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A Case Study of Itching Dermatitis Caused by *Cheyletus fortis* (Oudemans, 1904) (Acarina : Cheyletidae) Found in Okayama Prefecture, Japan

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ABSTRACT. Itching eruptions in a woman caused by cheyletid mites probably from new Tatami-mats (rice straw mat) is reported. On August 1987, the scattered itching eruptions were found on skin surface of the lower extremities of a 50-year-old housewife living in Kurashiki City, Okayama Prefecture, Japan. The patient has exclusively been resided in a Tatami-mat room which was recently annexed to a country-style frame house. A large number of mites were found on the Tatami-mat surfaces of the room right after she noticed the presence of itching eruptions on her legs. The number of mites appeared to be increased. On acarological observations the mite is identified as *Cheyletus fortis* (Oudemans, 1904) based on morphological analyses of gnathosoma, pedipalps, comb-like setae, thumb-claws, dorsal and dorso-marginal setae and other characteristics. The skin lesions of the patient were completely healed within about two weeks after the mites disappeared entirely from Tatami-mat surfaces by repeated control with a pertinent acaricide.

Key words : cutaneous acariasis — new Tatami-mat (rice straw mat) — cheyletid mite — *Cheyletus fortis* — Acarina

Recently, classic Japanese houses have been transforming gradually into Western-style ones. These new houses, however, are not exactly suitable for Japan, with high temperature and high humidity. Nearly all rooms of the Western-style houses are almost always kept substantially constant-temperature throughout the year by an airconditioner without pertinent circulation of fresh air. Furthermore, the rooms of these houses inevitably transform into the ill-ventilated and insanitary condition.

Adding to the fact, some species of mites, suitably propagate in the surroundings of comparatively high temperature and humidity, are often found in house-dust, thus they are generally called house dust mites. These mites certainly increase in number by their vigorous breeding in accumulated dusts in the ill-ventilated or insanitary rooms.

In an average house in Japan, about 18 families of mites have been recognized in house-dust (Yoshikawa, 1986).[1] They are listed in order of appearing frequency, as follows : Pyroglyphidae, Acaridae, Cheyletidae, Tydeidae, Tarsonemidae, Haplochthoniidae, Cosmochthoniidae, Ascidae, Ameroseiidae,

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Glycyphagidae, *etc.* These mites are already known to cause bronchial asthma, allergic rhinitis or other allergic diseases for human beings (Ishii *et al.*, 1979;[2] Takaoka, 1988[3]). Among them, some species of Cheyletidae are most important from dermatological point of view, because cheyletid mites propagate themselves in Tatami-mats and possibly give rise to infest in human beings.

The authors report here a case of itching dermatitis in a woman in Kurashiki City, Okayama Prefecture, Japan, caused by cheyletid mites which may be derived from new Tatami-mats, together with SEM pictures of agential mites.

CASE REPORT

The patient (M.H.) was a healthy 50-year-old housewife residing in Kurashiki City, Okayama Prefecture, Japan. On early August 1987, the patient first noticed the presence of scattered eruptions with mild itching on the skin surface of her lower legs. By gross examination of the skin itching eruptions were recognized on the lower extremities with numerous erythematous papules and vesicles of a millet in size and bright-red in color (Fig. 1). At first glance the eruptions seemed somewhat like punctured wounds by small insects or mites.

