

Exposure test with non-Dermatophagoides mites

J. C. García Robaina

Allergy Service, "Nuestra Señora de la Candelaria" Hospital, Santa Cruz de Tenerife, Canary Islands, Spain

INTRODUCTION

Mites represent the main allergenic factor for the development of asthma and rhinitis. Over the last years, and particularly since the '60s, the interest regarding some acarine species has increased, and particularly that for a number of mites from genera different from the *Dermatophagoides*, which are collectively termed storage or non-*Dermatophagoides* mites. Significant among them are the members of the *Glycyphagidae* and *Acaridae* families, which have been considered to represent important allergenic sources.

Some of these species have been identified in farms, in other areas where cereals are manipulated or stored, and also in dust samples from dwellings. Positive skin tests and positive IgE to them have been detected, and allergens from some of these species have been characterised.

In 1979, Cuthbert *et al.*¹ carried out an epidemiological study on 220 subjects who evidenced rhinitis and asthma in their work environments. Sensitisation was detected to *Acarus siro*, *Tyrophagus putrescentiae* and *Lepidoglyphus destructor*, which were the species most abundant in their work environments and were almost absent in their homes. In that same year, Ingram *et al.*² found positive inhalational challenge tests with a mixture of *Tyrophagus longior* and *L. destructor* in four farmers who evidenced rhinitis and asthma while at their work.

M. Van Hage-Hamsten *et al.*³, in 1985, published the results of an extensive epidemiological study on 2578 farmers in the Gotland island in the Baltic sea; 440 of them reported symptoms upon exposure to their work environment. The predominant mite in the farms was *L. destructor*. The RAST study of sensitizations to *A. siro*, *L. destructor* and *T. putrescentiae* disclosed 52 farmers who had positive RAST to one or more of these species, representing a 6.2% sensitization preva-

lence in their environment; the sensitization rates were even higher than those elicited by pollens or by animal danders. The bronchial challenge test with a *L. destructor* extract was positive in 12 of these farmers, and negative both in the control subjects and in those farmers sensitized only to *D. pteronyssinus*.

However, most of these studies have been performed on patients who had an occupational relationship to cereal storage areas or facilities, and there are but few investigating the importance of those mites in patients not exposed to them as a possible occupational risk.

Pearson and Cunningham⁴, in a study carried out in Barbados in 1973, found that although *D. pteronyssinus* was the main cause of asthma in those islands, the storage mites were abundant in the dwellings and could represent an additional allergenic factor. Woodcock *et al.*⁵, in 1989, found that mites of the family *Glycyphagidae* and particularly *Blomia tropicalis* and *Glycyphagus* were the most abundant ones in dwellings in Brunei, in Southeastern Asia. They studied 60 asthmatic patients using skin tests, and found that only eight were sensitized to *Dermatophagoides* exclusively, while the remainder were also sensitized to storage mites.

Iversen⁶, in 1990, studied 326 asthmatics in Denmark; 25 of them were sensitized to storage mites, and most of them also to *Dermatophagoides*. A significant association was observed between these sensitizations and living in humid dwellings.

Ebner *et al.* (1994)⁷ studied with RAST 50 persons from farming and urban environments in Austria and found sensitizations in both groups, but sensitization to *L. destructor* and *Euroglyphus maynei* predominated among city dwellers.

In contrast to other allergens, the exposure test has not been commonly used as a diagnostic tool in corroborating the importance of storage mites as allergens. The published studies in which such methods have been used refer mostly to patients who were occupationally exposed through cereal manipulation⁸.

In our own country, A. Armentia *et al.* published a study of 43 patients with cereal flour allergy⁹. Among this population 30% were sensitized to *L. destructor*; 13 of them had positive bronchial challenge tests and 4 positive conjunctival challenge tests with a *L. destructor* extract.

In more recent times, and in patients with no occupational exposure, Stanaland and co-workers have published a study¹⁰ on 19 patients with rhinitis and mite allergy. The nasal challenge test with *Blomia tropicalis* was positive in 83% of the subjects sensitized to that mite, and negative in those who were not sensitized.

In our own region, the Canary Islands, mites represent the main allergenic factor among patients with rhinitis and/or asthma. Previous studies have identified a predominance of *Dermatophagoides pteronyssinus* in dust samples collected in the dwellings, but also the presence of other non-*Dermatophagoides* mites.

