

Myobia

(arachnid: mite)

Overview

Arthropods are coelomate metameric invertebrate animals with a chitinous exoskeleton and jointed limbs. They undergo protostomial embryonic development and grow by cuticular moulting (ecdysis). Three main subphyla are recognized: Chelicerata, Crustacea and Hexapoda. Arachnids have chelicerate mouthparts, two tagmata (cephalothorax and abdomen), four pairs of legs and slit sensilla, but no antennae or wings. All species exhibit incomplete metamorphosis whereby eggs hatch larvae which moult to nymphs and then adults. Acarines comprise the ticks and mites which have sac-like bodies with inconspicuous segmentation and their mouthparts are confined to an anterior gnathosoma. Four major groups are recognized primarily on the location of their respiratory stigmata: ixodid ticks (Metastigmata), gamesid mites (Mesostigmata), trombidiform mites (Prostigmata) and sarcoptiform mites (Astigmata). Ectoparasitic mites inhabit the skin of mammals and birds, feeding on fluids and/or tissues. Most spend their entire lives on individual hosts, so horizontal transmission between hosts is primarily by physical contact. Sarcoptiform mites lack stigmata but respire directly through the cuticle. They have unique legs which lack claws but have terminal sucker-like modifications. They are ectoparasitic on a range of birds and mammals and may cause severe dermatitis (known as mange). Myobiid mites have lateral bulges of the body between their legs which are modified for grasping hairs of fur-bearing mammals. Infestations by *Myobia musculi* may cause dermatitis (myobiic mange) in mice.

Classification:

Domain: Eukaryota (membrane-bound nucleus)
Supergroup: Amorphea (unikonts with single flagellum, or nonflagellated amoebae)
Kingdom: Metazoa (multicellular eukaryotes, heterotrophs, notably animals)
Group: Protostomia (triploblastic, spiral cleavage)
Subgroup: Ecdysozoa (cuticle moulted = ecdysis)
Phylum: Arthropoda (chitinous exoskeleton, segmented body, jointed limbs, haemocoel)
Subphylum: Chelicerata (chelicerate mouthparts, two tagmata, no antennae)
Class: Arachnida (spiders & allies, four pairs of legs, slit sensilla, incomplete metamorphosis)
Subclass: Acari (Acarina) (ticks and mites, segmentation inconspicuous, sac-like body, mouthparts on gnathosoma)
Superorder: Acariformes (diverse group of mites, without posterior stigmata)
Order: Prostigmata [Trombidiformes] (sucking mites, stigmata on gnathosoma)
Suborder: Eleutherengona (thumb-claw process, tube-like midgut, females with adjacent anal-genital openings)
Superfamily: Myobioidea (anal-genital openings dorsal, first pair legs modified for attachment)
Family: Myobiidae (parasitic on fur-bearing mammals, esp. bats, body with lateral bulges)
Genus: *Myobia* (parasitic on skin/hair of mice)
Species: *M. musculi* causes myobiic mange in mice

Parasite biodiversity and host range: Most Metazoa are multicellular triploblastic animals with differentiated tissues, many being bilaterally symmetrical with a body cavity. Most invertebrate animals are protostomes as their embryonic development involves spiral determinate cleavage. Those that moult their external cuticles during their life-cycles (process known as ecdysis) are grouped together in the unique clade Ecdysozoa, including the nematodes (roundworms), onychophorans (velvet worms), tardigrades (water bears) and arthropods (myriapods, chelicerates, crustaceans and hexapods). Arthropods have small segmented bodies encased in chitinous exoskeletons with articulated limbs. Most species are free-living in terrestrial and aquatic habitats, although a small range are ectoparasitic on other animals, some feeding on the blood or skin of vertebrates. Five subphyla are recognized: Chelicerata, Crustacea, Hexapoda, Myriapoda and Trilobita. The chelicerates typically have appendages (cheliceræ) in the form of pincers or fangs anterior to the mouthparts, 2 body parts (cephalothorax and abdomen), but no antennae or wings. Three classes are recognized: Arachnida (spiders and allies), Merostomata (horseshoe crabs) and Pycnogonida (sea spiders). Arachnids have 8 legs, slit sensilla and life-cycles involving incomplete metamorphosis whereby larvae and nymphs resemble adults. They are classified in 4 orders: Acari (acarines), Araneae (spiders), Opiliones (harvestmen) and Scorpiones (scorpions). The Acari comprises the ticks and mites which have saccular bodies and mouthparts confined to an anterior gnathosoma. Four major groups are recognized primarily on the location of their respiratory stigmata (called spiracles in insects): ixodid ticks (posterior Metastigmata), gamesid mites (middle Mesostigmata), trombidiform mites (anterior Prostigmata) and sarcoptiform mites (without stigmata = Astigmata).