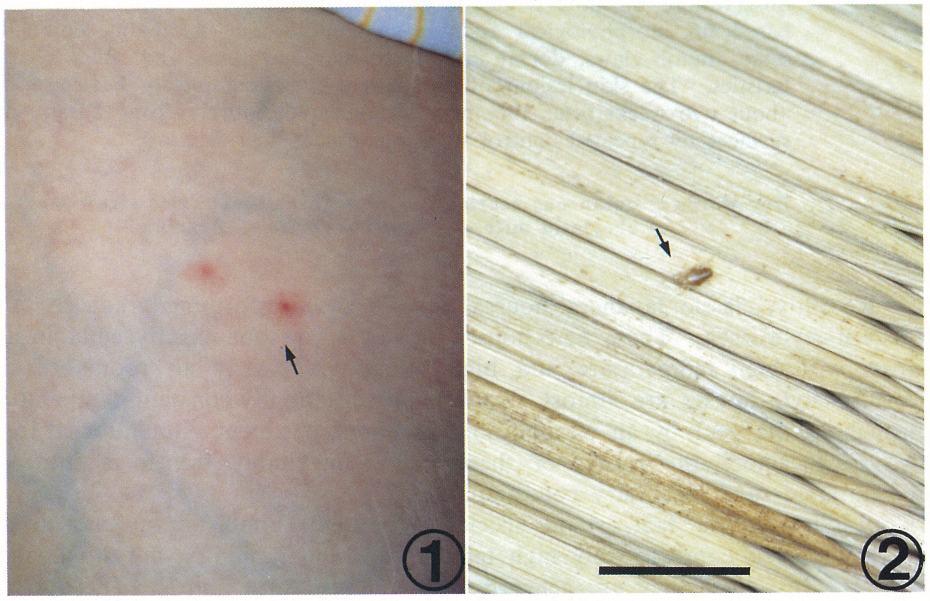


Fig. 1. Clinical picture of the skin lesion (arrow) caused by a cheyletid mite, right lower extremity of the patient
Fig. 2. A cheyletid mite (arrow) ranging on the Tatami-mat surface (Scale=4.0 mm)

The patient has been living in a country-style frame house for 13 years, and about four months ago two more rooms were newly annexed to the house. At that stage new Tatami-mats (rice straw mat) were placed into new rooms, one of which had been used by the patient. The patient's husband who had previous knowledge on sanitary animals was able to surmised that the itching

eruptions could be induced by some species of mites related to new Tatami-mats. Then careful examination on the Tatami-mat surfaces through a magnifying glass was made, and a great number of crawling creatures which looked somewhat like a miniature insect were found (Fig. 2).

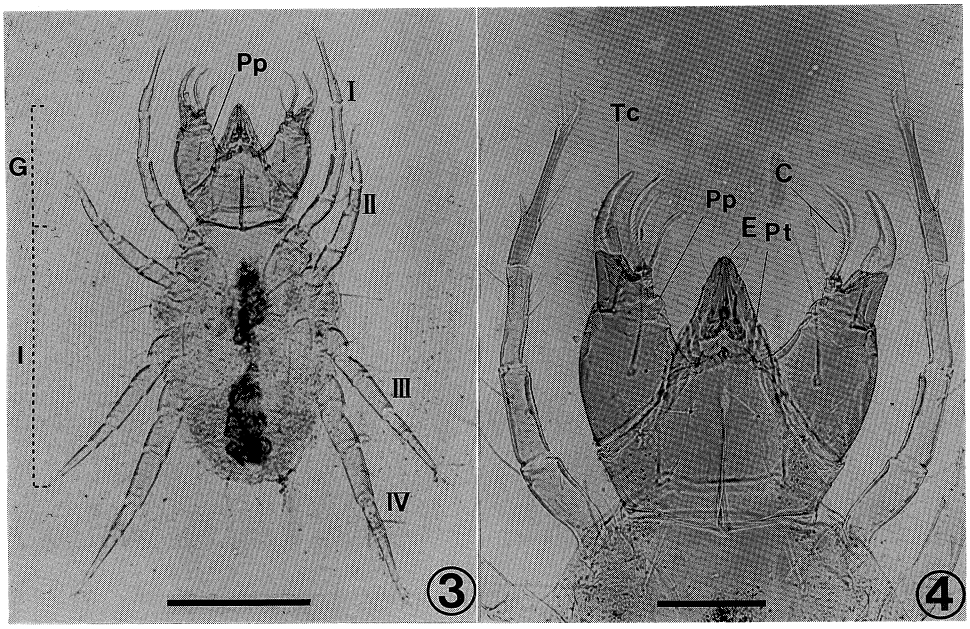


Fig. 3. Whole body of *Cheyletus fortis,* dorsal view (Scale = 0.3 mm)
G: gnathosoma, I: idiosoma, Pp: pedipalp, I-IV: 1st to 4th legs
Fig. 4. Anterior end (gnathosoma) of *Cheyletus fortis,* dorsal view (Scale = 0.1 mm)
C: comb-like seta, E: epistome, Pt: peritreme, Tc: thumb-claw

