

Otodectes
(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). Psoroptids are non-burrowing mites with oval bodies and the last two pairs of legs project beyond the body margin. Infestations by *Otodectes* spp. in the ear canals of carnivores (cats, dogs, foxes, ferrets) may cause intense irritation and otitis.

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: Astigmata [Sarcoptiformes] (mange mites, without stigmata, legs separated, with suckers)
Superfamily: Sarcoptoidea (mites associated with mammals, ecto- or endo-parasitic)
Family: Psoroptidae (non-burrowing mites, oval bodies, third and fourth pairs of legs project beyond body margin)
Genus: *Otodectes* (parasitic in ears of cats/dogs/foxes/ferrets)
Species: various species cause otitis in carnivores

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	-
Raillietiidae (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 astigmatid mites have been described in 230 families: with around 12,000 species in 154 families being free-living or predatory in terrestrial or aquatic environments (including a large assemblage of soil-dwelling oribatid mites); and some 4,000 species in 76 families occurring as commensals or parasites of arthropods and vertebrates (notably birds and mammals). Parasitic species may be ectoparasitic (on external surfaces of the host) or endoparasitic (within host epidermal or respiratory tissues) and their development often only includes 2 nymphal stages (in contrast to 3 nymphal stages in free-living species, sometimes including a specialized heteromorphic deutonymph (hypopus) adapted for phoretic dispersal or tolerance of adverse conditions). Common names for many of the parasitic groups include mange, itch, or scab mites as they may cause serious inflammatory skin conditions in their hosts.

Adult mites tend to be small, slow moving, whitish stages with soft cuticles and round-oval bodies (never vermiform) often with long setae. They possess chelate or dentate chelicerae, unbarbed hypostomes, small inconspicuous palps, legs with coxae fused to the body wall and tarsal segments bearing complex pulvilli (pad-like or trumpet-like) and empodia (claw-like or sucker-like, but never bearing tenet hairs). Most parasitic species may complete their entire life-cycles on individual hosts, so horizontal transmission between hosts is primarily by physical contact. A total of 10 astigmatid superfamilies have been recognized (Acaroidea, Analgoidea, Canestrinioidea, Freyanoidea, Glyciphagoidea, Hemisarcoptoidea, Histiostomatoidea, Hypoderatoidea, Pterolichoidea, Sarcoptoidea) and an additional 2 families are currently unplaced (Cytoditidae, Heterosporidae).

Early classification schemes identified different assemblages principally on the basis of host and site specificity; including bird-associated feather mites (e.g. Analgoidea); bird-associated skin mites (e.g. Knemidokoptidae), mammal-associated fur mites (e.g. Listrophoridae), mammal-associated skin mites (e.g. Psoroptidae); and mammal-associated skin-burrowing mites (e.g. Sarcoptoidea). However, phylogenetic studies (both cladistic and molecular) have revealed that many groups are not monophyletic but para- or poly-phyletic, so further studies are required to resolve the fidelity of most groups. Recently, molecular studies suggested that 16 sarcoptoidean families may belong to 2 main lineages: 13 families identified in a 'sarcoptid' complex (Atopomelidae, Audycoptidae, Chirodiscidae, Chirorhynchobiidae, Galalgidae, Gastronyssidae, Lemurnyssidae, Listrophoridae, Listropsoralgidae, Myocoptidae, Pneumocoptidae, Rhyncoptidae, Sarcoptidae), and 3 families in a 'psoroptid' complex (Lobalgidae, Paracoroptidae, Psoroptidae). Nevertheless, most families can still be categorized into 4 broad 'morphocotypes': namely; fur mites (Atopomelidae, Chirodiscidae, Listrophoridae, Lobalgidae), skin mites (Chirorhynchobiidae, Myocoptidae, Psoroptidae), skin-burrowing and follicle mites (Rhyncoptidae, Sarcoptidae), and respiratory mites (Gastronyssidae, Lemurnyssidae, Pneumocoptidae). The family Psoroptidae contains non-burrowing skin mites with oval bodies and 4 pairs of legs projecting well beyond the body margin. They are obligate mammalian ectoparasites commonly known as scab mites as their feeding activity causes dermatitis resulting in scab formation at the bite site. A total of 17 genera have been identified (*Acaroptes*, *Caparinia*, *Cheiroalges*, *Choriopsoroptes*, *Chorioptes*, *Choriotodectes*, *Echimyalges*, *Hyracoptes*, *Listropsoralges*, *Listropsoralgoides*, *Myoproctalgae*, *Nasalialgae*, *Otodectes*, *Paracoroptes*, *Petauralges*, *Psorochoirioptes*, and *Psoroptes*). The genus *Otodectes* was previously thought to contain numerous species that colonized separate mammalian hosts, but molecular characterization studies have indicated that mites from different hosts may be the same species (or at most, strains of the same species). The genus is now considered to be monotypic with the single species (*O. cynotis*) being recognized as a common ear mite of carnivores (both companion animals and wildlife). The mites have oval bodies with distinctive chaetotaxy (setation) and leg anatomy (2 anterior pairs with short stalked pretarsi, 2 posterior pairs with terminal whip-like setae). Infestations have been associated with otoacariasis (ear mange or otodectic mange) usually manifest as otitis externa (inflammation of the outer ear and ear canal) but sometimes causing lesions on the face and body of companion animals.

