



Mites as Human and Animal Parasites

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Abstract: Mites, are eight-legged bloodsucking organisms. Mite is a term commonly used to refer to a group of insect-like organisms, some of mites lives on their host (ectoparasitic) which bite or cause inflammation to humans. Mites comes under the category of free living in soil or water or parasitic (ectoparasite external or subcutaneous) on plants and animals including man or even scavengers (Dog, Cat etc.). Some parasitic mites are disease vectors. One species causes the famous mange (mite associated skin disease in vertebrates). Other species of mites are beneficial, feeds on nematode worms and aphid eggs. The scientific discipline devoted to the study of ticks and mites is called acarology.

Keywords: Mites, Morphology, disease vectors mites, acarology

I. Introduction:

More than 250 species of mites are causing the health-related problems for humans and domestic animals. Mites are small arthropod belonging to the order Acarina, class Arachnida and the phylum Arthropoda. Mites are actually arachnids and not insects. Mites are a group of invertebrates related to spiders. There are two major divisions of the body of the mite, the anterior gnathosoma, bearing the pedipalps and chelicerae, and the idiosoma, and the remaining body contain the legs and eyes (when present). The pedipalps are five segmented but it may be highly reduced and highly modified in different groups of mites. The pedipalps are sensory appendages and the presence of chemical and tactile sensors that assist mites in finding food and get awareness of environmental cues. They are very small, normally not visible to the naked eye. Ticks are larger in size than mites and some reach half an inch or more in length. Mites are 0.4-3 mm in length. Majority of their shape are more or less round or oval. The adult mite has a sac-like body, and like other insects, they do not have separated head, thorax, and abdomen. Thus, there is no external body divisions and abdominal segmentation. Legs are in four pairs. Their Piercing mouthparts are used for sucking juices from plants and for penetrating skin of humans and animals. Most species of mites lay eggs, but in some species the young are born live. They usually develop in four stages: the egg, the larva, the nymph, and the adult. All stages have eight legs except the six-legged larva. Reproductive structures are diverse among mites, which are useful in distinguishing the sexes and identifying taxa. Sperm transfer can be occur in two ways they directly inseminate the sperm via the male aedeagus to the sperm storage organ, or spermatheca, of the female), or indirect (e.g., transfer of sperm via the male chelicerae to the female genital opening). The respiratory systems of mites often include tracheal ducts that supplement the exchange of oxygen, carbon dioxide, and other gases across the body surface

The digestive system can digest mainly the liquefied food that has been preorally digested by enzymes secreted in the saliva. The salivary glands is present in pair typically located in the anterior portion of the idiosoma and open via ducts into the mouth region of the gnathosoma. These glands also secrete anticoagulants in hematophagous mites. In Certain groups (e.g., chiggers), they may produce fixing Substances to anchor their parts in host skin. Waste products, in the form of guanine, are excreted by one or two pairs of long, slender Malpighian tubules that open into the alimentary tract just anterior to the hindgut.

The main developmental stages in the life history of mites are generally the egg, prelarva, larva, protonymph, deutonymph, tritonymph, and adult. In some taxonomic group, one or more stages may be suppressed, resulting in a wide range of life-history patterns (e.g., chiggers).

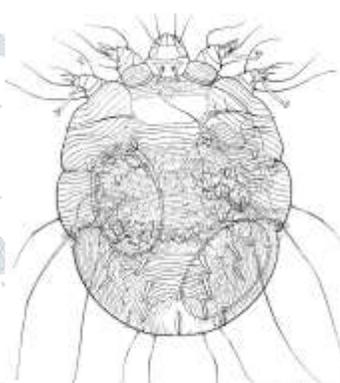
When a mite bites its prey, its entire head is inserted into the wound. They have an anchoring structure below the jaws that holds firmly to the wound. In the mite, this structure is even and regular surface, and the mite is easily brushed off.

The mite usually lays its eggs in the wounds of an animal's skin or on the outside of a plant. The females of some species lay their eggs on plant leaves in loose webs, which they spin with silk produced in glands near their mouths. Mites penetrate the skin and suck the juices from plants by using their piercing mouthparts.

The chigger (or jigger), *Eutrombicula alfreddugesi*; itch mite, *Sarcoptes scabiei*; chicken mite, *Dermanyssus gallinae*; cheese mite, *Acarus siro* and the red spider mite, *Tetranychus telarius* are the commonly found mites. The red spider mite, a garden pest, feeds on plants. The mite rips open leaf cells by using their sharp mouthparts. This damages the leaves and may cause the plant to die. A red spider is about the size of a grain of salt. Since the mite is so small, it is often detected by the damage it causes. There was a major outbreak of this mite, the general upsurge of spider mites following World War II has been due to improved cultural methods or stimulative effects of the pesticides and fertilizers that are cutting away dead branches and stems and promoting increased plant growth and better tetranychid nutrition. Spider mites can cause severe crop losses. They damage protective leaf surfaces, the stomata, and the palisade and spongy parenchyma and they may inject toxic substances into the leaf and interfere with vital processes. The general term for infestations of animals by mites is called acarism, whereas any disease condition caused by mites is acarism (acarism).

