

HOUSE DUST MITE CONTAMINATION IN HOTELS AND INNS IN BANDAR ABBAS, SOUTH OF IRAN

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ABSTRACT

House dust mites have been shown to be strongly associated with allergic respiratory diseases such as, bronchial asthma, rhinitis and atopic dermatitis in the world. The climatic conditions of Bandar-Abbas, which is located in a coastal area and has a humid subtropical climate, provide a suitable place to proliferate mites. The aim of this study was to determine the contamination rate and analyze the house dust mite fauna in hotels and inns in Bandar-Abbas that had not been investigated previously. In this study 6 hotels and 6 inns were selected randomly in six areas of Bandar-Abbas. Two dust samples were collected from each place with a vacuum cleaner. One square meter of carpets and mattresses were vacuumed for a period of 1 min. Then the samples were cleared in lactic acid and then mites were mounted in Hoyer's medium for study and identification. A total of 2644 mites were collected and identified. The major mite family was Pyroglyphidae (98%). *Dermatophagoides pteronyssinus* was the most frequent and most numerous species recorded, occurring in 91% of samples examined and forming 88% of the Pyroglyphidae and 86% of the total mite populations. The family Cheyletidae was less commonly found with *Cheyletus malaccensis* (2%). Most of the mites were isolated from the carpets (57.5%), and a smaller number from mattresses (42.5%). Mites were present in 96% of the dust samples. Results revealed that all inns and 83% of hotels were contaminated by more than one species of mite and 34% of them had a population of more than 100 mites /g dust. This rate of contamination can be a major risk factor in asthma and other respiratory allergic diseases.

Key word: Asthma, mite, fauna, dust, public residence

INTRODUCTION

Mites dwelling in house dusts have become recognized in the past 30 years as the most important source of allergens in human habitations (Mumcuoglu *et al.*, 1999). House dust mites have a worldwide distribution; however there are differences in the mite numbers and allergen concentration in different locations (Koosgaard, 1998). Two pyroglyphid mite species namely *Dermatophagoides pteronyssinus* (Trouessart) and *Dermatophagoides farinae* Hughes (Acari: Astigmata: pyroglyphidae) associated with allergic diseases, such as bronchial asthma, rhinitis and atopic dermatitis, are the most important causative factors among indoor allergens. (Platts-Mills and Chapman, 1987). *D. pteronyssinus* predominates over most house dust mite species worldwide and

is the most frequent species in tropical and subtropical areas. *D. farinae* is most common in dry, continental climates and is rare in coastal climates (Arlian *et al.*, 1992; Jackson *et al.*, 2005). The allergen exposure degree can be estimated by the number of mites and the concentration of their allergens detected in the house dust. (Zheltikova *et al.*, 1994). Concentrations of greater than 10 mg/g mite allergens in the mattress are a risk factor for an increase in symptoms in sensitized individuals (Peat *et al.*, 1996). In Iran, the knowledge of the house dust mite's distribution is still poor and previously reported have shown that *D. pteronyssinus* was the more prevalent mite while *D. farinae* was less frequent (Amoli and Cunnington, 1977; Motavalli-Haghi *et al.*, 2003). Bandar-Abbas has subtropical climate with relative humidity and average annual temperature almost 64.8% and 27°C, respectively. Such situations are

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favorable to proliferate house dust mites. No valid data are available for the house dust mites fauna of Bandar-Abbas. Therefore, a study was carried out to determine the prevalence, number of species of mites and contamination rates of hotels and inns in Bandar-Abbas, between October and December 2006.

MATERIALS AND METHODS

Study areas

Bandar-Abbas located in south of Iran (27° 13' N, 56° 22' E). It is situated at an altitude of 10 m in a coastal area. In 2006 the maximum and minimum mean annual temperatures were 32.1°C and 21.7°C, respectively. The mean annual relative humidity was 64.8%. This city has a subtropical climate and warm humid summer with about 182.1 mm annual rainfall.

Sites examined

A descriptive, cross-sectional study was designed to investigate the mite fauna in hotels and inns of Bandar-Abbas, south of Iran. In this study Bandar-Abbas city was divided into 6 areas. In each area one hotel and one inn were selected randomly.