Major parasitic families	Biodiversity	Hosts	Parasitic stages	Pathogenesis	Disease transmission
Superorder: Parasitiformes (ticks and some mites, with posterior stigmata)					
Order: Ixodida [Metastigmata] (ticks, macroscopic, stigmata posterior to legs) [3 families]					
Argasidae (soft ticks)	5 genera, 193 species	birds, mammals	larvae, nymphs, adults	blood-sucking	viral, bacterial
Ixodidae (hard ticks)	14 genera, 705 species	birds, mammals	larvae, nymphs, adults	blood-sucking, paralysis	viral, bacterial, protozoal
Order: Mesostigmata [Gamasida] (gamesid mites, stigmata between 2 nd & 4 th legs) [100 families, 662 genera, 5,360 species]					
Macronyssidae (sucking mites)	26 genera, 127 species	birds, reptiles, mammals	nymphs, adults	blood-sucking	bacterial
Dermanyssidae (sucking mites)	5 genera, 37 species	birds, mammals	nymphs, adults	blood-sucking	viral, bacterial
Halarachnidae (lung/ear mites)	7 genera, 10 species	mammals	nymphs, adults	mucosal erosion	-
Raillietidae (ear mites)	1 genus, 7 species	mammals	nymphs, adults	ear wax	-
Rhinonyssidae (nasal mites)	30 genera, 160 species	birds	nymphs, adults	inflammation	-
Varroidae (bee mites)	1 genus, 5 species	bees	nymphs, adults	haemolymph-feeding	viral
Superorder: Acariformes (diverse group of mites, without posterior stigmata) [351 families, 32,000 species]					
Order: Prostigmata [Trombidiformes, Actinedida] (sucking mites, stigmata on gnathosoma) [121 families, 17,000 species]					
Demodecidae (follicle mites)	7 genera, 65 species	mammals	larvae, nymphs, adults	inflammation	-
Cheyletidae (fur mites)	80 genera, 500 species	mammals (dogs, cats, rabbits), birds	larvae, nymphs, adults	pruritus	-
Myobiidae (fur mites)	46 genera, 185 species	mammals (rodents, bats, marsupials)	larvae, nymphs, adults	mange	-
Psorergatidae (itch mites)	3 genera, 77 species	mammals (rodents, artiodactyls)	larvae, nymphs, adults	mange	-
Trombiculidae (chigger mites)	71 genera, 3,000 species	mammals, birds	larvae	skin-feeding	bacterial
Order: Astigmata [Sarcoptiformes, Acaridida] (fur/feather/itch/dust mites, lacking stigmata) [230 families, 15,000 species]					
Sarcoptidae (itch mites)	3 genera, 42 spp./ssp.	mammals	larvae, nymphs, adults	scabies, mange	-
Psoroptidae (scab mites)	20 genera, species	mammals (carnivores, ungulates)	larvae, nymphs, adults	mange	-
Listrophoridae (fur mites)	20 genera, 170 species	mammals (esp. rodents)	larvae, nymphs, adults	mange	-
Myocoptidae (fur mites)	10 genera, 70 species	mammals (esp. rodents)	larvae, nymphs, adults	myocoptic mange	-
Cytoditidae (airsac/nasal mites)	2 genera, 12 species	birds	larvae, nymphs, adults	respiratory signs	-
Knemidokoptidae (burrowing mites)	7 genera, 16 species	birds	larvae, nymphs, adults	scaly face, scaly leg	-
Laminosioptidae (quill/skin mites)	8 genera, 25 species	birds	larvae, nymphs, adults	flesh/skin lesions	-