The aim of our initial study was to assess the prevalence of sensitisation to those mite species in our environment. To this purpose, a cross-sectional epidemiological study was designed, in which patients were included who were seen for the first time because of rhinitis and/or asthma. The inclusion and exclusion criteria allowed the elimination of those patients who could have become sensitized in their work environments or in tropical or subtropical countries, where a number of other mite species have also been identified in the dwellings.

Skin tests and RAST were performed on all patients with commercially-acquired (Ifidesa-Aristegui) extracts of the following mite species: *D. pteronyssinus*, *D. farinae*, *E. maynei*, *B. kulagini*, *L. destructor*, *T. putrescentiae*, *A. siro*, *C. arcuatus* and *G. fusca*. Both *Dermatophagoides* extracts were standardised to 5 SPT/ml, and the ones of the remaining species to 5000 Noon Unit equivalents/ml. The cross reactivity between the most relevant species according to the results of the skin tests and specific IgE was assessed using RAST inhibition.

Over the patient inclusion period, and with the aim of corroborating the clinical importance of some mite species, conjunctival challenge tests were performed on a number of patients, mostly with positive skin prick tests.

Upon completion of all the laboratory studies, it was observed that there was a considerable number of asthmatic patients with sensitization to *B. kulagini* and with high titers of specific IgE antibodies to that mite. The cross reactivity to *Dermatophagoides* spp was low in these patients. Considering this, and in order to confirm the eventual significance of the involvement of this sensitisation in asthma, inhalational bronchial challenge tests with a *B. kulagini* extract were carried out in a group of 23 patients, of which 18 were sensitized to both *D. pteronyssinus* and *B. kulagini* and 5 only to *D. pteronyssinus*.

RESULTS

Over the recruitment period, 732 patients were seen for the first time because of rhinitis and/or asthma. The final population included in the study comprised 207 patients (115 females and 92 males), with a mean age of 17.0 ± 7.29 years. Eighty-nine patients had only rhinitis, 12 only asthma, and 106 both rhinitis and asthma.

Table I shows the results of the skin tests and RAST with the various mite species. The skin tests showed that 146 patients (70.5%) were simultaneously sensitized to *Dermatophagoides* and to other mite species, 59 (28.5%) only to *Dermatophagoides*, and 2 (1%) only to non-*Dermatophagoides* mites. The corresponding results of the RAST showed 181 cases (97.4%) of coincident sensitization to *Dermatophagoides* and to other mite species, 22 (10.6%) of sensitization only to *Dermatophagoides* spp, and 4 (1.9%) of sensitization only to non-*Dermatophagoides* mites.

The cross reactivity studies showed it to be high between phylogenetically-related species and low between species with no such relationship.

Table I. Results of the skin tests and specific IgE determinations to the various mite species studies

	RAST				Skin prick test			
	Positive		Negative		Positive		Negative	
	N	%	N	%	N	%	N	%
<i>D. pteronyssinus</i>	192	94,1	12	5,9	203	98,1	4	1,9
<i>D. farinae</i>	197	96,6	7	3,4	193	93,2	14	6,8
<i>E. maynei</i>	187	90,3	16	7,7	74	35,7	133	64,3
<i>B. kulagini</i>	154	76,2	48	23,8	80	38,6	127	61,4
<i>A. siro</i>	139	69,8	60	30,2	27	13,0	180	87,0
<i>T. putrescentiae</i>	78	37,7	123	59,4	78	37,7	129	62,3
<i>L. destructor</i>	146	70,5	53	25,6	61	29,5	146	70,5
<i>C. arcuatus</i>	135	65,2	68	32,9	26	12,7	178	87,3
<i>G. fusca</i>	98	47,3	104	50,2	30	14,6	175	85,4

Table II. Results of the challenge tests with *Blomia tropicalis* in the various patient subgroups according to the results of the skin and CAP tests

		<i>Blomia tropicalis</i> (Prick positive = 19; negative = 23 (CAP positive = 26; negative = 16)				<i>Dermatophagoides pteronyssinus</i> (Prick positive = 41; negative = 1) (CAP positive = 39; negative = 3)			
		Prick +	Prick –	CAP +	CAP –	Prick +	Prick –	CAP +	CAP –
<i>B. tropicalis</i>	Positive CCT	18	2	16	4	19	1	19	1
	Negative CCT	11	2	10	12		12		
<i>B. tropicalis</i>	Positive BCT	7	2	9		9		8	1
	Negative BCT		6	1	5	6		6	
<i>D. pteronyssinus</i>	Positive CCT	18	13	18	13	32			
	Negative CCT								
<i>D. pteronyssinus</i>	Positive BCT	6	8	9	5	14		14	
	Negative BCT	1		1		1			1

• CCT = conjunctival challenge test; BCT = bronchial challenge test.

