

## Mites

The following families contain species which infest man:

1. The scab mites, itch mites
2. The chiggers, red bugs
3. The chicken mites, tropical rat mites
4. The grain itch mites
5. The cheese mites, grain mites
6. The hair-follicle mites

## • The Scab Mites, Itch Mites

*Sarcoptes scabiei*, the scab or itch mite, causes scabies or the itch, as it is called. It is world-wide in distribution, the incidence being higher the more people live crowded in narrow quarters.

The adults are small, 0.4 mm. in length, oval, with a flat ventral and a convex dorsal side, with spines and bristles which give them the appearance of a hedgehog. The mouth parts, similar to those of ticks, are difficult to make out. They have four pairs of legs, two pairs being situated towards the anterior and two towards the posterior end of the body. The anterior legs terminate in distensible, thin-walled sacs, the suckers. The posterior legs end in long bristles, except in the male, where the fourth pair bears suckers.

The fertilized female lays eggs from which larvae (three pairs of legs) hatch. These develop into nymphs and eventually adults. This development takes about two weeks.

The stage most likely to transmit the infestation is the fertilized female. It crawls around (2.5 cm. a minute) on the warm surface of the skin of the new victim (at a temperature less than 20° C. *Sarcoptes* are immotile), until one of the preferred sites has been found. The mite burrows into the horny layer of the skin, which takes about one hour, tunneling in this layer at the rate of about 5 mm. a day. It remains in the burrow for the rest of its life (two months), laying two or three eggs a day. The larvae from these eggs leave the burrow, enter hair follicles, and develop into nymphs and adults. The latter leave the follicles, migrate about, and burrow into the skin to stay there for a day or two. Both male and unfertilized female again wander around until they succeed in meeting and copulation takes place. The fertilized females then make their permanent homes in the horny layer of the skin. The male repeats his previous performance.

The places of predilection for the burrows are the interdigital webs and the wrists (85 per cent), elbows, feet, penis and scrotum, buttocks, and

backwards anchor in the skin and the mouth parts may break off. Wounds with the decomposing capitulum in the tissue fester and require surgical treatment.

To prevent tick paralysis from having serious effects, early removal of the tick (*Dermacentor andersoni* or *D. variabilis*) is necessary. Since rickettsial infections are prevented if the tick is removed within the first two or three hours, frequent search of the body, particularly of the neck, for ticks is indicated for persons exposed in tick-infested areas. When a tick of a species known to carry human disease has been removed, it is advisable to observe the person for early manifestations of tick-borne diseases.

A good repellent is dimethylphthalate. It acts against the nymphs (less against the adults) of ticks. Clothes are immersed in a solution of 5 per cent dimethylphthalate and 2 per cent soap and dried. Impregnated clothes remain repellent for a month or two even though laundered.

The most effective clothing treatment to repel hard-bodied ticks (and fleas and chiggers) is benzene hexachloride (see p. 275). When impregnated into clothing at the rate of 2 Gm. of the gamma isomere (= 20 per cent of the technical grade) per 1,000 sq. cm., it retains its effectiveness over 20 launderings in hot soapy water. However, benzene hexachloride has a musty odor, and skin irritation may occur with such high dosage.

Ticks (*D. variabilis* and *Amblyomma americanum*) can be controlled with benzene hexachloride (see p. 275). A 1 per cent solution of technical benzene hexachloride (containing 10 per cent benzene hexachloride) in fuel oil is used as a field spray, 1 kg. per 4,000 sq. m. Against ticks on dogs a 5 per cent solution is sprayed, or the powder is dusted, into the hair. It is effective, although it is slow in knockdown and has only little residual action. Benzene hexachloride has a disagreeable odor and leaves a taste in exposed food.

Chlordane sprays (see p. 274) are effective against some species of ticks (e.g., *A. americanum*). For the control of ticks on dogs (*Rhipicephalus sanguineus*, *D. variabilis*), an emulsion concentrate containing 10 per cent piperonyl butoxide and 1 per cent pyrethrin is used. The dilution for spraying on dogs is 1:100, for kennels 1:10. The eyes should be protected during the application.

Soft-bodied ticks (*Ornithodoros*) are controlled by rodent-proofing of houses and DDT sprays which, however, act only on the larval stages.

## INSECT REPELLENT

Dimethylphthalate . . . . .	6 parts
Indalone (butyl mesityl oxi-oxalate) . . . . .	2 parts
Rutgers 612 (2-ethylhexanediol-1,3) . . . . .	2 parts

These are mixed mechanically. One-half teaspoonful is poured into the palm of the hand; the hands are rubbed together, and a thin layer is applied to face, neck, ears, hands, and wrists (but not into eyes or mouth). The application on the skin is effective for two to four hours. In addition to mites, it repels immature ticks, mosquitoes, gnats, and flies.