The superorder Acariformes comprises acarines without posterior respiratory stigmata and includes two major orders of parasites: trombidiform mites (order Prostigmata) with stigmata on the gnathosoma (capitulum) or propodosoma; and sarcoptiform mites (order Astigmata) which lack stigmata and peritremes and respire through their cuticles. Over 16,000 species of prostigmatid mites have been described: many species being free-living (including most trombiculids although some have parasitic larvae); and others being obligate ectoparasites on mammals or birds. Parasitic species spend their entire lives on individual hosts, so horizontal transmission between hosts is primarily by physical contact. Prostigmatid mites are characterized by having oval-ellipsoidal bodies (sometimes vermiform) with distinctive setation, piercing chelicerae (sometimes pincer-like), unbarbed hypostomes, well-developed palps, and short legs with coxae fused to the body wall and terminal tarsi with 1-2 claws (but lacking complex pulvilli). A total of 34 superfamilies have been recognized in 4 suborders: Anystina (with 17 superfamilies); Eleutherengona (10); Endeostigmata (3); and Eupodina (4). Many members of the suborders Anystina and Eleutherengona have legs with distinctive arrangements of the terminal tibiotarsal segments referred to as the 'thumb-claw' process. Eleutherengone mites have simple tube-like postventricular midguts, small salivary glands (if present), females with anal and genital openings located close together posteriorly, and males with few

glandular components of their testicular epithelia and accessory glands. Ten superfamilies are recognized (Cheyletoidea, Eriophyoidea, Pomerantzioidea, Pterygosomatoidea, Pyemotoidea, Pygmephoridea, Raphignathoidea, Tarsocheyloidea, Tarsonemoidea, Tetranychoida)

The superfamily Cheyletoidea comprises free-living predators, nidicolous forms and highly specialized ecto- or endo-parasites. Adult mites have chelicerae with basal segments fused into a single unit (stylophore), movable segments that are stylet-shaped, and the female anal and genital openings are located ventrally. A total of 8 families are recognized (Cheyletidae, Cloacaridae, Demodicidae, Harpyrhynchidae, Myobiidae, Ophioptidae, Psorergatidae, Syringophilidae), but some recent studies have transferred the Myobiidae to a new superfamily Myobioidea on the basis of molecular studies and observations that the female anal and genital openings are dorsal, and the first pair of legs are highly modified for attachment. The family Myobiidae is further characterized by mites with oval-elongate bodies with sparse non-feathery setae and some legs modified for grasping host hairs using claws. Some 46 genera have been recognized (*Acanthophthirus*, *Acrobatobia*, *Amorphacarus*, *Anuncomyobia*, *Australomyobia*, *Binunculoidea*, *Binuncus*, *Blarinobia*, *Calcarmyobia*, *Chimarrogalobia*, *Crocidurobia*, *Cryptomyobia*, *Eadiea*, *Eudusbabekia*, *Eutalpacarus*, *Ewingana*, *Foliomyobia*, *Furipterobia*, *Gundimyobia*, *Gymnomyobia*, *Hipposiderobia*, *Idiurobia*, *Ioannela*, *Limnagalobia*, *Madamyobia*, *Metabinuncus*, *Microgalobia*, *Myobia*, *Mystacobia*, *Myzopodobia*, *Natalimyobia*, *Nectogalobia*, *Neomyobia*, *Nycterimyobia*, *Oryzorictobia*, *Phyllostomyobia*, *Placomyobia*, *Proradfordia*, *Protomyobia*, *Pteracarus*, *Pteropimyobia*, *Radfordia*, *Schizomyobia*, *Thyromyobia*, *Ugandobia*, and *Xenomyobia*), most occurring as ectoparasites on the fur of mammals, especially bats and rodents. Some 16 species have been described in the genus *Myobia*, with most allocated to 3 subgenera, *M.* (*Myobia*), *M.* (*Angomyobia*) and *M.* (*Otomyobia*). They occur as ectoparasites living in the fur of rodents, although the species *M. murismusculi* (often incorrectly referred to as *M. musculi*) has also been found on dogs, cats and humans.