<i>Otodectes</i> species	Hosts	Location	Clinical signs	Distribution
<i>O. cynotis</i> (syn. <i>O. furonis</i>) (ear mite, ear canker mite)	Carnivora: canid (dog, timber wolf, coyote, golden jackal, red fox, Arctic fox, pampas fox, crab-eating fox), felid (cat, ocelot, Eurasian lynx), mustelid (European polecat, American mink, American marten, North American river otter, short-tailed weasel, wolverine), procyonid (common raccoon, South American coati), ursid (American black bear); Lagomorpha: leporid (rabbit); Artiodactyla: cervid (white-tailed deer); Primates: hominid (human)	skin (external ear canal, head)	irritation, pruritus, otitis, dark waxy exudates, emaciation	worldwide

Parasite morphology: *Otodectes* form 4 different types of morphological stages during their development: namely, eggs; larvae; nymphs (2 instars); and adults. The eggs are elliptical to oblong stages measuring from 160-210 µm in length and they are slightly flattened along one side. They are pearly-white in colour and attached to the skin surface by a sticky cement. They hatch by splitting longitudinally releasing hexapod larvae with pale-grey oval bodies measuring 135-225 µm in length. Their legs are located ventrally and arranged in 3 pairs: 2 anterior pairs of long legs each ending in a cup-shaped sucker, and a posterior pair of shorter legs each ending in 2 long setae. They are covered by a finely-striated integument except for a sclerotized triangular propodosomal plate. Larvae moult to form octopod nymphs which have developed a fourth pair of very short inconspicuous legs located posteriorly and not extending beyond the body margin. Two nymphal stages are formed: firstly, protonymphs measuring 180-300 µm long and with more setae than larvae; and then deutonymphs measuring 225-355 µm long and possessing a pair of postero-dorsal attachment suckers. Deutonymphs then moult to form adult mites which have oval-rounded white bodies that are dorsally compressed measuring 0.3-0.5 mm long. Adults have weakly sclerotized cuticles divided into 2 main tagma: a small anterior gnathosoma and a large posterior idiosoma. The gnathosoma does not possess antennae but has well developed mouthparts consisting of segmented chelicerae (blunt in males, sharp in females) flanked by small sensory 2-segmented palps without terminal claws. The oral opening has a dorsal rostrum, a ventral buccal cone and a central unbarbed hypostome. The alimentary tract consists of a tubular foregut (oesophagus, pharynx), a saccular midgut (ventriculus with caeca) and a tubular hindgut (with excretory Malpighian tubules) leading to the subterminal anus. The idiosoma lacks dorsal shields and spines but has several long setae usually protruding beyond

the body margin. Ear mites respire directly through the tegument and lack stigmata and tracheae (like all members of the order Astigmata). The ventral idiosoma gives rise to 4 pairs of legs that are well developed and protrude beyond the body margin (except for the fourth pair in females). Each leg consists of 6 segments (coxa, trochanter, femur, genu, tibia, and tarsus) with the coxae fused to the body wall and the first 2 pairs of legs having thickened epimeres (apodemes) that are joined. The first 2 pairs of legs are located anteriorly projecting forwards and are long and stout, while the hind 2 pairs are located posteriorly and project backwards and are somewhat smaller (the last pair being tiny especially on females). All legs on males and the first 2 pairs of legs on females have short stalked pretarsi with an unsegmented ambulacrum (not jointed like *Psoroptes*) consisting of a short pedicel ending in cup-shaped empodial suckers (not trumpet-shaped like *Psoroptes*). The last 2 pairs of legs on females each end in 2 whip-like setae, and the third pair of legs on males also bears 2 long setae in addition to its ambulacrum. The first 3 pairs of legs on males and the first 2 pairs on females also have small hooked tarsal claws. The sexual dimorphism between adult mites also extends to body size (males smaller than females, 0.27-0.36 v. 0.35-0.5 mm long) and their genitalia. Adult males have 2 postero-ventral copulatory adanal suckers (each with 5 hair-like setae) used for attachment during copulation (suckers engage with copulatory tubercles of female deutonymph). Males have 2 testes with tubular vas deferens leading to an ejaculatory duct, long sheathed aedeagus (penis) and subterminal genital pore. The posterior end of *Otodectes* males is only slightly excavated medially with simple setae (whereas that of *Chorioptes* males is deeply incised medially forming 2 distinct lobes bearing foliate setae). Adult females are ovigerous (egg bearing) and have 2 ovaries with tubular oviducts leading to a common uterus (with muscular shell-glands), vagina (with bursa copulatrix and spermathecae accessory organs for sperm receipt and storage) and a ventral vulva opening as a transverse slit with trailing genital apodemes (but no suckers).

