

Studies on House-Dust Mites. The Itching Dermatitis in Okayama Prefecture, Japan

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Accepted for publication on March 16, 1992

ABSTRACT. Seventy-three patients (52 females and 21 males) with suspected itching dermatitis caused by house-dust mites admitted to our hospital during the period of June 1984 to December 1991. Survey of the mites in house-dust collected from the residences of all patients was carried out to clarify the precise relationship between itching dermatitis and causative mites. The patients were more in female (71.2%) than in male (28.8%),

and the highest incidence was observed in female in forties (19.2%). The mite infestation occurred most in August and September in every year. Eighteen mite species in 11 families were found in 56 (76.7%) out of 73 cases. The dominant species were *Dermatophagoides farinae* (47.9%), *D. pteronyssinus* (27.4%), *Haplochthonius simplex* (26.0%), *Chelacaropsis moorei* (24.7%), *Cosmochthonius reticulatus* (21.9%), *Laelaps* spp. (11.0%), *Dermanyssidae* spp. (7.7%), *Cheyletus fortis*, *Tyrophagus putrescentiae* and *Hirstia domicola* (6.8% each). In 32 (43.8%) out of 73 cases, 5 mite families such as Cheyletidae (34.2%), Laelapidae (11.0%),

Dermanyssidae (7.7%), *Macronyssidae* (*Ornithonyssus bacoti*) (2.7%) and *Pyemotidae* (1.4%) were confirmed. Therefore, it reveals that the itching dermatitis found in 32 patients were caused by the mites inhabiting in house-dust.

Key words: itching eruption — acarine dermatitis — house-dust — mite — Acarina

Recently, human infestation with mites inhabiting in house-dust has been increasing in Japan, and the problem now becomes consequential both medically and publicly. The exact relationship between allergic asthmas and house-dust mites is presented by Voorhorst *et al.* (1964)¹⁾ in Holland, although it has been known that the house-dust mites are regarded as being ambiguously correlated with allergic diseases to humans. In Japan, it is also known that some species of house-dust mites may provoke several allergic diseases such as bronchial asthma, rhinitis, ophthalmitis, itching dermatitis as well as mite neurosis since Miyamoto and Ouchi (1976).²⁾

Among them, the itching dermatitis caused by house-dust mites has annually been increasing in number, and so far, it becomes clear that the cheyletid mites surviving and propagating in Tatami-mats are primarily responsible for acarine dermatitis³⁾ along with dermanyssid, macronyssid,

laelapid and pyemotid mites.

The authors have accumulated a total of 73 patients with suspected acarine dermatitis caused by house-dust mites during past 7 years. The present study was conducted in order to clarify the mite fauna found in house-dust from the residences of the patients and to determine dominant species related to dermatitis.

MATERIALS AND METHODS

The house-dust examined in this study was collected from the residences of 73 suspected patients (52 females and 21 males). They admitted to Department of Dermatology, Kawasaki Hospital during the period of June 1984 to December 1991. The mites in the house-dust were examined according to flotation method by Hart and Fain (1987)⁴⁾ with our modification. Procedure for extraction of the mites is as follows: the house-dust sample, volume of tip of a thumb removed from vacuum cleaner bag was placed into a Petri dish of 8 cm × 2 cm. Seventy *per cent* ethanol was added onto the dust mass until the whole dust was fully penetrated, and about 60 ml of saturated NaCl solution was then added to the dish. The dust mass was cut-open by a needle under a dissecting microscope. The floated mites and other microinsects were carefully examined, and the sediment was also examined for the sunken mites. This procedure was repeated twice on each dust sample. The mites were picked up with a needle and mounted in Gum-chroral, then each individual was checked taxonomically according to the illustrations by Baker (1949),⁵⁾ Ehara (1980)⁶⁾ and Takada (1990).⁷⁾

RESULTS AND DISCUSSION

Incidence of acarine dermatitis patients

Among the outpatients admitted to our hospital, 73 patients were diagnosed as having acarine dermatitis (Table 1). The distribution of sex ratio of 73 patients was more in female (52, 71.2%) than in male (21, 28.8%).