Myobia species	Hosts	Clinical signs	Distribution
<i>M. afromuris</i>	Rodentia: murid (Jackson's soft-furred mouse)		Africa
<i>M. (Myobia) agraria</i>	Rodentia: murid (striped field mouse)		Eurasia
<i>M. (Myobia) annae</i>	Rodentia: murid (eastern broad-toothed field mouse)		Eurasia
<i>M. apodemi</i>	Rodentia: murid (small Japanese field mouse)		Asia
<i>M. apomys</i>	Rodentia: murid (Mindanao lowland forest mouse)		Asia
<i>M. (Myobia) hyatti</i>	Rodentia: murid (Asiatic long-tailed climbing mouse)		Asia
<i>M. kobayashii</i>	Rodentia: murid (Korean field mouse)		Asia
<i>M. (Angomyobia) machadoi</i>	Rodentia: murid (typical striped grass mouse)		Africa
<i>M. (Myobia) malaysiensis</i>	Rodentia: murid (Indomalayan pencil-tailed tree mouse)		Asia
<i>M. micromydis</i>	Rodentia: murid (Eurasian harvest mouse)		Eurasia
<i>M. multivaga</i>	Rodentia: murid (house mouse, wood mouse, Ural field mouse, Black Sea field mouse, Steppe field mouse, yellow-necked mouse)		Europe
<i>M. murismusculi</i> (syn. <i>M. musculi</i> , <i>muris?</i> , <i>coarctata?</i>)	Rodentia: murid (house mouse, wood mouse, Ural field mouse, Black Sea field mouse, Steppe field mouse, yellow-necked mouse, brown rat), cricetid (western harvest mouse, Pinyon mouse); Carnivora: canid (dog), felid (cat); Primates: hominid (human)	myobiic mange, pruritus, inflammation, alopecia	worldwide
<i>M. nodae</i>	Rodentia: murid (large Japanese field mouse)		Asia
<i>M. (Otomyobia) otomyia</i>	Rodentia: murid (southern African vlei rat)		Africa
<i>M. (Angomyobia) pelomys</i>	Rodentia: murid (Creek groove-toothed swamp rat)		Africa
<i>M. stewardi</i>	Rodentia: murid (black rat)		Asia

Many other species previously thought to belong to the genus *Myobia* have been re-assigned to other genera, including: *M. affinis* = *Radfordia*; *M. blairi* = *Crocidurobia*; *M. brevihamata* = *Eadiea*; *M. canadensis* = *Acanthophthirus caudata*; *M. capensis* = *Acanthophthirus*; *M. caudata* = *Neomyobia*; *M. chalinolobus* = *Pteracarus*; *M. chiropteralis* = *Foliomyobia*; *M. claperedi* = *Protomyobia*; *M. clara* = *Acanthophthirus*; *M. davisii* = *Radfordia*; *M. elongata* = *Amorphacarus*; *M. ensifera* = *Radfordia*; *M. ewingi* = *Radfordia*; *M. heteronycha* = *Hipposiderobia*; *M. ingens* = *Crocidurobia*; *M. jacksoni* = *Neomyobia*; *M. lancearia* = *Radfordia*; *M. longa* = *Ewingana*; *M. longirostris* = *Fischeria bicolor*; *M. magna* = *Binuncus*; *M. michaeli* = *Crocidurobia*; *M. minima* = *Acanthophthirus*; *M. miniopteris* = *Acanthophthirus minimus*; *M. minuta* = *Pteracarus*; *M. mystacinalis* = *Acanthophthirus*; *M. noctulia* = *Radfordia*; *M. oudemansi* = *Radfordia*; *M. pantopus* = *Acanthophthirus*; *M. phillipsi* = *Radfordia*; *M. pipistrellia* = *Pteracarus*; *M. plecotius* = *Acanthophthirus*; *M. poppei* = *Acanthophthirus*; *M. ratti* = *Radfordia ensifera*; *M. rhinolophia* = *Binuncus*; *M. rollinatti* = *Neomyobia*; *M. rotundata* = *Cryptomyobia*; *M. simplex* = *Blarinobia*; *M. trouessarti* = *Afromyobia*; and *M. zibethicalis* = *Radfordia*.