Collection of dust samples

A total of 24 dust samples were collected by the same investigator (M. Soleimani) from bedroom of the 6 hotels and 6 inns in Bandar-Abbas, between October and December 2006. In the bedroom two samples were taken from carpets and surface of mattress. A preliminary examination revealed that these places are the best biotopes of the mites. A piece of thin, cellulose filter (20×25 cm) was placed between the vacuum cleaner (Moulinex-Agilo, 60 Hz, China) and the extension tube so that the dust could be collected on the filter during the vacuuming. One square meter of each place was vacuumed for a period of 1 min. The filter was removed and numbered. After collection, samples were immediately frozen to avoid mite proliferation. Once in the laboratory, dust samples were weighed and separated into 50 to 100 mg aliquots.

Isolation of mites

Ten milliliters of 90% lactic acid were added to 100-250 mg of the sample dust. This mixture was heated until boiling and diluted with 90 mL distilled water. Individual mites were removed using a fine needle under a stereomicroscope and identified under a compound light-microscope. The mites were then placed into 2 drops of Hoyer's medium

in order to prepare permanent slides. Prepared slides were kept warm for 24–48h. afterwards; they were counted and identified according to Colloff and Spieksma (Colloff and Spieksma, 1992). The results are expressed as the number of mites per gram of dust.

RESULTS

A total of 24 dust samples were collected from 6 hotels and 6 inns in six areas of Bandar-Abbas and 2644 mites (987 from hotels and 1657 from inns) were collected and identified. The following 3 species were found in inns: *Dermatophagoides pteronyssinus* (85.7%), *Dermatophagoides farinae* (10.9%) and *Cheyletus malaccensis* (3.4%). In hotels: *D. pteronyssinus* (91.8%) and *D. farinae* (8.2%) were collected (Fig. 1). The results show that the Prevalence of house dust mite in inns was more than that in hotels. The major mite family was pyroglyphidae (98%). The most frequently occurring and most abundant species present was *D. pteronyssinus* which occurred in 91% of samples and accounted for nearly 86% of the total mite numbers and 88% of the Pyroglyphid population.

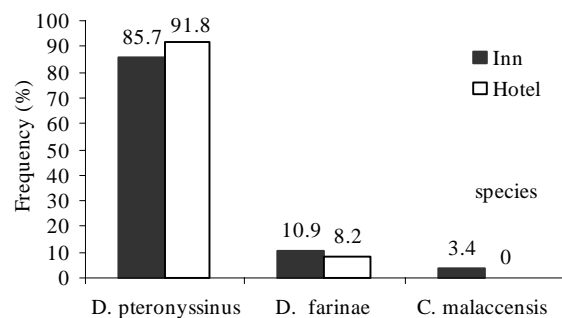


Fig. 1: Fauna of mites in hotels and inns of Bandar Abbas, southern Iran, 2006

D. farinae occurred much less frequently and was much less abundant than *D. pteronyssinus*, which occurred in 75% of samples. It was found in only 12% of pyroglyphidae mite numbers and less than 11.6% of total mite population.

From family Cheyletidae (Acari: Prostigmata) only one species *C. malaccensis* was collected, it was accounted for only 2.4% of total mites and found in 33% of samples. The most prevalent species of mites were *D. pteronyssinus* and *D. farinae*, which were found in 91% and 75% of the samples, respectively (Table 1). Most of the mites were isolated from the carpets (57.5%) and smaller

numbers from surface of mattress (42.5%). The average number of mites per gram of dust in the different localities ranged between 26 and 250. All studied inns and 83% of hotels were

contaminated by more than one species of mite and 34% of them had a population of more than 100 mites/g dust.

Table 1: Mite species present in dust samples collected from Hotels and Inns in Bandar-Abbas, 2006

| Species | Total No (%) | Samples No (%) | Niche | |
|-------------------------|--------------|----------------|----------------|-------------------|
| | | | Carpets No (%) | Mattresses No (%) |
| Pyroglyphidae | 2588(97.6) | 23(96) | 1180(98.5) | 1408(97.5) |
| <i>D. pteronyssinus</i> | 2280(86) | 22(91) | 1062(88.5) | 1218(84.5) |
| <i>D. farinae</i> | 308(11.6) | 18(75) | 118(10) | 190(13) |
| Cheyletidae | 56(2.4) | 8(33) | 20(1.5) | 36(2.5) |
| <i>C. malaccensis</i> | 56(2.4) | 8(33) | 20(1.5) | 36(2.5) |

DISCUSSION

House dust mites have been shown to be strongly associated with allergic respiratory diseases in the world. These associations were mostly made with reference to mites of the *Dermatophagoides* species. (Platts-Mills and Thomas, 1992).