Site of infection: These mites are obligate ectoparasites mostly in the ear canals of carnivorous mammals, including domestic pets, farmed fur-bearing animals and wildlife (canids, felids, mustelids, procyonids, ursids) and occasionally lagomorphs, cervids and humans. Several species were originally described from different animals, but molecular characterization studies have shown them all to belong to the single species *O. cynotis*. The mites are non-burrowing and parasitize the external surface of the skin in the external ear canal (auditory meatus), but they may sometimes spread to other body parts in heavy infestations, moving to the head, neck, rump and tail on animals and the arms and torso on humans.

Pathogenesis: Infestations by these ear mites are often only mildly pathogenic, but they can lead to a severe inflammatory disease of the outer ear and ear canal (otitis externa), known variously as otoacariasis, ear canker, ear mange or otodectic mange. All motile mite stages are parasitic and feed on the skin surface on epidermal debris and probably host tissue fluids. There is considerable variation in the host responses to the presence of mites but the release of mite antigens (saliva and faeces) can provoke severe inflammation and probably hypersensitivity reactions in some animals. Hosts experience aural irritation with intense pruritus (itching) and inflammation (otitis) with the 4 cardinal signs of calor (warmth), rubor (redness), tumor (swelling) and dolor (pain) causing otitis externa. Irritation causes the epithelium to become hyperkeratotic and sheets of dry scaly material may slough off filling the ear canal with wax, blood and mite debris evident as thick brown-grey waxy exudates. Heavy infestations may result in the formation of reddish-brown crusts and/or scabs on inner surface of the ear covering feeding mites next to skin. Animals attempt to relieve the irritation and clear the ears with frequent and vigorous head shaking, scratching and rubbing, often resulting in self-mutilation with excoriation of the pinnae, aural haematoma formation, scabbing and alopecia (hair loss). Inflamed waxy ears are prone to secondary bacterial or fungal infection causing purulent otitis externa, or vestibular signs including torticollis which may cause otitis media. In heavy infestations, lesions may not be restricted to the external ear canal but may be found more widely over the body as mites roam. Extra-aural infestations may sometimes cause pruritic dermatitis with scabby lesions and hair loss over parts of the head, neck, base of the tail and paws, often exacerbated by self-trauma. Young animals (especially puppies and kittens) are more susceptible to infestation than older animals, which suggests that hosts may acquire some immunity against mite proteins. Cats vary in their responses to mites, many seemingly able to tolerate moderate numbers without clinical signs, but some individuals develop marked inflammation with copious aural exudative discharges. Dogs may also tolerate moderate mite burdens and generally display mild otitis externa with minimal discharges. Humans exposed to infestations may develop uncomfortable pruritic vesicular rashes, papules or wheals on exposed body regions. Immunological studies have shown some antigenic cross-reactivity between ear mites (*O. cynotis*) and house dust mites (*Dermatophagoides*) associated with allergies, atopic dermatitis, asthma and anaphylaxis, suggesting some cross-sensitization may occur.

Developmental cycle and mode of transmission: Ear mites exhibit hemimetabolous (incomplete) metamorphosis whereby eggs hatch larvae which moult to nymphs and then adults. The whole life-cycle may occur on the same host, and transmission between hosts occurs via direct contact. Gravid female mites lay eggs one at a time attaching them to the ear canal lining using a sticky cement. The eggs hatch after 2-6 days (longer at cooler temperatures) releasing hexapod larvae which feed actively for 3-10 days followed by a short quiescent resting period (10-30 hours) before they moult to octopod nymphs. The first nymphal instars (protonymphs) feed for 3-5 days followed by a short quiescent period before they moult to the second instars (deutonymphs) which exhibit similar active and resting cycles. During this time, adult male mites may approach deutonymphs and attach themselves end-to-end to the nymphal postero-dorsal suckers using the cup-shaped empodial suckers on their hindlegs. Both coupled and uncoupled deutonymphs subsequently moult to form adult mites. This pre-moult coupling strategy appears to be required for the production of fertile female mites. Coupled deutonymphs that moult to form adult females copulate with the attached male and then begin to produce eggs, whereas uncoupled deutonymphs moulting to adult females remain infertile and do not lay eggs. Coupled