Parasite morphology: *Myobia* spp. form 4 different types of morphological developmental stages: namely, eggs, larvae (1-2 instars), nymphs (2-3 instars), and adults (males and females). Eggs are pale oval stages around 200 µm long and attached to the bases of host hairs. Larvae are small ovate stages ranging in length from 200-300 µm. They are hexapodal with 3 pairs of legs comprising an anterior pair of short pincer-like forelegs and then 2 lateral pairs of longer jointed legs (tarsi II with claws, tarsi III without). The larvae have distinctive chaetotaxy (patterns of setation) with the gnathosoma (head) bearing a pair of dorsal setae, and the idiosoma (body) having 12 pairs of dorsal setae and a single pair of ventral setae. Some early descriptions of parasite development reported that a second larval instar occurred in some species, but few details are available. Nymphs are larger ellipsoidal stages that are octopodal with 4 pairs of legs (short anterior forelegs and longer lateral hindlegs). Most descriptions indicate that 2 nymphal instars are formed (protonymphs and deutonymphs) although a few studies have reported a third instar (tritonymphs) for some species. Nymphs increased progressively in size from 250 µm up to a maximum of 500 µm in length. Protonymphs and deutonymphs had setate legs (including small microchaetae), a single scale-like seta on coxae I, ventral setae on the gnathosoma, and claws on tarsi II-III. Tritonymphs had more leg setae, 2 scale-like setae on coxae I, claws on tarsi II-IV and lacked anal setae. Adult mites had irregular oval bodies, often elongate with distinct lateral bulges between their legs. They were translucent in appearance and the integument had small elaborate transverse striations. Adults varied in size depending on species and gender, with females ranging in length from 400–500 µm compared to males which measured from 285–320 µm. The anterior gnathosoma was small and simple, bearing small mouthparts comprising paired stylet-like chelicerae flanked by sensory palps. The palps were minute and lacked terminal claws (apoteles). The chelicerae had 3 segments with the basal segments fused into a single unit (stylophore) and the other movable segments being stylet-shaped. The oral opening (mouth) was bounded by a dorsal rostrum, ventral buccal cone and central unbarbed hypostome. The alimentary tract consisted of a tubular foregut (oesophagus, pharynx), saccular midgut (ventriculus with caeca), tubular hindgut (with excretory Malpighian tubules) and a cuticle-lined rectum leading to a dorsal anus flanked by a long pair of setae (up to 40 µm long). The idiosoma had characteristic bulges between legs II-IV and the dorsal surface had sparse but stout bristle-like setae of various shapes, sometimes expanded, spine-like, striated, or barbed (but not feathery). The ventral idiosoma was the point of attachment for 4 pairs of legs, but the first pair was short and pincer-like being highly modified for grasping hairs (often giving the impression that the mites only had 3 pairs of legs). The first pair of legs projected forwards and only had 3 movable segments, with the tibia and tarsus completely fused, and the genu partly fused with the tibiotarsus. The forelegs lacked claws, but terminated in strongly laterally-curved hooks. The remaining walking legs had 6 segments (coxa, trochanter, femur, genu, tibia, and tarsus), and all ended in a single tarsal empodial claw (whereas tarsi II in the genus *Radfordia* terminated in paired claws). The coxae were fused to the body wall, and all legs were setate, with the first pair of legs bearing specialized sensory solenidia. Like other prostigmatid mites, adults possessed lateral respiratory openings (stigmata) near the bases of the chelicerae. Male mites had paired testes with tubular vas deferens leading to the ejaculatory duct and the long straight sheathed aedeagus (penis). The genital opening (gonopore) was dorsal and subterminal with a chitinized cone-like genital plate bearing 3 pairs of apical setae. Female mites had a single ovary with a long complex oviduct leading to the uterus and cuticular vagina with a receptaculum seminis (for sperm receipt). Vitellogenic oocytes develop in ovarian pouches (like other trombidiform mites) and the oviduct was tripartite (2 proximal portions producing egg-shell components, and a distal portion never containing oocytes but thought to produce special glue-like secretions). The female anal and genital openings are both located dorsally (unusual for mites), and the vulva had well-developed lobes.