A. Human Itch Mite (*Sarcoptes scabiei*)

Phylum: Arthropoda
Class: Arachnida
Order: Acarina
Family: Sarcoptidae
Genus: *Sarcoptes*
Species: *scabiei*



Human scabies mite, *Sarcoptes scabiei* (Sarcoptidae), female, with two developing eggs, dorsal view. From Hirst, 1922

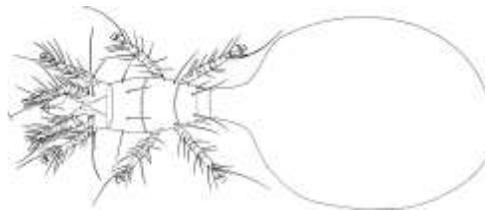
This mite is very small in size, round in shape and whitish in colour. There are wavy parallel lines on the cuticular surface. These mites have bristles or hairs project from their body surface. They consist of four pairs of short and stumpy legs. There are long bristles on the third pair in male and the 3rd and 4th pairs in the female. They have no eyes and tracheae. The male body length is less than 0.25 mm and the female about 0.3-0.4 mm in length. The adults are ectoparasites. The female of this species makes tunnels below the skin all over the body except the head after mating. The female lays eggs in the burrows at the rate of 2 or 3 per day. In a few days, eggs hatch into larvae lacking in 4th pair of legs. The larvae of this mite transform into nymphs in 2-3 days. Within a week nymphs moult twice and become adult male and female mites. The duration of life of an adult is 4 weeks and the entire mite develops within 8-14 days.

The feeding of mites causes intense itching. The itch develops 6-8 weeks after infection. The infection shows its result commonly at night. The main reason for the infection are the male and female mites or an impregnated female from an infected to a healthy individual.

The surface treatment of home remedies used to kill all the mites are not that much effective since the mites and their eggs are situated beneath the skin although they may reduce their numbers. Treatment consists of applying an insecticidal lotion containing benzyl benzoate, malathion or carbaryl. The body of the diseased individual can be treated with a dilute mixture (1 part to 5 parts water) of DDT (6 parts), benzocaine (ethyl p-aminobenzoate) (12 parts), and benzyl benzoate (68 parts). The head part should be avoided. Even more effective in treatment is lindane, applied either as 1 per cent in vanishing cream at the rate of 30-50 g or sprayed on the skin in 1 per cent emulsion. To prevent the spread of disease, the infected individual must be put in quarantine situation.

B. Straw Itch or Harvest Mite (*Pyemotes ventricosus*)

Phylum: Arthropoda
 Class: Arachnida
 Order: Acarina
 Family: Pediculoididae
 Genus : *Pyemotes*
 Species: *ventricosus*



Straw itch mite, *Pyemotes tritici* (Pyemotidae), gravid female, dorsal view. From Gorham, 1991; courtesy of the US Department of Agriculture.

This mite generally attacks on the people who works in crop field. It consumes weevils and moths which represents its predaceous nature. They are microscopic in size. The female is about 1/300 cm long. Which after mating becomes 1/40 cm in length. Eggs are fertilized within the body of female. Adults are born viviparous. The duration of the Life cycle is one week. A single female can produces about 250 adult mites. When an adult mite bites someone. This causes itching, along with fever, vomiting and headache.

This can be controlled by staying away from infested straw and other material. The sulphur dust is used in clothes consists of infested materials and regularly change of work clothes fumigation and heating at 130 F for 6 hours to disinfect the mattresses and other things, use of coating ointments against irritation, etc.

C. Chiggers (*Eutrombicula alfreddugesi*)

Phylum: Arthropoda
 Class: Arachnida
 Order: Acarina
 Family: Trombidiidae
 Genus : *Eutrombicula*
 Species: *alfreddugesi*



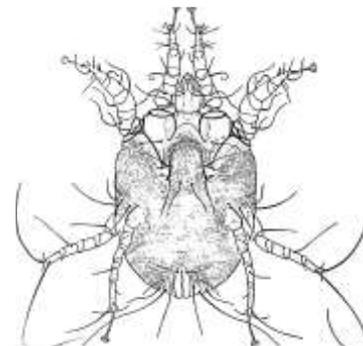
Larval stage (chigger) of the harvest mite, *Neotrombicula autumnalis* (Trombiculidae), of Europe. (A) Dorsal view; (B) scutum (dorsal plate), showing characteristic arrangement of setae. Modified from Baker et al., 1956.