The application on garments is more lasting. It is sprayed or applied by hand and remains effective for a number of days.

The impregnation of clothes with dimethylphthalate lasts still longer. They are immersed in a solution of 5 per cent dimethylphthalate and 2 per cent soap and dried. Clothes remain repellent for a month or two even though laundered.

Chlordane sprays (see p. 274) are effective in the field control of chigger mites for a month or more. One kilogram is used per 4,000 sq. m.

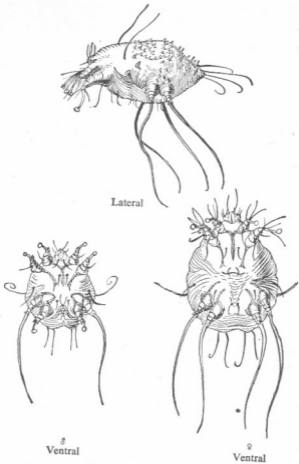
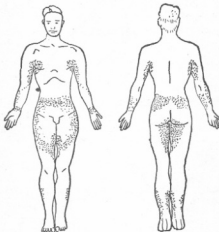


Fig. 61. *Sarcoptes scabiei*  
x100

axillae. Face, palms, and soles are always free in adult persons, but may be involved in young children, whose tender skin seems to offer suitable digging places anywhere. The average number of fertilized females (12) on an individual is remarkably small, the majority of patients having not more than five, although more than 500 have been counted. While the reproduction rate is high, the mortality rate is very high because of the exposed life cycle.



The rash does not correspond with the sites of predilection of *Sarcoptes*

Fig. 62. Distribution of the Rash in Scabies

Clinical manifestations are absent when the mites burrow into the epidermis for the first time. After a month or two, however, the skin is sensitized and erythematous patches appear around the burrows. Intense itching is experienced, especially at night. As a result, the body shows scratch marks and a characteristic rash which readily becomes secondarily infected. Since the parts of the body are not equally sensitive to itching, the distribution of the rash does not correspond with the sites of predilection of the mites.

A patient reinfested after his first scabies has been cured shows inflammation and irritation immediately. Systemic reactions and eosinophilia are absent.

An itching rash which spares the face, palms, and soles can be suspected

as scabies. The egg-laying female is most readily found and used for diagnosis. Hands and wrists offer the best chance for detection. After an inhabited burrow is discovered the raised, whitish, oval animal is looked for at the end of the tortuous, 1-cm.-long burrow. The skin covering the animal is reflexed, and the *Sarcoptes* is removed with a needle.

*S. scabiei* is transmitted by personal contact of a prolonged nature, such as sleeping in the same bed. The fertilized female is the stage which, when transmitted, establishes the infestation. Transmission through transfer of other developmental stages of the mite is improbable. Bedding is unlikely to transmit the infestation, because the mites prefer to stay on the warm body rather than on the colder linen. Off the host, they die within two days.

### TREATMENT

See p. 263.

### PREVENTION

Avoidance of contact with infested individuals. Treatment of those found infested. Sterilization of bed linen and underwear. Personal cleanliness and the use of soap, by themselves, are not effectual.

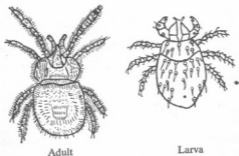


Fig. 63. Red Bugs  
*Trombicula irritans*

### The Chiggers, Red Bugs

Chigger mites are distinct from other mites parasitic on vertebrates in that only the larva is parasitic. The nymphal and adult stages are spent in a nonparasitic existence off the host, feeding on insect eggs and other minute

*Trombicula irritans* (*Eutrombicula alfreddugèsi*), the chigger, harvest mite, red bug. This is the common chigger in the United States.

The adults, with eight legs, are found on grass and bushes, especially blackberry. They feed on vegetable matter and do not attack man. The larvae, with six legs, however, suck lymph and tissue fluids from the subdermal layers of rodents, birds, or man. They attach themselves to the skin (they do not burrow into it) and inject an irritating secretion which causes severe itching for several days. The engorged larvae drop to the ground or are scratched off within a day or two after itching begins.

The larvae are diagnosed on the basis of the three pairs of legs and the oblong scutum with seven hairs.

#### TREATMENT AND PREVENTION

See p. 264.