This study recorded the presence of three mite species in hotels and inns in six areas of Bandar-Abbas for the first time. These species may play a role in mite-induced respiratory symptoms in this region of Iran. In this study the family Pyroglyphidae was found in the majority of samples and made up the large proportion of individual mites. Two species of Pyroglyphidae that occur most commonly in house dust, *D. pteronyssinus* and *D. farinae*, feed chiefly of desquamated skin scales shed by the human body, which is why they are particularly abundant in the bedrooms (Hart and Whitehead, 1990).

The European house dust mite *D. pteronyssinus* is the most prevalent mite in Iran. In the present study, 86. % of the mites belonged to this species. Previous surveys conducted in Iran have shown that the percentage of *D. pteronyssinus* in house dust was between 60% to 88% and *D. farinae* is the second most frequent species (Amoli and Cunnington, 1977; Motavalli-Haghi *et al.*, 2003). The high prevalence of *D. pteronyssinus* mites in this study compared with *D. farinae* is comparable to UK and Australian house dust studies (Hughes and Maunsell, 1973; Colloff, 1991). In contrast, studies of mite fauna in houses in other areas of Europe and the USA commonly find *D. farinae* (Sidenius *et al.*, 2002). It has been suggested that *D. farinae* thrives in drier conditions than *D. pteronyssinus* and is thus distributed in inland areas rather than coastal areas where *D. pteronyssinus* predominates. Bandar-

Abbas is located on the north shore of the Persian Gulf and has a humid subtropical climate, is probably too warm and damp for efficient survival of *D. pteronyssinus*.

The results show that all inns and 83% of hotels were contaminated by mites and mites were present in 96% of total dust samples. The climatic conditions of Bandar-Abbas provide a suitable place to proliferate mites. Our results agree with a study conducted in the late 1970s in Iran, which showed that most of the mites were isolated from the relatively humid areas of the Caspian Sea region, while the lowest numbers were found in Tehran, Shahrood and Khorram-Abbad (Amoli and Cunnington, 1977).

Similar differences between coastal localities and continental interiors were also found in Australia (Green *et al.*, 1986). Most of the mites in the present study were isolated from carpets and lesser numbers from mattresses. It is possible that the number of mites in some of the carpets were much higher than that reported here. Vacuum cleaners seem to be strong enough to collect most of the mites from mattresses. For the examination of heavy, longhaired carpets, the 'heat escape method' (Bischoff *et al.*, 1986) might be more appropriate, where mites either escape from very high temperatures or are attracted to more moderate temperatures (Colloff, 1991). The widespread use of carpet in Iran may also contribute to the build-up of mite populations within the hotels and inns. It has been suggested that the large amount of animal dander's, human and animal food particles, fungi, bacteria and other debris found between the carpet fibers provided an excellent protective niche and suitable micro-environment for the development of house dust mites and also other species (Brunekreef, 1999).

In this survey *Cheyletus malaccensis* was also found in relatively low number in some places. This mite has been reported to be predacious on several other mite species although its number was always lower than the pyroglyphid mites. Low presence of predatory mites may thus have an influence on the eco-bio-system balance within these niches. The results showed that the prevalence of house dust mite in inns was more than that in hotels. Probably, some environmental factors (humidity, temperature and ventilation), the personal life style of the inhabitants, micro-climate of mattresses and carpets, were more favorable for development of house dust mite populations in inns than in hotels.

In this study, the mean number of total mites was 65 mites per gram of dust and 34% of the hotels and inns had a population of more than 100 mites per gram of dust. A value of 100-500 mites/g of dust has been suggested as the threshold at which mite density and mite allergen concentration is clinically important (Korsgaard, 1983; Arlian *et al.*, 1992). This indicates that most people in the hotels and inns in Bandar Abbas are constantly exposed to levels of house dust mite allergens that are approximately more than is acceptable from a clinical point of view.

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