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□ Brief Communication □

# House dust mite fauna in western Anatolia, Turkey

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**Abstract:** House dust mites play an important role in the pathogenesis of allergic diseases. Many factors may influence mite growth. The presence of mites is related to mean temperature and humidity as well as altitude. The aim of this study was to analyze the mite fauna in 5 regions of western Anatolia, Turkey, that have similar climatic properties with low mean temperature and humidity, but differ in altitude. During the period October-November 2004, house dust was collected from 290 homes in 5 different cities. House dust mites were isolated in 67 (23.1%) of 290 samples. The family Pyroglyphidae (Astigmata) was present in all positive samples. This study suggests that the selected western Anatolian regions that share similar environmental conditions host similar dust mite populations.

**Key words:** *Dermatophagoides pteronissynus*, *Chortoglyphus arcuatus*, *Oribatid* sp., house dust mite, fauna, western Anatolia, Turkey

An increase in atopic diseases has become obvious in our time, principally in developed countries, and there are many factors that appear to contribute to this trend. Considerable variation within and between different countries has been attributed to factors such as living habits, occupation, humidity, climate, home standards and ventilation (Koosgaard, 1998). Mites living in house dust represent a major source of common allergens that cause sensitization and development of allergic diseases, especially asthma, rhinitis and atopy all over the world (Warner et al., 1999; Eggleston and Bush, 2001).

House dust mites have a worldwide distribution; on the other hand, there are differences in the mite species due to different locations, seasons and climates. Most houses host multiple species of mites that feed on human skin scales, pollens, fungi, bacteria and animal dander. Human, cat, dog, and horse dander have been used to raise these species in the laboratory. Dust mites do not drink free water, but they absorb water from the air and the environment. The food consumption of these mites and their development increase high humidity. They do not survive well at low relative humidity, especially when the temperature is high (Demir et al., 1997; Arlian, 2001). The aim of this study was to investigate the mite species living in house dust in random samples from 5 cities of western Anatolia.

The study was conducted with 290 house dust samples collected from cities Afyon, Uşak, Isparta, Kütahya, and Denizli, whose altitude differs, but climate, geographic structures and life style are similar. These 5 cities are located in the inner part of Aegean region, western Anatolia, Turkey (Fig. 1). Since the coastal cities of this region have different climatic conditions from others, they were excluded from this

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**Fig. 1.** A map showing the surveyed areas in western Anatolia, Turkey.

study. The houses from which the dust samples were collected were chosen randomly among different districts of each city. The socio-demographic data of families and their housing conditions were questioned by a survey during house-visits. The local humidity and temperature measurements during the study and the average values for the study term were recorded according to the reports issued by local meteorology offices. Geographic, weather and natural environment data were obtained from the official bodies' information desk.

A total of 290 samples were collected from randomly selected houses in 5 cities (99 from Afyon, 46 Uşak, 51 Isparta, 44 Kütahya, and 50 from Denizli). Habitants used their own vacuum cleaner for 1 week using a new dust bag. Samples were collected from the living room/bed room floors, and mattresses. Then the samples were taken from dust bags into sealed plastic bags.

About 10 g of dust sample was put into a glass tube and 90% concentrated lactic acid was added. Examinations were made 3 times for each tube. For the first examination, a sample was taken from the surface of lactic acid layer within the first 1 hr. The second examination was made after 24 hr and the sample was taken from the sediment of mixture. The third sample was taken from the sediments after 1 week. For identification of mites, the slides were prepared with Hoyer's medium and mites were identified under a light microscope at a magnification of x 400 (Voorhorst et al., 1969). Statistical analyses for all values were evaluated by the Chi-square test, and $P <$ 0.05 was considered significant.