The individuals were collected and fixed in 70% alcohol and characteristic aspects of them were examined with a light microscope and a scanning electron microscope. Several individuals were mounted in Gum-chloral. The collected creatures had 4 pairs of legs, and gnathosoma and idiosoma were fairly distinguished. Therefore, it was suspected to be some species of mites (Fig. 3).

A mounted mite specimen was measured about 0.7 mm in length and 0.3 mm in maximum width (idiosoma). The microscopic appearance of the present mite, especially gnathosoma with strong pedipalps (Figs. 3, 4, 5), comb-like setae (Figs. 4, 7, 8), thumb-claws with each of large single basal flat tooth (Figs. 7, 8), epistome and U-shaped peritreme (Fig. 4), and arrangement of dorsal and dorso-marginal setae (Figs. 5, 6) were comparable to those of *Cheyletus fortis* (Oudemans, 1904) as revealed by Baker (1949)[4] and Tanaka (1953).[5] All the mites collected from the Tatami-mat surfaces were nymphal stage of development.

Immediately after confirming the existence of cheyletid mites, an acaricide to effectively kill the house dust mites (pyrethroid compound on the market) was repeatedly sprayed on and around surfaces of the Tatami-mats. Several days after no mite was recognized on the mat surfaces as well as the patient's

eruptions were spontaneously healed in two weeks. Judging from the epidemiological course, it is supposed that skin eruptions appeared on the patient were caused definitely by *Cheyletus fortis* from new Tatami-mats.

