

Dust Mites

A 1-Year Study

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Mattress dust was collected by out-patients attending hospital for respiratory allergic problems. The dust mites were counted in "pool" samples of 100 mg. Each sample represented a single month's collection.

The mites were classified according to family: Pyroglyphidae and Cheyletidae. Those not belonging to either of these two families were classified as "other mites".

Temperature and humidity during the period of the study showed no correlations with the number of mites.

There was a statistically significant correlation between the various mite groups.

Key words: Allergens, dust, mites.

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In 1925 Storm Van Leeuwen demonstrated that the major allergenic determinants of house dust originated in mites (10). In 1956, Baker et al. (1) showed that the predominant mite family found in housedust samples was Pyroglyphidae. In 1967, Voorhorst et al. (12) and Miyamoto et al. (6) confirmed Storm Van Leeuwen's findings and showed that housedust allergy and allergy to Pyroglyphidae are almost identical. They proved that the allergenic strength of housedust and the mite populations follow the same annual variation curve.

The aims of our study were to verify which housedust mite populations predominate in Brasília, D.F., to determine their annual variation, to set up a simple technique for counting them, and to establish correlations between their development and the environmental factors of temperature and humidity.

MATERIAL AND METHODS

Dust collection and preparation

Patients attending the Allergy Clinic were asked to collect dust from their mattresses; these were removed from the beds, held perpendicularly over newspapers spread on the floor, and beaten with a switch. The dust produced was collected and put into a clean glass container, 122 samples were obtained by this method. No samples were obtained in December 1975. On receiving the samples, they were stored immediately at 60°C for 30 min in order to kill the mites and thus avoid any increase in their numbers. The containers were sealed with paraffin and then stored at 0°C until November 1976. The samples were then sieved (using 2 mm gauge wire) and subsequently returned to their original container. The dust retained by the sieve was discarded.

The following method was used to obtain a total monthly sample: equal amounts were taken from the samples collected in a single month and were placed together in a container; the final weight being 1 g. From this, 100 mg were removed and used for counting. A glass slide was placed on a hot plate at 80°C and 0.5 ml 90% aqueous solution of lactic acid was dropped on the slide. The dust was spread on the acid, forming a thin layer. After 10 min 0.5 ml lactic acid was again added, since some of it had evaporated. Approximately 10 slides were required in order to examine 100 mg of the sample.

Counting

In order to examine the structures of the mite bodies, a phase contrast microscope with 25.6 magnification was used; 320 magnification was used when more detailed examination was required.

Most of the mites remained on the surface of the acid layer. Some went to the bottom, adhering to heavier particles.

Classification

The mites were classified according to family: Pyroglyphidae and Cheyletidae. Those not belonging to either of these families were classified as "other mites".

Climatological data

The temperatures represented were the monthly means of the mean compensated temperatures for each day. The mean compensated temperature was calculated using the formula:

MCT =

$$\frac{T_9 + 2(T_{21}) + T_x + T_n}{5}$$

(MCT = mean compensated temperature; T_9 = temperature at 9 a.m.; T_{21} = temperature at 9 p.m.; T_x = highest temperature of the day; T_n = lowest temperature of the day).

The relative humidity of the air was represented by the monthly mean values.

Statistical methods

The Pearson correlation test was used to calculate the correlation between the various mite groups (8).

Kendall's coefficient was used to calculate the correlation between the mites and temperature, and between the mites and humidity, because of the non-normality in the distribution of the values.

RESULTS

Table 1 shows the absolute number of Pyroglyphidae, Cheyletidae and "other

Table 1.

Mites per 100 mg of dust. Mean compensated temperature, humidity

Months	1975										1976	
	M	A	M	J	J	A	S	O	N	D	J	F
Pyroglyphidae	1583	272	552	378	385	253	45	412	592		110	228
Cheyletidae	107	16	47	21	12	8	3	32	12		1	8
Other mites	451	38	55	36	41	39	6	35	85		14	37
Total no. mites	2141	326	654	435	438	300	54	479	689		125	265
% Pyroglyphidae to total no. mites	78	83	84	86	87	84	83	86	85		88	86
Humidity	71	78	66	58	54	44	46	69	80	74	71	80
Temperature	22.2	20.3	19.1	18.4	17.2	20.2	21.8	21.5	20.9	21.1	21.9	20.9

For details, see text.

mites", the proportion of the Pyroglyphidae to the total number of mites, and the temperature and humidity means.

The temperature showed only slight variation: from 17.2°C to 22.2°C, the lowest and the highest being in July and March, respectively.

The relative humidity showed a wider variation: the lowest value was 44% in August, and the highest was 80% in November and February.

Pearson's correlation coefficient, calculated using the values of the mite groups, showed a statistically significant interdependence among these mite populations (Table 2).

No statistical correlations between mites and humidity, and mites and temperature were found (Table 3).

Table 2

Correlations between the mite groups

Mites	r
Pyroglyphidae × Cheyletidae	0.95
Pyroglyphidae × other mites	0.98
Cheyletidae × other mites	0.90

r = Pearson's correlation coefficient at 1% level.

Table 3.

Correlations between mites and temperature, and mites and humidity

Mites	Temperature		Humidity	
	T	P	T	P
Pyroglyphidae	-0.110	0.319	0.278	0.117
Cheyletidae	-0.147	0.264	0.089	0.342
Other mites	-0.147	0.264	0.315	0.088
Total	-0.110	0.319	0.278	0.117

T = Kendall's correlation coefficient

P = probability

DISCUSSION

We are interested to determine the causes of respiratory allergies in our city, and also, to

classify the mite populations and observe the presence, or not, of a seasonal distribution. These are vitally important points, as mites, especially Pyroglyphidae, are one of the most important causes of these syndromes.

Their numbers decrease at high altitudes and they are rarely found above 1400 metres (11). Brasilia, D.F. is 1000 metres above sea level, therefore altitude here is not an obstacle to mite development.

The optimum temperature for them is 25°C. In Brasilia, D.F. there is little temperature variation. During the time-span of this study, the extremes were 17.2°C and 21°C (monthly mean compensated temperature) and it was probably for this reason that no statistical correlations between the mite populations and temperature were found (Table 3). High and low humidity values existed, but as in the case of temperature, no statistical correlations were found. These non-correlations could be because the comparisons were made using outdoor and not indoor values of temperature and humidity, or alternatively, they could be a consequence of the size of the sample studied.

However, there was a statistical correlation between the mite populations ($P < 0.01$) (Table 2). This indicated that either they were controlled by the same factors, or they were interdependents. This obviously happens with the predator Cheyletidae, which uses the other mites as a source of food.

An interesting finding was the large number of mites — as many as 2141 per 100 mg in the month of March. This could partly be explained by the fact that dust from mattresses can contain a great amount of human scales, which is an excellent food source for mites, plus the fact that the material originated from low-income homes where sanitary conditions are not always satisfactory. Pyroglyphidae and Cheyletidae were found in all samples, a single Cheyletidae in only some of them. This could be because our samples were not

"individual" but "pools". Pyroglyphidae comprised between 73% and 87% of the total number of mites, which is similar to the proportions found in other studies (4, 5, 6, 9).

One difficulty encountered was in the method used for counting the mites. The procedures already described (3, 4, 6, 7, 9) are time-consuming. The technique we used achieved its aim, or at least in part, because it is known that some of the mites adhered to the bigger particles which were discarded when the material was sieved. This problem could not be avoided.

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