Chiggers are very small, which are not visible easily they are eight-legged, oval shaped mites, which helps them to run with speed. The adult mites are scavengers. The female lays eggs after fertilization. The larvae of this mite is six-legged. Their larvae attacks on human beings. This larvae pierce their mouth parts into the skin of human being and this causes irritation. The larvae attain the nymph stage and adult stage after falling on the ground soil. The Red eruptions that appear on the body. This cause the itching and irritation.

To Prevent and control the infection of this mite, the infested area must be sprayed with lindane at 0.25-0.5 lbs, dieldrin at 0.5-1 lbs, or chlordane or toxaphene at 2-4 lbs per acre; treating clothes with dimethyl phthalate, dibuty phthalate or benzyl benzoate; applying cooling ointments, viz., ammonia or salicylic acid in alcohol with a little olive oil and dusting 5 per cent benzyl on arms and legs and opening of clothing.

D. Sheep Scab Mite (*Psoroptes equiovis*)

Phylum: Arthropoda
 Class: Arachnida
 Order: Acarina
 Family: Sarcoptidae
 Genus: *Psoroptes*
 Species: *equiovis*



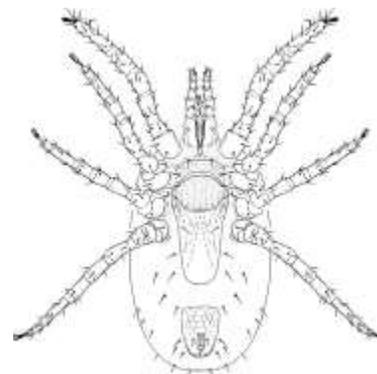
Psoroptes ovis (Psoroptidae), female, ventral view.
 From Baker et al., 1956.

This ectoparasitic mite mainly found on cattle, especially sheep, horses and goats. This mite causes Scabies disease to sheep. This grey coloured mite has sharp, biting and sucking type of mouthparts. The base of hairs is the site where the Eggs are laid in clusters. The egg hatch into six-legged larvae which grow into adults. In scabies, the mite extract the blood from the skin. The blood flows gets hardens over the skin and turn into a scab. The mite feeds below the scab and keeps on feeding resulting into the formation of successive layers of scab. This causes irritation, rubbing of the body by animals and loss of hair by the roots. The animal becomes weak and even dies if not properly cured.

The infested animal are protected by dipping in toxaphene, lindane and nicotine; dipping of animals in lime-sulphur at a dilution of 1 part to 15 parts of water (in case of heavy infestation two dippings are needed at 15 days gap) and quarantine measures.

E. Chicken Mite (*Dermanyssus gallinae*)

Phylum Arthropoda
 Class Arachnida
 Order: Acarina
 Family: Dermanyssidae
 Genus: *Dermanysus*
 Species: *gallinae*



Chicken mite, *Dermanyssus gallinae* (Dermanyssidae), female, ventral view. Modified from Gorham, 1991; courtesy of the US Department of Agriculture.

These mites, also known as poultry mites specifically attacks on bird and rodent or fowl. This mite is cosmopolitan in distribution. They are generally found in walls, floors, ceilings and cracks of houses at day time and during night they feed on the blood of fowls. They are small, grey coloured with sharp piercing type of mouthparts. They continuously feed on the blood of fowls and at the end the fowls become weak, unable to lay eggs and ultimately dies. The eggs hatch into six-legged larvae. After third moulting the larva becomes adult. The life cycle takes about 10 days.

The proper hygiene should be maintained of poultry houses for the Prevention and control of this mite; makes the poultry houses cracks free; spraying 1% malathion at the rate of 1-2 gallons per 1000 sq. ft. in the poultry houses, spraying poultry by 0.5% malathion at the rate of one gallon per 1000 birds and providing ventilation and natural light in the poultry houses.

There are some phytophagous mites like tetranychid mites are used as a arthropod predators represented by the insect groups: Thysanoptera, Anthocoridae, Lygaeidae, Capsidae, Reduviidae, Chrysopidae, Itonididae, Syrphidae, and Coccinellidae; and, among Acarina, principally Phytoseiidae used as a practical biological control some species effective as a predators and they are well established

When Types of problems are considered related to mites in which there is a strange type of problem which is known as acarophobia, an abnormal fear of mites and delusory acariosis, a psychological condition in which individuals are persuaded to do that they are being attacked by mites, when in fact there are no any mites involved.

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