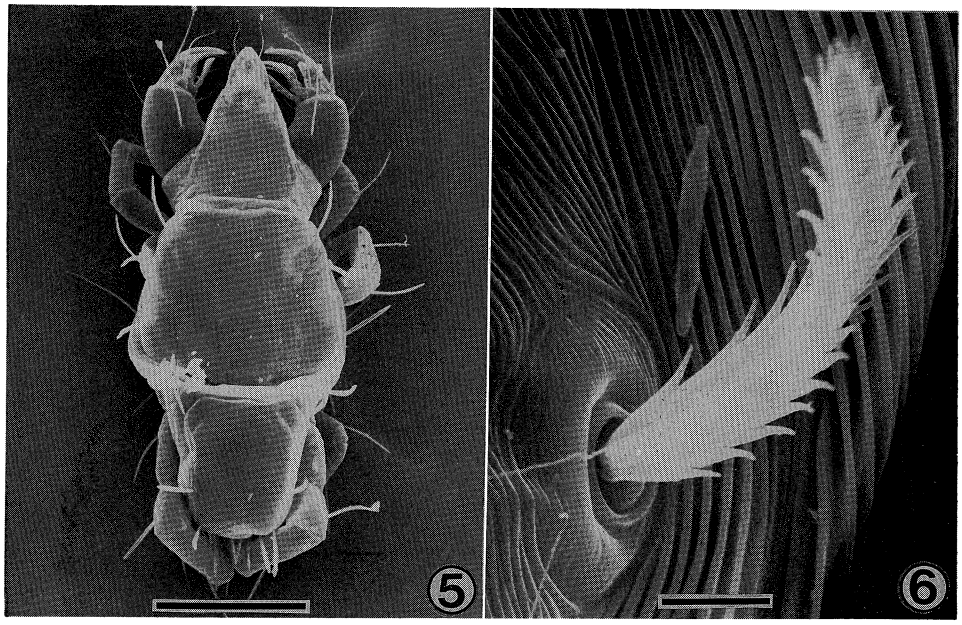
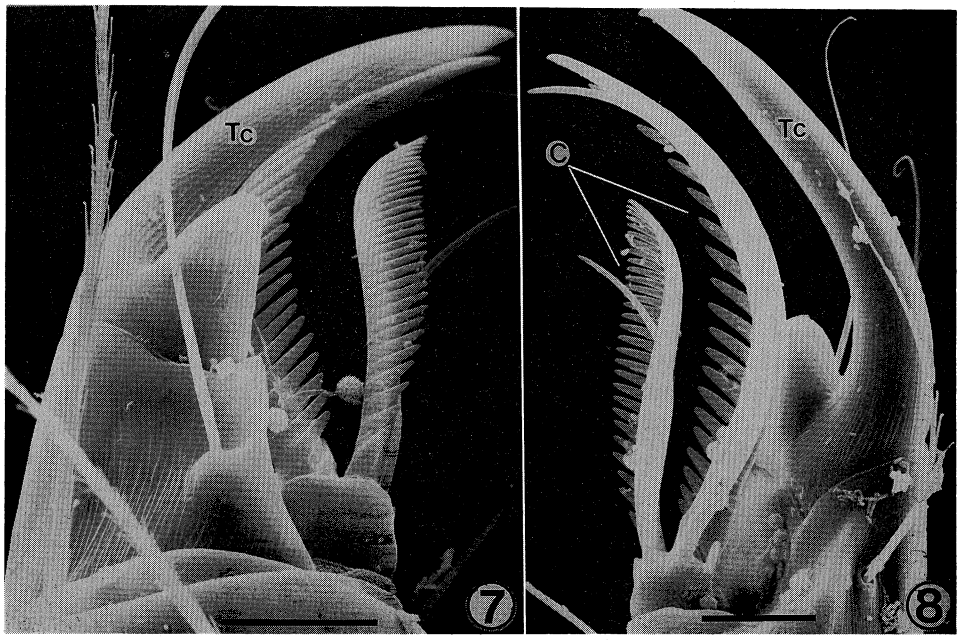


Fig. 5. SEM picture of *Cheyletus fortis*, dersal view (Scale = 0.2 mm)
Fig. 6. High-mag. SEM picture of dorso-marginal seta (Scale = 5.0 μm)



Figs. 7, 8. SEM pictures of left pedipalp of *Cheyletus fortis*, dorsal view (7) and ventral view (8) (Scale = 20 μm)
C: comb-like seta, Tc: thumb-claw

DISCUSSION

It is believed that itching eruptions occurred in the present patient were caused by cheyletid mites surviving and propagating in new Tatami-mats. The mites are taxonomically classified in class Arachnida, and they develop into adult by incomplete metamorphosis passing through 3 developmental stages, egg, larva and nymph (including protonymph, deutonymph and tritonymph). The mite has 4 pairs of legs in adult and nymphal stages but whereas 3 pairs in larval stage. In the larval and nympal stages of mite, the genital opening is still not well-recognized on the ventral surface. In addition, the mites are quite easily distinguished from insects as the bodies are segmented into two parts of gnathosoma and idiosoma (Fig. 3).

In the current studies on Acarina the house dust mites have been attracting public attention (Miyamoto and Ouchi, 1976;[6] Ishii *et al.*, 1979;[2] Sakaki *et al.*, 1987;[7] Takaoka, 1988;[3] Aida, 1989;[8] Yoshida, 1989;[9] Tanaka and Tanida, 1989[10]). The most frequently found species of mites in house-dust are *Dermatophagoides farinae* Hughes, 1961 and *D. pteronyssinus* (Troussart, 1897), followed by *Hirstia domicola* and *Euroglyphus maynei* as belonging to pyroglyphid mites. Otherwise, several species of mites are normally seen in house-dust as described above. According to Yoshikawa (1986),[1] the appearing frequency of *D. farinae* and *D. pteronyssinus* is accumulated to over 90% of total mites found in house-dust. These mites feed on mould fungi, grow in dump place and often found in the ill-ventilated Tatami-mat rooms not only in newly-built Western-style houses but in new and old country-style frame houses.

