

Allergy to Storage Mites or Cow Dander as a Cause of Rhinitis among Finnish Dairy Farmers

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The role of storage mites *Acarus siro*, *Lepidoglyphus destructor*, and *Tyrophagus putrescentiae*, compared with that of cow dander, as a cause of allergic rhinitis was studied by nasal challenges in a population of 106 non-smoking dairy farmers. Thirty-six of the subjects were challenged with storage mites alone, each with only one of the three species in consecutive order, 43 with cow dander alone, and 27 with both. Thus mite challenges were performed on 63 farmers and cow dander challenges on 70. Challenges with any one of the storage mite species were positive in 18% and with cow dander in 20% of farmers with allergic rhinitis. All challenges to asymptomatic farmers were negative. Five of the eight positive reactions to storage mites were due to *Lepidoglyphus destructor*, and three to *Tyrophagus putrescentiae*. *Acarus siro* was not responsible for any of the positive reactions. The results indicate that, among dairy farmers, storage mites are as common as cow dander as a cause of allergic occupational rhinitis.

Key words: allergy; farmers; nasal challenges; occupational; rhinitis; storage mites.

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CLINICAL ASPECTS

Previous analyses showed that several species of storage mites occur in Finnish farm environments. The present study confirms that, among dairy farmers, storage mites are as important as cow dander as a cause of allergic occupational rhinitis. Allergens from storage mites should be included in the allergological test panels for investigation of farmers.

Several species of storage mites have been found in the work environments of farmers (1, 4, 6, 11). Sensitization to species of storage mite genera *Acarus*, *Lepidoglyphus*, *Glycyphagus*, or *Tyrophagus* has been shown by skin tests (1, 3, 10, 11) or RAST (2, 3) to occur in farmers with symptoms of respiratory allergy. Two of these species, *Tyrophagus longior* and *Lepidoglyphus destructor* have been confirmed by bronchial challenge tests to be sources of inhalant allergens in asthmatic farmers (5). It has been found that several species of storage mites occur also in farm environments in Finland (8). The objective of the present study was to investigate the allergenic importance of some storage mites, compared with that of cow epithelium, in a Finnish farming population. Since it is known

that challenges distinguish better than skin tests symptomatic subjects from asymptomatic, we decided to use nasal challenge as a tool of investigation.

MATERIAL AND METHODS

Subjects

The study was conducted among farmers in Leppävirta, a municipality in the rural district of Eastern Finland. Ninety-six per cent of active farmers in the municipality had previously taken part in a large postal survey of the work and health of farmers (9). Based on the survey data, a total of 106 non-smoking dairy farmers, who all gave their informed consent, were re-

cruited for the study. The material consisted of 19 men and 87 women: mean age 47.7 years (range 23–63 years). According to the inquiry, 86 of the subjects had suffered from allergic rhinitis or rhinitis together with asthma (symptomatic subjects) and 20 were free of respiratory diseases (asymptomatic subjects). Thirty-six of the subjects were challenged with storage mites alone, 43 with cow dander alone, and 27 with both. Thus, mite challenges were performed on 63 farmers and cow dander challenges on 70 farmers. The age and sex distribution of both groups was similar. The symptom profile and smoking habits were checked by interview at the time of the present study.

Allergens

Freeze-dried extracts of storage mites *Acarus siro*, *Lepidoglyphus destructor*, and *Tyrophagus putrescentiae*, as well as of mite culture medium (wheat germ – yeast) were prepared by Allergologisk Laboratorium A/S (ALK), Copenhagen. These mites were chosen because the same genera had been previously found in Finnish farm environments (8). From freeze-dried allergens, water extracts were made in concentrations required for nasal challenges in ALK's diluent for freeze-dried extracts. The diluent did not contain phenol.

Commercially available ALK's water extract of cow dander was used in the investigation of allergy to cow. Dilutions required for nasal challenges were made from the stock solution in ALK's ordinary diluent for water extracts, also without phenol.

Freshly made solutions were used in challenges. The same batch of allergens was used throughout the study.

Nasal challenges

Nasal challenges were performed in the local health center by a specially trained nurse. The technique approved by the Committee for Standardization of Allergy Diagnostics in Finland was used (7). Briefly, at rhinoscopy 0.05 ml of test solution and a small amount of air were blown by tuberculin syringe through a 26G

needle on to the mucosa of one nostril, in the anterior region of the lower turbinate.

After the challenge, the following symptoms were noticed: sneezing, itching, rhinorrhoea, blocking of the nose, and symptoms from the eyes, pharynx, larynx, or lungs. The challenge was considered positive if at least two of the above symptoms were clearly present. In dubious cases, rhinoscopy was performed, and if the mucosa of the lower turbinate showed clear signs of oedema and change in colour, the challenge was considered positive.

Before the allergen challenge, a control challenge was performed with the solvent of the corresponding allergen. Allergen challenges with cow dander extracts were started with a concentration of 1:10,000 followed, in negative cases, by successive 10-fold increments until 1:100, which was the concentration of the stock solution. Preliminary challenges in 48 voluntary farmers (28 symptomatic and 20 asymptomatic) with the same concentrations of mite allergens did not reveal a single positive reaction. Therefore, the challenges with mite extracts were started with the concentration 1:1000 followed by 10-fold increments until 1:10. Challenges with the three mite species were performed in consecutive order, one species/subject. Of the 63 challenges with mites, 23 were performed with *Acarus siro*, 22 with *Lepidoglyphus destructor*, and 18 with *Tyrophagus putrescentiae*, equally distributed between symptomatic and asymptomatic subjects. Similar dilutions were made from freeze-dried plain culture medium and challenges were performed on seven asymptomatic volunteers, not occupied in farming, as well as on two symptomatic subjects, the one not occupied in farming and the other a farmer with a positive nasal reaction to *Lepidoglyphus destructor*. All challenges with culture medium were negative.