Age distribution of the patients was, in order of frequency, 21.9% in forties (14 females and 2 males), 16.4% in over sixty (6 each of females and males), 15.1% in twenties and fifties (each of 9 females and 2 males), thirties (7 females and 4 males), 11.0% in teens (7 females and one male) and 5.5% in 4 boys under 9 years of age. The highest was 14 females in forties (19.2%).

The seasonal occurrence was shown in Table 2. The patients were found in every month except for successive Februaries and relatively numerous in June to November annually. The most frequent appearances were in August and September. The most patients noticed itching eruptions on the upper and lower extremities and trunks, then admitted to the hospital several days later. The clinical photographs of typical skin lesions were shown in Fig. 1. By gross examination the following skin eruptions were confirmed in dorsal and hip (Figs. 1A,C), chest and upper arm (Fig. 1B) and lower limb (Fig. 1D), with erythematous papules and raised vesicles of azuki-bean to horsebean size of bright-red urticaria (Figs. 1A-D). At first glance, those eruptions were clearly

TABLE 1. Mites found in house-dust from the residences of 73 patients with suspected acarine dermatitis

Year	No. of examined		No. of mites found (%)		Percentage (%)
1984	1	F	1	F	100
1985	10	[M 4 F 6]	8	[M 2 F 6]	80.0
1986	8	[M 1 F 7]	6	[M 1 F 5]	75.0
1987	8	F	7	F	87.5
1988	9	[M 2 F 7]	7	[M 2 F 5]	77.8
1989	12	[M 7 F 5]	10	[M 7 F 3]	83.3
1990	13	[M 3 F 10]	8	[M 3 F 5]	61.5
1991	12	[M 4 F 8]	9	[M 2 F 7]	75.0
Total	73	[M 21 F 52]	56	[M 17(23.3) F 39(53.4)]	76.7

F: female, M: male

TABLE 2. Seasonal occurrence of the mite bite patients with suspected acarine dermatitis

Year	No. of patients												Total
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1984						1							1
1985			3					2	3	1		1	10
1986				1	1	2			2	1	1		8
1987					2	1		2			2	1	8
1988	3					1			3	1	1		9
1989	1					1		1	3	2	3	1	12
1990	1		1				4	3	3	1			13
1991						1		7	1	1		2	12
Total	5	0	4	1	3	7	4	15	15	7	7	5	73

identified as a popular type of dermatitis by their striking features.

Survey on the house-dust mites

In 56 out of 73 cases, the mites were found in the house-dust, and results were shown in Table 1.

Genera and species of the mites found were summarized in Table 3. Those were 18 species in 11 mite families. Although one to 6 species of the mites were recognized in all the house-dust samples, coexistence of 2 species was dominated. Major mites classified were as follows: *Dermatophagoides farinae* (47.9%); *D. pteronyssinus* (27.4%); *Haplochthonius simplex* (26.0%); *Chelacaropsis moorei* (24.7%); *Cosmochthonius reticulatus* (21.9%); *Laelaps* spp. (11.0%); Dermanyssidae spp. (7.7%); *Cheyletus fortis*, *Tyrophagus putrescentiae* and *Hirstia domicola* (6.8%). Thus, both of *D. farinae* and *D. pteronyssinus* were dominant in the house-dust, and the results are closely similar to those investigated in the past.⁸⁻¹⁵⁾