The mite *Cheyletus fortis* in the present study appeared to be derived only from new Tatami-mats. This mite has already been found from the Tatami-mat rooms of numerous houses in Japan (Nakamura *et al.*, 1967;[11] Oshima, 1970,[12] 1971;[13] Miyamoto and Ouchi, 1976;[6] Ishii *et al.*, 1979;[2] Sakaki *et al.*, 1987;[7] Aida, 1989;[8] Yoshida, 1989;[9] Tanaka and Tanida, 1989[10]). The eight species of cheyletid mite found in the Tatami-mat rooms have so far been reported in Japan, namely *Cheyletus eruditus* (Schrank, 1781), *C. rapax* Oudemans, 1903, *C. fortis* (Oudemans, 1904), *C. malaccensis* (Oudemans, 1904), *C. rarus* Shiba, 1969, *Cheletomorpha lepidopterorum* (Shaw, 1794), *Ch. tatami* Hara, 1955, *Chelacaropsis moorei* Baker, 1949.

The reason for existence of cheyletid mites in the Tatami-mat rooms may be considered as follows: the mites gradually increase in house-dust by breeding in the same manner as some other species of pyroglyphid mites do; thus the mites have already attached to the Tatami-mat materials. Most striking is the fact that fresh rice straws used for Tatami-mat had not been fully dried throughout the early process of mat manufacturing. The most raw materials used for Tatami-mat are imported to Japan from tropical and sub-tropical areas. Hence it is appropriate to assume that several mite species, especially cheyletid were introduced into our country, together with foreign raw straws.

When the population of pyroglyphid mites in house-dust reached to a plateau by breeding, cheyletid mites successively began to appear in the house-dusts unnoticeably. Besides mould fungi, the cheyletid mites feed upon other species of mite inhabiting in house-dust since they are primarily free-living predatory, and soon or later cheyletid mites will form a most dominant group in the house-dust.

During past 10 years several species of cheyletid mite have been found in house-dust by considerable numbers of workers. Yoshikawa (1980)[14] reported that *Chelacaropsis* mites belonging to Cheyletidae were found in house-dust of 11 homes which resulted the familial cases of itching dermatitis, and the most predominant species in these cases were mainly of *Chelacaropsis moorei* or the closely related species of it.

Although a causative factor of dermatitis occurred is suspected from the environmental changes of the patient's house by the authors, no one has yet reported the reliable case of human dermatitis caused by *Cheyletus* mites inhabiting in house-dust. Most descriptions in the past are the results which are nothing more than indirect judgment considered by living environment. Accordingly, whether or not cheyletid exactly attack the human body has been established, but there is no clear reason to doubt that itching eruptions occurred in the present patient were essentially related to the mite *Cheyletus fortis*.

It is conceivable that itching eruptions in the present case was spontaneously healed at minimal injury without treatment because the agential mites were controlled with an adequate acaricide before they have increased in a large number. Therefore, it is highly probable that the *Cheyletus fortis* frequently attack human beings and produce itching eruptions. Otaki (1988)[15] has reported that a total number of personal injuries caused by cheyletid mites is limited in clinical data, but it must be emphasized here that special attention should be given to cheyletid mites since they have strong thumb-claws.

The effective methods for prevention and control of house dust mites may be suggested as follows: (1) keep room humidity lower, namely, open windows to let outside air in; (2) clean up rooms frequently and exterminate mould fungi in the rooms, and (3) dry Tatami-mats, carpets, bedcovers and others in the sun. As the suggestions are practiced, presence of the mites in the house-dust or Tatami-mats should been eliminated.

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