Site of infection: These fur mites are found worldwide clasping to the hairs of mice, and rarely other rodents. They are usually host-specific and some 16 species have been described, mostly from murids and some cricetids, although one species (*M. murismusculi*) has also been found on dogs, cats and humans. Mites are generally found on the head, neck and shoulders of their hosts.

Pathogenesis: Many infestations are light and remain asymptomatic or subclinical, but heavier infestations can lead to dermatitis and alopecia, exacerbated in hypersensitive individuals. Developing and mature mites feed on dermal tissue fluids (cellular interstitial fluids), and sometimes blood from superficial capillaries, but they do not invade or burrow into the skin. Host responses vary greatly depending on the age, sex, strain and immunological status of the mice. Most animals do not develop clinical signs unless they are stressed, immunocompromised or have become sensitized to mite antigens. Infestations can then lead to dermatitis, pruritus, harsh fur or alopecia, with epidermal excoriations worsened by allergic reactions. Sensitized hosts often engage in vigorous scratching to relieve biting-stress which can result in self-trauma with ulcerative dermatitis secondary to bacterial infections. Severely affected mice may show self-mutilation damage to the ears and eyes, and in some cases death. Infestations can be problematic in laboratory animal colonies where most mice become infested and disease become rampant in genetically-modified mice strains. Persistent infestations may also affect the general health of the colony by contributing to physiological alterations, immune perturbations, chronic inflammation, fibrosis, hyperkeratosis, reduced body weights, decreased fertility and shorter life-spans.

Developmental cycle and mode of transmission: *Myobia* mites undergo incomplete (hemimetabolous) metamorphosis wherein eggs hatch larvae that moult to nymphs and then adults. The whole life-cycle may be completed on the same host and transmission between hosts occurs by close contact and/or contamination of fomites. Gravid females lay eggs singly, gluing them to the bases of hair shafts (whereas *Myocoptes* spp. attach them distally). The eggs hatch in 7–8 days releasing hexapod larvae which feed over 4–10 days before moulting to the first octopod nymphal instar (protonymphs). The nymphs feed and develop through further nymphal

instars over 5 days, all species forming second nymphal instars (deutonymphs) and some species forming a third nymphal instar (tritonymphs). The final nymphal instar moults to form adult male and female mites which feed and mate on their hosts. Female mites may produce fertile eggs within 24 hours of mating but little is known about the fecundity or longevity of the mites. Under experimental conditions, the whole life-cycle has been completed in 12-23 days. Transmission occurs through direct physical contact when mites crawl from one host to another, particularly when they are in close quarters when nursing, huddling or sleeping. Mouse pups may become infested 4-5 days after birth shortly after they begin to grow hair. Adult mites have also been found to leave dead mice as the carcass cools, and it is possible that some animals may become infested when in contact with contaminated fomites, such as bedding and nesting materials. However, little is known about the environmental survival capabilities of the different mite developmental stages when dislodged from hosts. Adult *M. murismusculi* appear to be readily transferred to other hosts in close contact (such as cats, dogs and humans).