It is generally suspected that some species of the house-dust mites belonging to the genus Astigmata strongly associated with allergic asthma and rhinitis to humans, but they are no close relation morphologically and ecologically to itching dermatitis. On the contrary, both genus Mesostigmata and Prostigmata are well known as biting mites to humans, and they are definitely related to itching dermatitis to humans. In the present study, 5 biting mite families were found in 32 patients (43.8%) out of 73 examined. Among those biting mites the Cheyletidae was the most frequent (25 cases, 34.2%), followed by Laelapidae (8 cases, 11.0%), Dermanyssidae (5 cases, 7.7%), Macronyssidae (*Ornithonyssus bacoti*) (2 cases, 2.7%) and Pyemotidae (one case, 1.4%) as shown in Table 3. The *Chelacaropsis moorei* (18 cases, 24.7%) was most abundant among 6 species in Cheyletidae. Our data suggested that these biting mites were certainly related to cause itching eruptions of humans, and acarine dermatitis found in the present cases were causally related to cheyletid mites inhabiting in the house-dust. The photographs of representative mites studied were shown in Figs. 2-13.

Although atopic house-dust asthma and allergic rhinitis by pyroglyphid mites have so far been reported in Japan,⁹⁾ the detailed investigation on the reciprocal relationship between acarine dermatitis and the house-dust mites has not well been studied. As mentioned above, acarine dermatitis by house-dust mites are now gradually increasing and this problem has recently begun to arouse considerable attention. There are, however, limited account of reports which dealt with classification of agential mites, even though the patients were diagnosed as having acarine dermatitis by the house-dust mites. The reports on the relationship between itching dermatitis and causative mites have hitherto been presented by Oshima *et al.* (1971),¹⁶⁾ Hagiwara and Sato (1977),¹⁷⁾ Takaoka *et al.* (1984)¹⁸⁾ and Maeda and Anekohji (1988).¹³⁾ They revealed the mites in the house-dust collected from residences of the patients caused arthropodous dermatitis by the following species, *Dermanyssus hirundinis*, *Ornithonyssus sylviarum*, *O. bacoti* and Cheyletidae. The results were 24.5% (Oshima *et al.*, 1971),¹⁶⁾ 50.0% (Hagiwara and Sato, 1977),¹⁷⁾ 83.3% (Takaoka *et al.*, 1984)¹⁸⁾ and 61.3% (Maeda and Anekohji, 1988),¹³⁾ respectively. According to Maeda and Anekohji (1988),¹³⁾ cheyletid mites were 77.8% which appeared to be dominant in the agential mites for acarine dermatitis, and a

TABLE 3. Fauna of the mites in house-dust collected from the residences of 73 patients

Species	No. of positive sample	Percentage (%)
(Mesostigmata)		
Dermanyssidae spp.	5	7.7
Macronyssidae		
<i>Ornithonyssus bacoti</i>	2	2.7
Laelapidae		
<i>Laelaps</i> spp.	8	11.0
(Prostigmata)		
Cheyletidae	25	34.2
<i>Cheyletus fortis</i>	5	6.8
<i>C. eruditus</i>	3	4.1
<i>C. trouessarti</i>	1	1.4
<i>C. malaccensis</i>	2	2.7
<i>Chelacaropsis moorei</i>	18	24.7
<i>Cheletomorpha lepidopterorum</i>	2	2.7
Pyemotidae		
<i>Pyemotes</i> sp.	1	1.4
(Astigmata)		
Acaridae		
<i>Tyrophagus putrescentiae</i>	5	6.8
Glycyphagidae		
<i>Glycyphagus domesticus</i>	4	5.5
Pyroglyphidae	45	61.6
<i>Dermatophagoides farinae</i>	35	47.9
<i>D. pteronyssinus</i>	20	27.4
<i>Hirstia domicola</i>	5	6.8
(Cryptostigmata = Oribatei)		
Cosmochthoniidae		
<i>Cosmochthonius reticulatus</i>	16	21.9
Haplochthoniidae		
<i>Haplochthonius simplex</i>	19	26.0
Oribatulidae spp.	3	4.1

majority of them were identified as *Chelacaropsis* sp.

