

DISTRIBUTION OF MITES OF THE GRAIN STORAGE COMPLEX AND THEIR ROLE IN SENSITIZATION OF THE MOSCOW POPULATION

T. M. Zheltikova and M. A. Golysheva

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Populations of storage mites, which exist in large numbers, determine the allergization background in dwellings and industrial buildings (at farms and factories where raw materials suitable for supporting mites are found) [1, 3, 4, 11]. Cases of illness due to increased sensitivity to acaroid mites have recently become more widespread in grain elevator workers, bakers, and farmers [6-10].

The aim of this investigation was to study the distribution of mites of the grain storage complex within the boundaries of Moscow, to determine their role as an allergization factor and to study the frequency of sensitization to these mites among patients with allergies under treatment in Moscow hospitals, and also in workers in the food industry.

EXPERIMENTAL METHOD

An acarologic investigation was undertaken of various buildings in Moscow. Altogether 83 apartments (where 62 patients with allergies and 21 healthy individuals lived), eight laundry reception points, seven hairdressers, two hotels and one hostel, two bakeries, and two grain elevators were investigated.

Dust for acarologic analysis was collected by means of a modified "Veterok" electric brush. Dust in the dwellings was collected from beds and bedding, soft furnishings, wall coverings, and carpets. At enterprises of the food industry, besides dust samples, samples of raw materials (flour, bran) were also taken for analysis. The mites were extracted from the dust samples by flotation in saturated sodium chloride solution. Mites were expelled from samples of raw material by means of a photothermoelector. Microscopic preparations were produced in the gum arabic mixture of Faure and Berlese or in lactic acid.

Two groups of patients were studied. Group 1 comprised 116 persons from enterprises of the food industry (from 17 to 54 years of age). They were selected from a card index of out-patients attending for treatment of allergic diseases (bronchial asthma, allergic rhinitis, atopic dermatitis). Group 2 consisted of 71 persons receiving in-patient treatment (from 4 to 49 years of age). These patients were chosen from 550 with symptoms of "domestic" allergy. The control group consisted of 26 healthy individuals.

The total IgE level and the level of allergen-specific IgE-antibodies were determined in all the subjects for investigation with the aid of PRIST (Paper Radioimmunosorbent Test, Pharmacia, Sweden) and RAST (Radioallergosorbent Test, Pharmacia, Sweden) kits and discs with allergens from the following mites: *D. pteronyssinus*, *D. farinae*, *E. maynei*, *A. siro*, *T. putrescentiae*, *G. destructor*, *G. domesticus*. The results are given for total IgE-antibodies in conventional units (CU) IgE/liter (1 CU/liter = 2.4 ng IgE in 1 ml), and for allergen-specific IgE-antibodies in PRU/ml (Phadebas RAST units), and in RAST classes.

EXPERIMENTAL RESULTS

Investigation of the dwellings and industrial premises in Moscow revealed a rich and varied mite fauna [2]. Besides mites of the pyroglyphidae family, constituting the basis of the dust acarofauna, at least 11 species of mites of the grain storage complex belonging to the Acaridae family were discovered: *Acarus siro* L. 1758; *Tyrophagus putrescentiae* (Schränk K., 1781), *Tyrophagus* sp., *Rhizoglyphus* sp., *Threophagus* sp., *Acotyledon* sp., and to the Glycyphagidae family: *Aeroglyphus* sp., *Glycyphagus destructor* (Schränk, 1781), *G. domesticus* (DeGeer, 1778), *Carpoglyphus lactis* (L, 1758), and *Gohieria fusca* (Oudemans, 1902).

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TABLE 1. Incidence of Mites of the Grain Storage Complex in Dust from Various Buildings in Moscow

Buildings	Total	Number of buildings studied with mites, in percent, of the grain storage						
		all mites	family Acaridae		family Glycyphagidae		Pyroglyphidae	
			T. putrescentiae	A. siro	G. domesticus	G. destructor	D. pteronyssinus	D. farinae
Domestic	83	23	16	4	6	1,2	75	37
Laundries	8	88	63	13	50	0	38	13
Hairdressers	7	57	43	0	0	0	0	14
Hotels and hostels	3	33	33	0	0	0	67	67
Bakeries	2	100	100	0	0	0	0	0
Grain elevators	2	0	0	0	0	0	0	0

TABLE 2. Frequency of Discovery of Sensitization and Level of Positive Allergen-Specific IgE-Antibodies to Mites of House Dust and of Grain Storage Complex in 17 Patients with Allergic Diseases

Species of mite	Number of sera with positive value of RAST	Number as a percentage of total number	Mean value of allergen-specific IgE-antibodies, PRU/kl	RAST class
D. pteronyssinus	71	100	16,60	4—3
D. farinae	57	80	13,70	4—3
E. maynei	39	55	4,84	3—4
A. siro	32	45	2,53	3—2
T. putrescentiae	14	19	1,52	2—3
G. destructor	25	35	7,08	3—4
G. domesticus	13	18	1,02	2—3