Differential diagnosis: Infestations are difficult to diagnose on the basis of symptomatology as most clinical signs (dermatitis, alopecia) only develop in immunocompromised hosts and may be attributable to other aetiological agents or disease conditions. Diagnosis is afforded by the microscopic detection of mites in skin scrapings, hair plucks (trichograms) or adhesive tape impression. Mites are often found in skin scrapings from the edges of lesions or in flakes or crusts that have been subject to caustic digestion (usually 10% potassium hydroxide) to break down skin (the mite's cuticle is impervious to digestion). Mites and mite eggs may be detected amongst hairs plucked from the edges of lesions or on sticky tape applied against the grain of fur. Mites may also be detected at postmortem by placing carcasses/pelts to cool on dark paper so that mites vacating the host may be visible as white specks. Several molecular biological techniques have recently been developed to diagnose infestations and characterize mite species by polymerase chain reaction (PCR) amplification of nuclear gene sequences (18S, 5.8S and 28S ribosomal RNA, internal transcribed spacers 1 and 2).

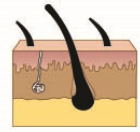
Treatment and control: Clinical infestations may be treated using chemical acaricides as topical or systemic formulations, including organophosphates (dichlorvos) and macrocyclic lactones (ivermectin, selamectin), although some drug resistance has been noted to ivermectin. Acaricides work well against all feeding stages (larvae, nymphs, adults) but less so against mite eggs encased in tough eggshells. Treatments are therefore often repeated at intervals to prevent re-infestations by newly-hatched stages. Various preventive measures may be adopted to break transmission cycles through regular health monitoring (as a prelude to treatment, isolation/quarantine, or culling), improved sanitation and hygiene (clean cages/fomites, replace bedding, apply residual acaricides (pyrethroids) to porous fixtures and litter) and animal management (cohort separation, especially nursing rodent pups, exclude wild rodents using barriers (screens) or other vermin control strategies).

Myobia

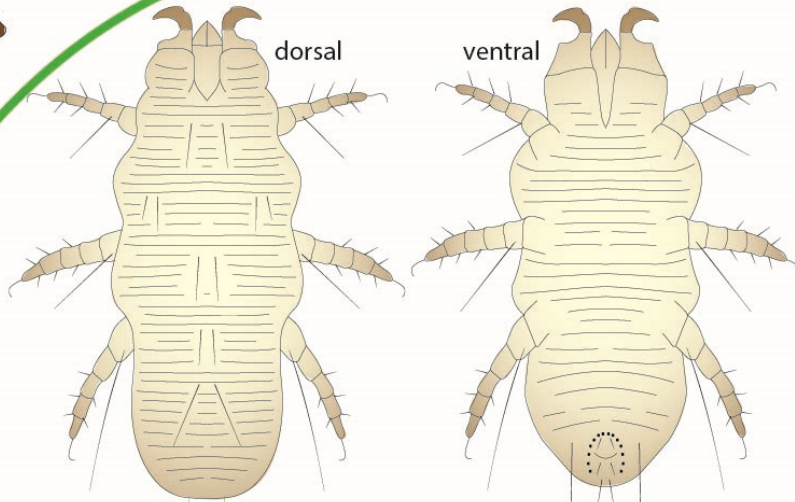
transmission between hosts by close contact
and possibly by contaminated fomites



Hosts
(rodents)



skin
(dermatitis,
alopecia,
'mange')

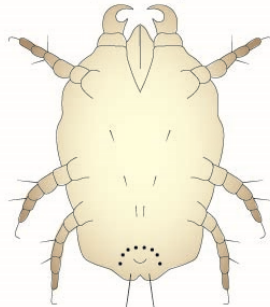


dorsal

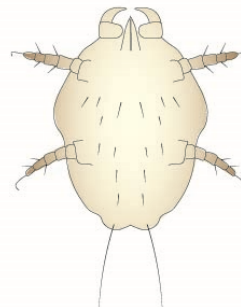
ventral

adult female
(~ 500 μm)

first pair of legs
pincer-like for
grasping hairs

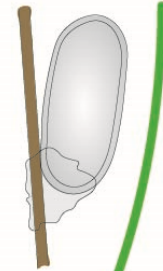


nymph
(ventral)
(~ 400 μm)



larva
(ventral)
(~ 300 μm)

eggs attached
to pelage



egg
(~ 200 μm)

hatch

2-3 nymphal instars
(proto-, deuto- & some
trito-nymphs)

all motile stages are ectoparasitic
(feed on dermal interstitial fluids)



Myobia adult