In the present study, the detection rate of agential mites for acarine dermatitis was 43.8%, and that of the cheyletid was 34.2% (Table 3). They are somewhat less than those in the investigations described above. It is possible that the difference is influenced due to technical difference on mite examination. As Moritani (1988)¹⁹⁾ has already pointed out, there existed an appreciable number of methods for mite extraction from house-dust samples. In this study the most simple and efficient method by Hart and Fain (1987)⁴⁾ was applied.

Several species of the mites belonging to 3 genera of Dermanyssidae, Macronyssidae and Laelapidae (Table 3) are well known as bloodsucking ectoparasites for rodents and avians, and they are also known to occasionally

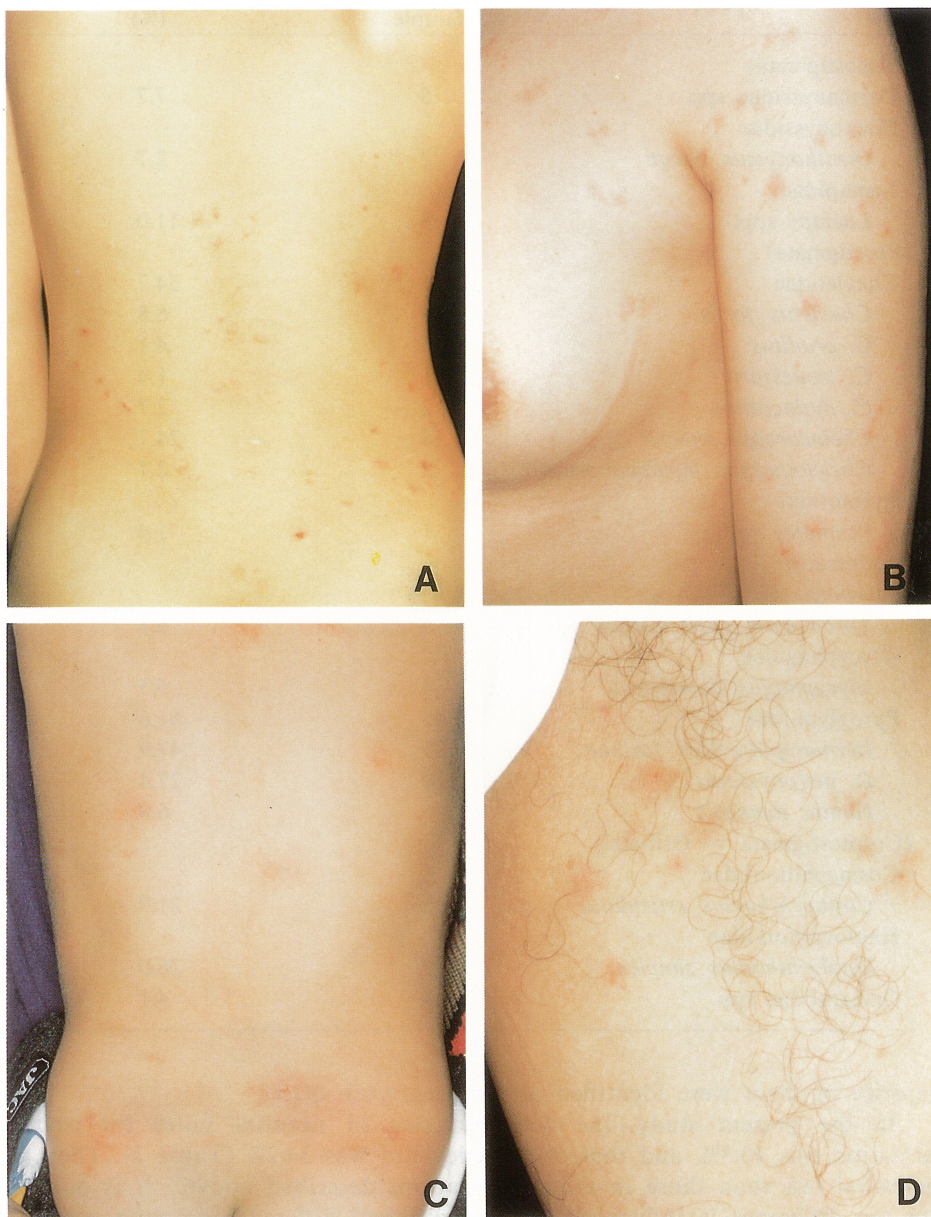
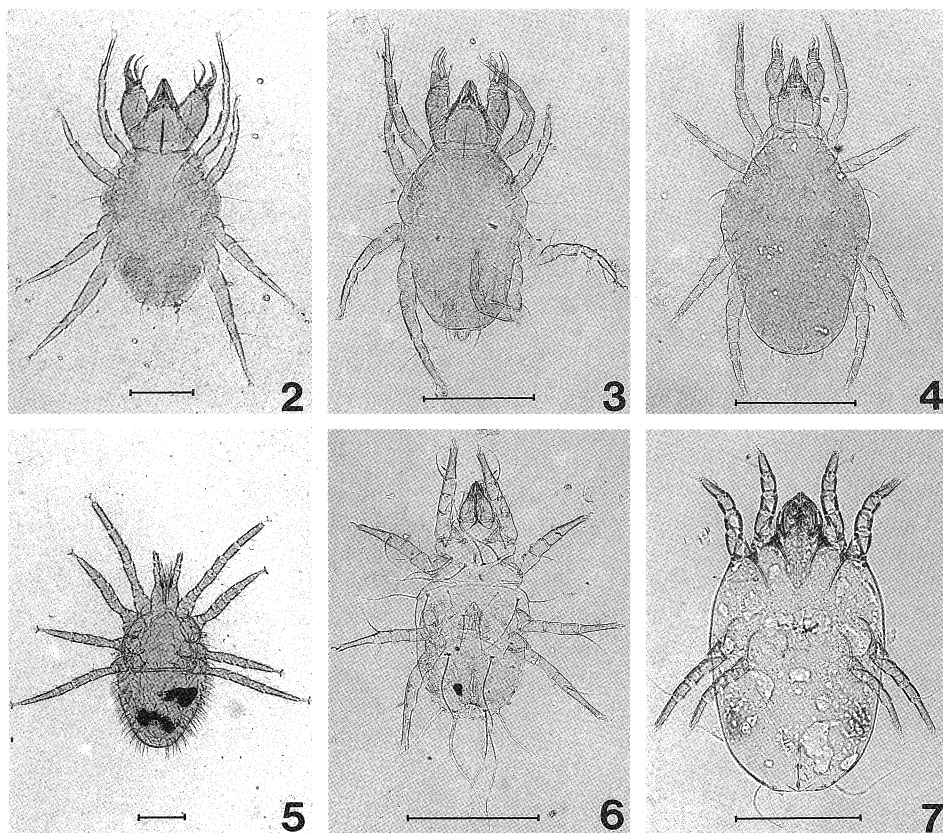