A total of 204 conjunctival challenge tests with non-Dermatophagoides species were carried out; 156 (76%) of those tests were positive.

The bronchial challenge tests with *B. kulagini* were positive in the 18 patients who were sensitized both to this mite and to *D. pteronyssinus* and negative in the 5 patients who were not sensitized.

In the light of these results, we concluded that the non-Dermatophagoides mite species have a considerable relevance in our environment. Among such mite species, *Blomia* spp is particularly relevant, because of the high prevalence of this sensitization and of its low cross reactivity to *Dermatophagoides* spp^{11,12}.

In a later study, and in part with particular consideration of the present meeting, we decided to further our investigation of the sensitization to that particular species. A new group of 42 patients was selected who had also been seen for the first time because of rhinitis and/or asthma and who had clinical features and history compatible with mite sensitization. This group was comprised of 31 females and 11 males with a mean age of 21.7 ± 7.02 years. In all cases the investigations performed were skin tests (CBF Leti extracts), specific IgE determination (CAP, Pharmacia-Upjohn) and conjunctival and/or bronchial challenge tests with *D. pteronyssinus* and *B. tropicalis* extracts (CBF Leti). The two challenge test extracts were standardised to 100 HEP/ml. 32 conjunctival and 15 bronchial challenge tests were performed with the two mite species.

Among the 42 patients, 41 had positive skin tests with *D. pteronyssinus* and 23 with *B. tropi-*

calis. The conjunctival challenge test with *B. tropicalis* was positive in the nine patients sensitized to this mite species, and negative in the five ones who were not.

All the challenge tests with *D. pteronyssinus* were positive with the exception of two patients who were not sensitized to this mite but to *B. tropicalis*. Table II summarises the results of the skin and challenge tests.

CONCLUSIONS

In the light of our results, we consider that the non-Dermatophagoides mite species are highly relevant in our environment because of the high number of patients sensitized to them. The cross reactivity studies and the allergen characterisation ones are incomplete, and further work is necessary in both aspects. However, those studies that have been completed to date, as well as the results of the challenge tests, indicate that some non-Dermatophagoides mite species, such as *Blomia tropicalis*, do possess some allergens which are shared by *Dermatophagoides* spp, together with other allergens that might be species-specific.

Considering that some of these non-Dermatophagoides mites may be also detected in the patients' homes, this might facilitate the development of co-sensitizations. For these reasons, we suggest that these mite species should be included in the habitual diagnostic protocols and in hypo-sensitization treatments, as soon as adequately standardised extracts are available.

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Mites as trophoallergens

D. C. Blanco, R. Castillo, N. Ortega, M. Álvarez, C. Arteaga*, D. Barber*, T. Carrillo

Allergy Section, "Nuestra Señora del Pino" University Hospital, Medical and Health Sciences School, University of Las Palmas, Las Palmas de Gran Canaria, Canary Islands; *Alergia e Inmunología Abelló, Madrid, Spain.

INTRODUCTION

Allergic food reactions may be causatively due to the foodstuffs themselves, or to contaminants including additives or other foodstuffs not mentioned in the labelling¹. The clinical features may range from mild manifestations, such as the oral syndrome, up to anaphylactic shock. On the other hand, house dust mites are a well-recognised cause of respiratory allergy, and storage mites also appear to play an important role in this context². Curiously, a number of recent studies suggest that mites may behave as trophoallergens, as the ingestion of foods and foodstuffs contaminated by them may cause anaphylactic reactions³⁻⁶.

The clinical observation of several patients with allergic reactions after the ingestion of foods prepared with flour and in whom no food allergy could be demonstrated led us to design a prospective study with the aim of testing the hypothesis that those reactions might be due to contamination of the flour by mites. Our results demonstrate that the ingestion of flour contaminated by various species of mites constitutes the aetiologic agent responsible for the reported allergic reactions.

METHODS

Patients reporting systemic reactions after the ingestion of foods prepared with flour that were suggestive of being IgE-mediated but in whom no food allergy could be demonstrated were included into the study protocol. Samples of the flours presumably implicated in the reactions were microscopically studied, together with control samples