Mites of the storage complex found in domestic dust were represented mainly by sinanthropic species, which can feed and multiply in this substrate. Of all the storage mites, the species found most frequently in all the buildings tested was *T. putrescentiae* (Table 1), the numbers of which may reach 10,000 per gram of substrate, but this is not the limit of the population of this species. *A. siro*, *G. destructor*, and *G. domesticus* were much less frequently found in domestic dust (Table 1), and their number was not as high as that of *T. putrescentiae*, and varied between one and 30 specimens per gram of dust. These mites are regularly found in dust of dwellings and industrial premises, and also in farm buildings in various districts of the Soviet Union and other countries [1, 12]. Other species found even less frequently in domestic dust were *C. lactis*, *G. Fusca*, *Aeroglyphus* sp., and *Acotyledon* sp. Only single specimens of *Rhizoglyphus* sp. and *Thyreophagus* sp. were found.

In moscow house dust mites of the storage complex were found approximately one-third as frequently as the Tyroglyphidae family (Table 1).

Under these circumstances acaroid mites account for only 4.2% of the total of all forms of mites. The number of these mites varied between one and 40 specimens per gram of dust.

In public buildings, storage mites were found two-three times more frequently than the Tyroglyphidae family (Table 1), and they accounted for 22% of the total number of all mites. The population density varied from one to 80 specimens per gram of dust. The discovery of storage mites in dust from reception points of laundries, where the incidence of these mites was 2.3 times higher than that of the Tyroglyphidae family, is particularly interesting (Table 1). The possibility cannot be ruled out that reception points of laundries play a definite role in the circulation and dissemination not only of the Pyroglyphidae, but also of the Acaridae [2].

No mites were found at elevators, for the production process takes place in airtight lines of flow, and the buildings are regularly cleaned to remove dust and remains of raw materials (flour, bran).

The study of bakeries revealed large numbers of storage mites in both dust and raw materials. The absolutely dominant species was *T. putrescentiae* which accounted for not less than 99% of the total number of all mites. Besides *T. putrescentiae*, single specimens of *C. lactis* and *Acotyledon* sp. were found. The density of the *T. putrescentiae* population at a bakery with an open type of production process was particularly high, for the baking equipment was not airtight and not insulated from the production buildings. Thus an intensive background allergization hazard from mites exists at bakeries, and there is consequently the real danger of mass sensitization of the bakery workers.

To discover sensitization to mites of the grain storage complex in patients we selected two groups. Group 1 consisted of persons working with raw materials which have favorable properties for mass reproduction of mites of the grain storage complex. It was found that 14% of patients (16 of 116) linked exacerbation of the disease with working with the raw materials. In 8% of patients (9 of 116) positive scarification tests were obtained with allergen from the house dust mite *D. pteronyssinus*. The average level of total IgE in sera from the patients studied was 119 CU IgE/liter (from 41 to 500 CU IgE/liter). No allergen-specific IgE-antibodies to the mite *D. pteronyssinus* could be found in the patients' sera.

Patients with atopic diseases and with symptoms of "domestic" allergy were selected for Group 2. All had a positive scarification skin test for allergen from house dust mites *D. pteronyssinus*. In the sera of these patients the total IgE level varied from 49 to 250 CU IgE/liter (mean 460 CU IgE/liter). In 88% of patients (62 of 71) the value for total IgE-antibodies was over 100 CU IgE/liter, i.e., it was above normal limits, in 35% (25 persons) it exceeded 500 CU IgE/liter, and in 15% (11 persons) it exceeded 1000 CU IgE/liter.

In all patients of Group 2 a high level of allergen-specific IgE-antibodies to *D. pteronyssinus*, a tyroglyphid house dust mite, was observed — mean value 16.60 PRU/ml (Table 2).

Allergen-specific antibodies to the mite *D. farinae* were found in 80% of patients (67 of 71), and to *E. maynei* in 55% (39 of 71). In almost half of the patients IgE-antibodies to *A. siro* were found. Sensitization to *G. destructor* was found in 35% of patients, and the fraction sensitized to *G. domesticus* and *T. putrescentiae* was almost 50% lower (Table 2).

Thus an allergizing background of mites exists in Moscow and is due chiefly to the very wide distribution of the Tyroglyphidae, and also to the considerable spread and regular discovery of mites of the grain storage complex. For this reason, among patients with symptoms of "domestic" allergy, some with sensitization to storage mites are found. It is particularly important to consider the possibility of sensitization to these mites in public buildings and some industrial premises, where the production process is associated with the handling of grain products.

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