not shared by the classical house dust mites *D. pteronyssinus* and *D. farinae*. This conclusion is supported by the present data derived from both RAST testing and RAST inhibition studies. Why the *E. maynei* extract partially inhibited the *D. pteronyssinus* system in some instances, despite the serum being negative in RAST, is not altogether clear. It could stem from an inadequate concentration of the inhibiting allergenic component on the *E. maynei* disk. However, Platts-Mills et al.³⁷ have suggested that *E. maynei* contains an allergen that cross-reacts partially with antigen P₁.

Several important issues are raised by the present data. First, from a clinical point of view the house dust mite *E. maynei* is indicated to be the most important mite species in a rural population next to *L. destructor* and *D. pteronyssinus* because positive RAST scores in symptomatic subjects are common and *E. maynei* cross-reacts only to an insignificant extent with the two allergenically distinct storage mites *L. destructor* and *A. siro*. Second, when investigating subjects with suspected allergy to house dust, *E. maynei* should not be overlooked as the causative allergen because a substantial number of subjects seem to be positive to *E. maynei* and negative to *D. pteronyssinus*. Finally, it remains to be ascertained whether these results pertain to other occupational groups and other countries.

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Specific IgE, IgG, and IgA antibody response to oral immunotherapy in birch pollinosis

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Thirty-nine patients with birch pollinosis participated in a double-blind, placebo-controlled trial of oral immunotherapy (OIT) for 18 months. They were treated with increasing doses of freeze-dried birch-pollen antigens for 16 months, reaching a cumulative dose of 280×10^6 biologic units. This is about 200 times more than the dose used in conventional subcutaneous immunotherapy (IT). In the placebo-treated group, but not in the actively treated group, there was a rise in postseasonal birch-specific IgE antibody levels. A significant decline in postseasonal values after 1 year of treatment was recorded in the actively treated, but not in the placebo-treated, group. Compared to the placebo treatment, there was a significant rise in birch-specific IgG antibodies in patients administered active treatment; however, the rise was less than that usually observed during subcutaneous IT. No significant change in birch-specific serum IgA was found in either group. The changes in IgE and IgG antibody levels demonstrate that OIT affects the immune system. This supports our recent findings that OIT demonstrates a beneficial effect in the treatment of birch pollinosis in adults. But, as with subcutaneous IT, there was no clear relationship between antibody response and clinical findings in the patients. The underlying mechanisms responsible for the relief of symptoms thus remain unknown. (J ALLERGY CLIN IMMUNOL 1989;83:589-94.)

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Recent placebo-controlled studies have demonstrated that OIT is beneficial in the treatment of birch-pollen hay fever in adults¹ and children,² provided that high doses are administered. The patients demonstrated a significant reduction in seasonal hay fever symptoms and in eye and skin sensitivity to birch pollen, as measured by CPT and SPT. Oral administration of an antigen to nonsensitized animals can induce tolerance to the antigen in question. This applies both to particulate^{3, 4} and soluble antigens.^{5, 6} Recently, it has been demonstrated that toler-