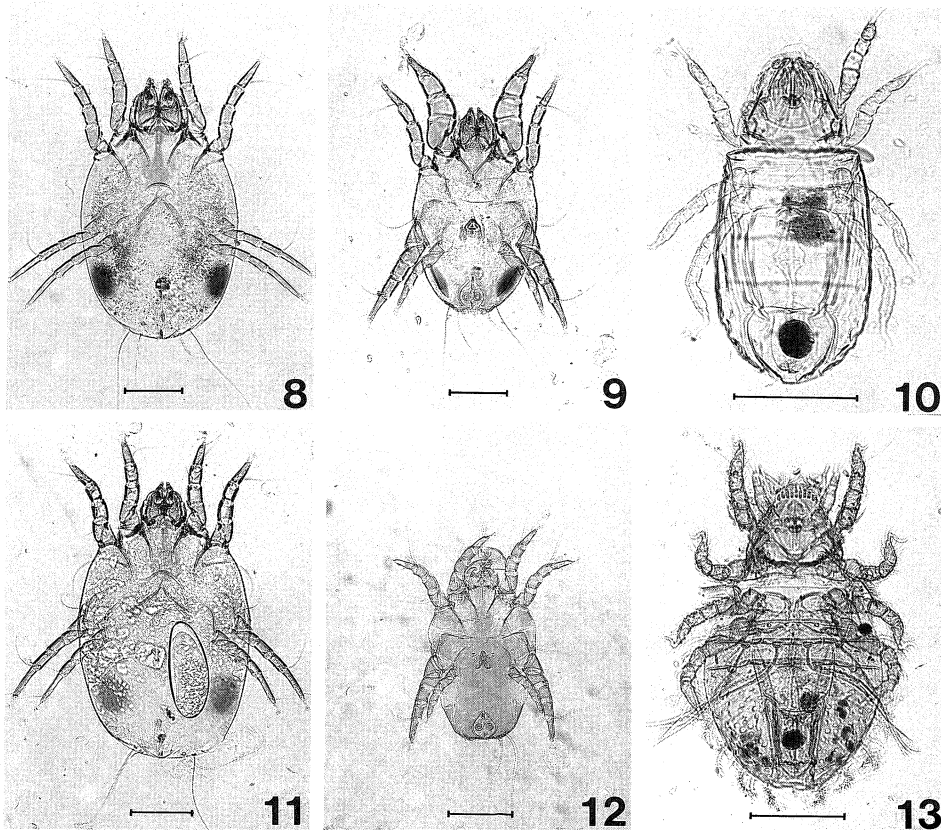
Fig. 1. Clinical pictures showing cutaneous lesions produced by house-dust mite bites
A: Multiple erythematous papules on the dorsal region of a 11-year-old girl
B: Itching edematous erythema on left upper arm and chest regions of a 19-year-old female
C: Several number of erythematous papules on the hip and dorsal regions of a 2-year-old boy
D: Itching red papules on left femur of a 36-year-old male