**Table1.** Numbers of mites identified in dust samples[a)]

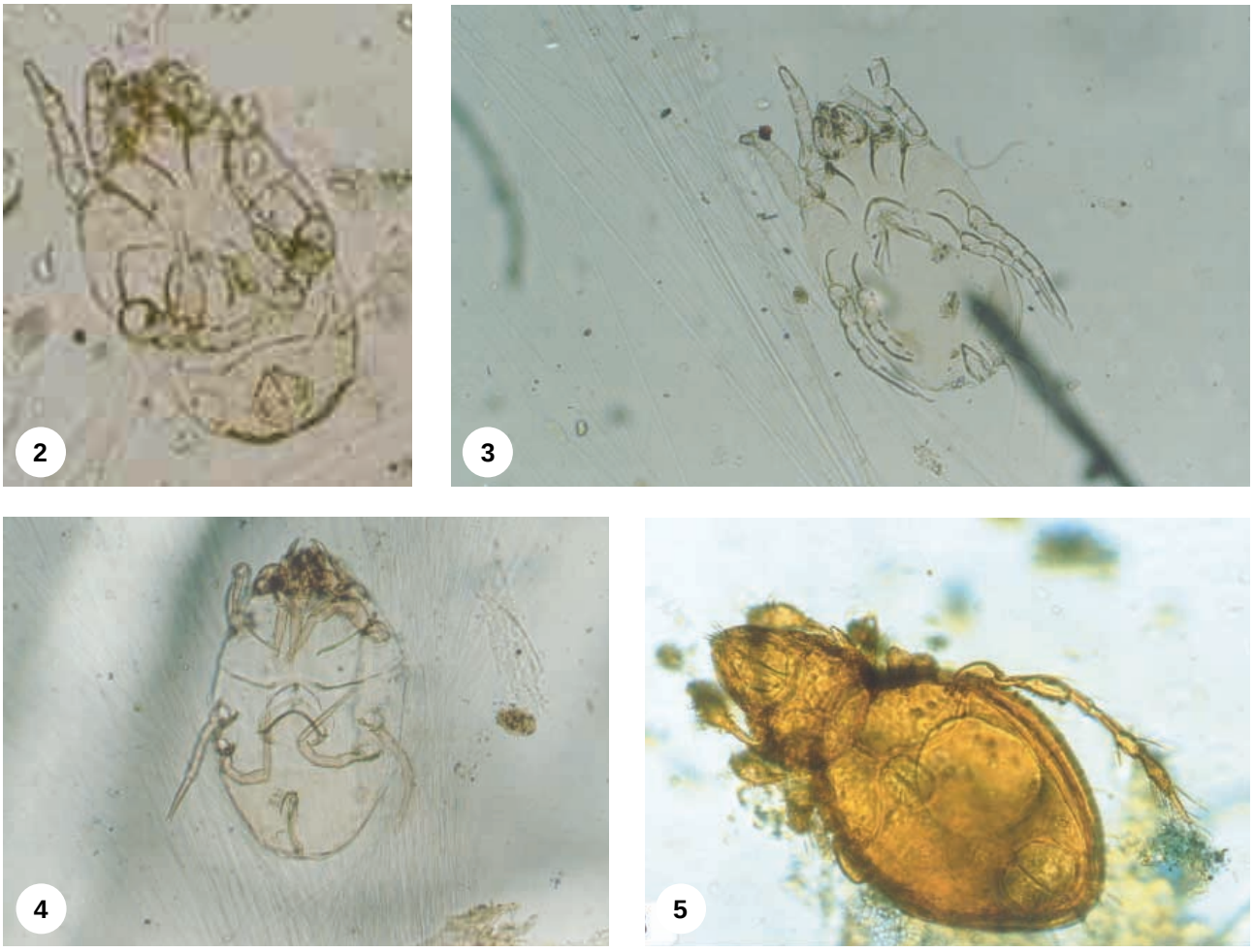
| Type of mite | Positive samples | |
|---|---|---|
| | % | n |
| Pyroglyphidae | | |
| *Dermatophagoides pteronyssinus* | 23.1 | 67 |
| *Dermatophagoides farinae* | 0.7 | 2 |
| Chortoglyphidae | | |
| *Chortoglyphus arcuatus* | 5.2 | 15 |
| Acaridae | | |
| *Tyrophagus* sp. | 2.8 | 8 |
| Oribatida | | |
| *Oribatid* sp. | 2.1 | 6 |
| Glycyphagidae | | |
| *Lepidoglyphus destructor* | 1 | 3 |
| Histiostomatidae | | |
| *Histiostoma* sp. | 0.7 | 2 |

[a)]Total number of samples examined: 290.

In microscopic analyses, at least 1 species was found in 23.1% (67) of 290 samples. *Dermatophagoides pteronyssinus* (Figs. 2, 3) of the Pyroglyphidae family was the main species and present in all mite positive samples. *Chortoglyphus arcuatus* (Fig. 4) of the Chortoglyphidae family was the second most frequent species, with a 5.2% (15/290) positive rate. *Tyrophagus* sp. of the Acaridae family was the third, and *Oribatid* sp. (Fig. 5) of the Oribatida family was the fourth frequent species. In all samples, a total of 7 different species were detected and their distributions are summarized in Table 1.