Only one challenge procedure per day was performed on each subject. The subjects were informed in advance that for 3 days before the challenge they should take no antihistamines or other medicines that would interfere with the results of the challenge. Because the farmers continued their usual daily work on the same day after the challenge, it was not possible to

Table 1

Positive reactions to nasal challenges with storage mites and cow dander in farmers with allergic rhinitis (symptomatic) and farmers without rhinitis (asymptomatic)

Challenge	Symptomatic farmers		Asymptomatic farmers	
	n	%	n	%
Storage mites n = 63	8 n = 45	18	0 n = 18	—
Cow dander n = 70	10 n = 50	20	0 n = 20	—

Table 2

Positive reactions to nasal challenges with individual species of storage mites in farmers suffering from allergic rhinitis (n = 45)

Mite species	No. challenges	Positive	
		n	%
<i>Acarus siro</i>	16	0	—
<i>Lepidoglyphus destructor</i>	15	5	33
<i>Tyrophagus putrescentiae</i>	14	3	21

Table 3

Reactions to nasal challenges with storage mites and cow dander in farmers suffering from allergic rhinitis (n = 24)

Reaction to storage mites	Reaction to cow dander	
	Positive	Negative
Positive	2	4
Negative	7	11

discern possible late reactions due to the challenge.

RESULTS

The results of nasal challenges with storage mites and cow dander are shown in Table 1. Positive reactions to mites and cow dander were equally common. Statistically, both mite challenges and cow dander challenges were

able to distinguish the symptomatic from the asymptomatic farmers (P -value for mites was < 0.06 and for cow dander < 0.03 by Fisher's exact test and < 0.01 for both by asymptotic chi-square test).

Positive reactions to individual mite species in nasal challenges on symptomatic farmers are shown in Table 2. Of the positive reactions, about two thirds were caused by *Lepidoglyphus destructor* and one third by *Tyrophagus putrescentiae*. Extracts of *Acarus siro* did not cause a single positive reaction.

The comparison of reactions to storage mites and cow dander in symptomatic farmers who were challenged by both, is shown in Table 3. The chi-square value, obtained by McNemar's test, is not statistically significant, which means that the reactions to storage mites and cow dander were not independent of each other.

DISCUSSION

When we planned this study we tried to obtain allergens from the most commonly occurring species of storage mites found in Finnish farm environments (8). In this respect, we did not entirely succeed. *Tydeus* spp. was found in abundance in farm environments, and therefore, it would have been justified to include allergens of *Tydeus* spp. in the test panel. It seemed, however, that nobody had managed to obtain pure, live cultures of this mite. *Lepidoglyphus destructor* was included in our test allergens and its occurrence was comparable to that of *Tydeus* spp.

A comparison of the relative importance of each of the three mite species as a cause of allergy should be made with reservation. For practical and ethical reasons it was not possible to challenge all the subjects with all three mite species. Therefore, the number of challenges with each species remained small. However, it seemed that the most important individual mite species as a cause of allergic rhinitis was *Lepidoglyphus destructor*. The same mite species has been shown to cause the largest skin test reactions in a British longitudinal of farmers (1), in which *Tyrophagus longior* also appeared to be a skin sensitizer. Our study confirms the findings of another British study (5) that both *Lepido-*

glyphus destructor and species of the genus *Tyrophagus* can be causes of respiratory allergy among farmers. *Acarus siro*, in contrast, did not cause positive reactions in our material. Either our allergen preparation was not potent, or allergy to *Acarus siro* did not exist among the farmers.

It is not likely that the positive reactions obtained were due to possible traces of culture medium in mite allergen extracts, or that they were non-allergic reactions due to nasal hyper-reactivity of the symptomatic subjects. The basis for this viewpoint is that the challenges with plain culture medium were negative in both the asymptomatic and symptomatic subjects. Furthermore, as the subgroups challenged with each mite species were similar, the challenges with *Acarus siro* served, besides the solvent, as another negative control, thus tending to exclude the possibility that the positive reactions were non-specific.

The study shows that storage mites are important causes of allergic rhinitis among Finnish dairy farmers. To estimate the relative importance we used cow dander as a reference. Although, again for ethical and practical reasons, it was not possible to challenge all 106 farmers with both storage mites and cow dander, this comparison is acceptable because the demographic and other characteristics of both subgroups (those challenged with mites and those challenged with cow dander) were similar. Also by approximations of risk ratio, it was found that storage mites and cow dander were nearly equally important causes of allergy. Allergy to cow dander was most common, allergy to storage mites slightly less common, and allergy to both least common, even though allergy to the one seems to favour the occurrence of allergy to the other (Table 3).

Our study confirms that the inclusion of storage mite allergens in allergological test panels for farming populations is necessary. Storage mites seem an important cause of occupational respiratory allergy among farmers.

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