*Trombicula autumnalis*, the harvest mite. The larvae of this chigger cause itching similar to that caused by *T. irritans* among those who harvest certain crops.



Larva

Fig. 64. *Trombicula akamushi*

*Trombicula akamushi* (syn. *T. fletcheri*) in Japan; *Trombicula deliensis* in Sumatra: these two are so similar that *T. deliensis* may be only a variety of *T. akamushi*.

These small, orange-red larval mites not only produce skin irritation but also transmit *Rickettsia orientalis* (*tsutsugamushi*), the causative organism of scrub typhus.

#### TREATMENT AND PREVENTION

See p. 264.

### The Chicken Mites, Tropical Rat Mites

*Dermanyssus gallinae*, the chicken mite. This pest of poultry may attack man and cause itching. In addition, it can transmit St. Louis encephalitis.

*Liponyssus bacoti*, the tropical rat mite. This pest may attack man and produce an itching vesicular dermatitis. From rat to rat, it transmits *Rickettsia typhi*, the causative organism of murine typhus.

*Allodermanyssus sanguineus*, the mouse mite. They attack man and transmit *Rickettsia akari*, the causative organism of rickettsialpox.

### TREATMENT AND PREVENTION

See p. 264.

### The Grain Itch Mites

*Pyemotes (Pediculoides) ventricosus*, the North American grain itch mite. They feed on insect larvae which infest wheat, barley, rye, other grain, straw, etc. They attack man, especially those sleeping on straw mattresses. The mites burrow into the epidermis and produce petechiae and erythema at each point of attack, followed by wheals, vesicles, and pustules which may cover the entire body.

### TREATMENT

See p. 265.

### The Cheese Mites, Grain Mites

These minute mites abound on dried fruits, cheese, sugar, roots, and bulbs. Man becomes infested when handling such products. Although they do not suck blood, they migrate under the superficial scales of the epidermis and produce an itching dermatitis. In addition, feces of these mites as well as dead mites produce pruritus. When ingested with cheese, they pass through the intestinal tract without causing harm and can be recovered from feces. When inhaled, they produce pneumonitis, with areas of the lungs infiltrated by leukocytes and especially eosinophils. This is known as acariasis, also called acarinosi.

*Acarus siro* occurs among vanilla workers and causes a dermatitis known as vanillism. It also infests cheese.



*Tyrophagus castellanii* occurs among copra workers, causing copra itch. It also infests cheese and cereal.

*Glyciphagus domesticus* infests sugar, dried prunes, and other fruits. It causes grocer's itch.

#### TREATMENT

See p. 265.

#### The Hair-follicle Mites

*Demodex folliculorum*, the hair-follicle mite. Wormlike mites with the legs reduced to stumps. Live in the hair follicles and sebaceous glands, but rarely cause discomfort. They may manifest themselves in acne, blackheads, or other skin conditions. Found particularly in women who use face cream instead of soap and water.

#### TREATMENT

See p. 265.

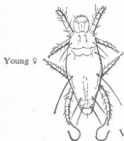


*Dermanyssus gallinae*  
Chicken Mite



*Liponyssus bacoti*  
Tropical Rat Mite

Dorsal



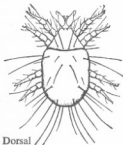
Young ♀

Ventral

*Pyemotes ventricosus*  
Grain Itch Mite



Gravid ♀



Dorsal

*Tyrophagus castellanii*  
Copra Itch Mite



Legs

Ventral

*Demodex folliculorum*  
Hair Follicle Mite

## Infestation with Grain Itch Mites ✓

Grain itch mites in grain, straw (straw mattresses), or hay can attack man. Although the mites leave the skin after a day or two, the area of itching dermatitis is sometimes rather extensive and requires treatment with a menthol-phenol paste.

## Grocer's Itch, Acarinosiis

Cheese and grain mites cause a dermatitis known as vanillism, copra itch, and grocer's itch. Menthol-phenol paste or other soothing applications are used topically.

When inhaled, these mites cause pneumonitis, referred to as acarinosiis, which is treated with organic arsenicals. Carbarsone (see p. 215), two tablets daily, is taken for two weeks, usually leading to rapid recovery.

More important than treatment of the various lesions caused by these mites is the destruction of the mites in the environment and the use of repellents to prevent infestation. The use of the insect repellent is effective (see p. 264).

In addition to mites, this mixture repels immature ticks, gnats, mosquitoes, and flies. It is more lasting on garments than on skin. Clothes are also impregnated against mites with dimethylphthalate and soap (see p. 262).