We detected no significant differences in the proportions of mite positive samples from other neighboring towns, which had following percentages; 24.2% (24) in Afyon, 24.0% (12) in Denizli, 23.5% (12) in Isparta, 22.7% (10) in Kütahya, and 19.6% (9) in Uşak (Table 2). Of all positive samples, 46.3% (31) contained a common single species, *D. pteronyssinus*. The regional distribution of 67 mite positive samples is summarized in Table 2.

Among the altitudes of regions where samples were collected, the highest was 1,050 m and the lowest was 428 m. In spite of these different altitudes, the distributions of detected species were similar. Furthermore, the lowest temperature was 4°C and the highest was




**Figs. 2-5.** House dust mites collected in the surveyed areas. x 40. **2.** *Dermatophagoides pteronyssinus*, male. **3.** *D. pteronyssinus*, female. **4.** *Chortoglyphus arcuatus*, female. **5.** *Oribatid* sp.

**Table 2.** House dust mite collections at 5 locations in western Anatolia, Turkey

| | Afyon | | Isparta | | Usak | | Kütahya | | Denizli | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | n | % | n | % | n | % | n | % | n | % | n |
| *D. pteronyssinus* | 15.2 | 15 | 7.8 | 4 | 8.7 | 4 | 11.4 | 5 | 6.0 | 3 | 46.2 | 31 |
| *D. pteronyssinus*+ *C. arcuatus* | 5.1 | 5 | 7.8 | 4 | 2.2 | 1 | 2.3 | 1 | 8.0 | 4 | 22.4 | 15 |
| *D. pteronyssinus*+ *Tyrophagus* sp. | - | - | 2.0 | 1 | 4.3 | 2 | 4.5 | 2 | 6.0 | 3 | 11.9 | 8 |
| *D. pteronyssinus*+ *Oribatid* sp. | 2.0 | 2 | 2.0 | 1 | 2.2 | 1 | 2.3 | 1 | 2.0 | 1 | 9.0 | 6 |
| *D. pteronyssinus*+ *L. destructor* | - | - | 2.0 | 1 | 2.2 | 1 | - | - | 2.0 | 1 | 4.5 | 3 |
| *D. pteronyssinus*+ *D. farinae* | - | - | 2.0 | 1 | - | - | 2.3 | 1 | - | - | 3.0 | 2 |
| *D. pteronyssinus*+ *Histiostoma* sp. | 2.0 | 2 | - | - | - | - | - | - | - | - | 3.0 | 2 |
| Total | 24.2 | 24 | 23.6 | 12 | 19.6 | 9 | 22.7 | 10 | 24.0 | 12 | 100 | 67 |

21.7°C in October-November 2004 in 5 cities, where study was conducted. The humidity rates were between 38% and 93%. Although the temperature and humidity rates had wide ranges, they were similar in 5 different cities, which help the standardization of the study. The altitude, temperature, relative humidi-

**Table 3.** Altitude, humidity, temperature and presence of mites in different cities of western Anatolia, Turkey

| Locations | Altitude (m) | Humidity (%) (av.) | Temperature (°C) (av.) | Mite positive rate (%) |
|---|---|---|---|---|
| Isparta | 1,050 | 40 to 91 (63.2) | 5.0 to 21.7 (13.9) | 23.6 |
| Afyon | 1,020 | 41 to 92 (70.6) | 4.6 to 18.6 (10.6) | 24.2 |
| Kütahya | 969 | 43 to 89 (58.9) | 4.0 to 20.5 (10.1) | 22.7 |
| Uşak | 907 | 46 to 93 (69.6) | 6.4 to 19.6 (12.3) | 19.6 |
| Denizli | 428 | 38 to 87 (60.4) | 7.6 to 21.5 (14.3) | 24.0 |

ty, and presence of mite species in different cities are summarized in Table 3.