Figs. 2-7. Photomicrographs of the mites found in house-dust samples, mounted specimens (Scale bars = 0.2 mm). 2: *Cheyletus fortis*, 3: *Cheyletus eruditus*, 4: *Chelacaropsis moorei*, 5: *Ornithonyssus bacoti*, 6: *Tyrophagus putrescentiae*, 7: dermatophagoidid nymph

bite man. By careful questioning, the following facts became evident that good number of house rats inhabited for several years in the residences of 3 patients and found laelapid species, and with 2 patients found *O. bacoti* in the house-dust. However, nesting of wild birds was not confirmed. Maeda and Anekohji (1988)¹³⁾ reported that the patients of itching dermatitis were found more often in females than in males during June to October. Essentially similar result was obtained in our study. Particularly the number of patients with suspected acarine dermatitis were most numerous in females of forties. It is conceivable that the females over 40 have been residing at their homes throughout the years. Thus, patients could be concentrated in the females over 40.

Fortunately, no marked allergic disease by the house-dust mites was seen, though continuous attention must always be paid to prevent propagation of the mites from house-dust. Although Takaoka (1988)²⁰⁾ has already pointed out,



Figs. 8-13. Photomicrographs of the mites found in house-dust samples, mounted specimens (Scale bars = 0.1mm). 8: *Dermatophagoides farinae* (female), 9: *D. farinae* (male), 10: *Haplochthonius simplex*, 11: *Dermatophagoides pteronyssinus* (female), 12: *D. pteronyssinus* (male), 13: *Cosmochthonius reticulatus*

it should again be emphasized that further studies are needed to clarify both ecosystem of house-dust mites and highly effective mite control system since the sanitary measures against allergic diseases by house-dust mites is not well considered at present.

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