The frequency of use of an electric vacuum cleaner was correlated with the presence of mite species. Additionally, environmental conditions, such as, size, structure, age and warming method of houses, and educational status and incomes of households had no effect on the presence of mites. There were 4 or less people living in 73.8% (214), and 5 or more people living in 26.2% (76) of the houses visited. Statistical analyses showed that the family size was correlated with the presence of mite species. The mite positive rates were 19.6% (42/214) and 34.2% (26/76) in houses where the number of family members was 4 or less and 5 or more, respectively.

It is well known that mites in house dust are responsible for the production of house dust allergen, a common cause of asthma and allergic rhinitis, and the predominant species differ by country and region. Many factors may influence the mite growth and proliferation. Differences in the seasonality and geographic distribution of the house dust mite species as well as allergen levels within and among different homes are hence attributed to variations on the environment components, such as the building characteristics (age of house, building material, and size of the dwelling), which affect the indoor climatic conditions (temperature and humidity) and the differences in the individual living habits (keeping of pets, carpets or mattresses, and cleaning routes) (Lau et al., 1990; Hart, 1998).

A preliminary study on house dust mites in Anatolia was made by Gürbüz and Mutluay (1978). They first reported that 95.8% of cases, who responded positively to house dust prick test, responded likewise to specific mite antigens. Then, Gürbüz and Mutluay (1979) detected mites in 16 house dust samples of 49 patients suffering from bronchial asthma and allergic rhinitis. Subsequently, 48.8% positivity was reported in house dust samples of bronchial asthma and allergic rhinitis patients (Misirligil, 1981). Budak and Ozbilgin (1988) collected 510 samples and reported positivity for 75.5% of them in a study named "Aegean region House Dust Mite Fauna". This looks like the first comprehensive study, and the distribution of mites by the altitude was very interesting. In that study, mite positivity rates were 87.1% between 0-300 m, 68.9% between 300-600 m and 26.8% between 600-945 m (Budak and Ozbilgin, 1988). The mite distribution in Anatolia by this time was reviewed by Budak (1989).

After a long period of time, studies about this topic was started again by Kalpaklioğlu et al. (1997), and in the first results, 24.1% mite positive rate was reported in 133 samples, which were collected from 5 different locations. In the same year, 980 samples were collected from Kayseri (altitude: 1,050 m) and only 1 sample was found positive for mite (Demir et al., 1997). Güngör et al. (1999) found mites in 9 (30%) of 30 samples, which were collected in rug workshops of Isparta. Aygan and Ozcelik (2002) reported that they found mites at an 18% rate in Sivas. Aycan (2002) reported the dust mite presence of 23.1% in a study he conducted in Malatya region at an altitude of 1,050 m. Kalpaklioğlu et al. (2004) reported the total mite positive rate as 18.6% (173) out of 930 samples. They also reported the mite rates as 48.4% in Mediterranean and 46.0% Black Sea regions. The limited studies in our country showed that the lowest value was 18.0% and the highest 75.5%. If the geographical conditions and climates of regions are taken into accounts the difference may be partially explained. For example Budak's

findings are consistent with our results.

Studies carried out in the United States reported that *D. pteronyssinus* and *D. farinae* were the predominant mite species with variation in their relative prevalence depending on geographic localization and climatic differences (Fernández-Caldas et al., 1993; Rose et al., 1996). *D. pteronyssinus* predominantly occurs in areas where the relative humidity in air is high (> 73%) and *D. farinae* is dominant in areas where the atmosphere is relatively dry (Ree et al., 1997). The relative dryness was 58.9% at least, and 70.6% at the most, during the period we collected samples. *D. pteronyssinus* could stay as dominant species in our study area, which did not reach the humidity rates mentioned in the literature.

Another interesting point in our study is that the positive rate of *D. farinae* was quite low. Kalpaklioğlu et al. (2004) found species of *Dermatophagoides* dominant, and 12% of them were *D. farinae*. We were surprised to find a very low rate of *D. farinae* in our study. We think that this may be due to affected conditions, such as, natural environment, family size, and carpets. The present study suggests that *D. farinae* is affected by in-house conditions, but similar effects could not be seen with *D. pteronyssinus*. Similarly, studies carried out in Far East countries emphasize that the structure, age and size of houses affect the existence of mite (Suto et al., 1992).

In conclusion, our study provides important information about house dust mite prevalence and mite fauna in western Anatolia, Turkey. However, our results and those of other Turkish investigators contain limited information about mite fauna in Anatolia. To get more detailed information, there is a need to carry out bigger series of studies in multiple centers.

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