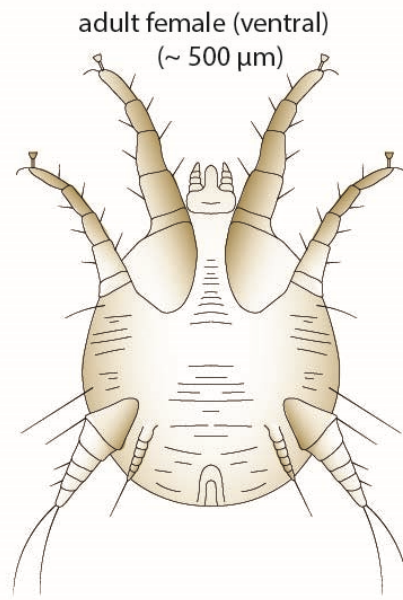
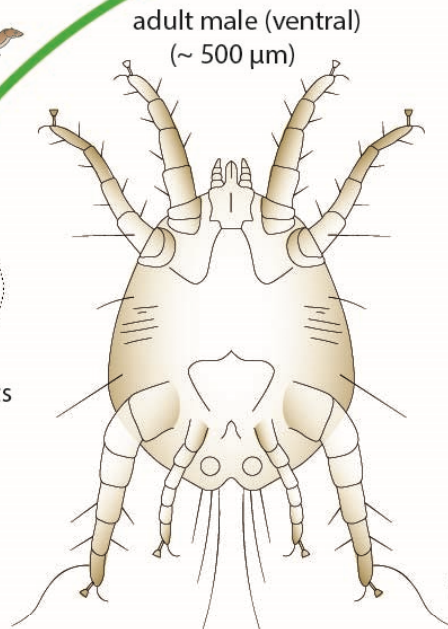
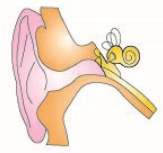
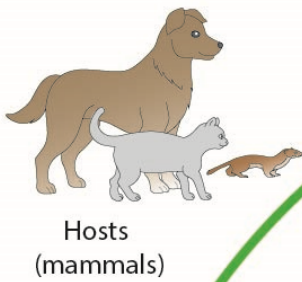
deutonymphs that moult to form adult males simply uncouple both seek mates, while uncoupled deutonymphs moulting to adult males become reproductively active and seek mates (deutonymphs). Adult mites live for 50-60 days and continually reproduce during their life-spans. The entire life-cycle may be completed in 18-28 days, but may take longer in cooler climates when mites move deeper into the ear canal. Infestations are highly contagious and mites are usually transmitted between hosts by direct contact, especially from mothers to suckling young. Occasionally, transmission may occur through the contamination of fomites as mites are able to survive off hosts for several days in humid conditions. Infestations become established on new hosts following the transfer of mated adult female mites, and sometimes by deutonymphs coupled with males that subsequently moult to form female mites. Humans are usually bitten by mites when they handle infested animals.

Differential diagnosis: Ear mite infestations may be strongly suspected on clinical grounds when animals have reddish-brown waxy aural exudates and exhibit frequent head-shaking and ear scratching. Infestations may be confirmed by the direct detection of ear mites by otoscopic observation or microscopy of ear swab samples (the mites are said to have the appearance of 'moving sand'). Care should be taken in otoscopic procedures as irritation of the attendant inflammation can cause pain and distress. Ear swab samples may also be examined against a dark background using an incandescent lamp to heat the ear wax and expel mites. More recently, molecular biological techniques have been used to detect and characterize mite isolates following the polymerase chain reaction (PCR) amplification of random amplified polymorphic DNA (RAPD), by real-time PCR as well as by sequencing specific nuclear (ribosomal DNA, internal transcribed spacer 2) and mitochondrial (16S ribosomal DNA) genes.

Treatment and control: Clinical infestations are conventionally treated using topical or systemic acaricidal chemicals, including pyrethroids (permethrin), benzimidazole-thiazolyis (thiabendazole), amidines (amitraz), dithiocarbamates (monosulfram), phenylpyrazole (fipronil), insect growth regulators (pyriproxyfen) and macrocyclic lactones (ivermectin, selamectin, moxidectin). Repeated treatments are often required 10-14 days later as infestations are quite persistent and re-infestations can rapidly occur. Careful attention should be paid to any drug contra-indications as some formulations such as ivermectin can cross the blood-brain barrier in collies, sheepdogs and similar breeds and cause neurological signs (ataxia, tremors, mydriasis, salivation, depression, coma and death). Otic treatment efficacy can also be improved by using ceruminolytic preparations to remove crusts and cerumen from infested ear canals. Animals should also be tested for secondary bacterial or fungal infections and treated accordingly. Due to the highly contagious nature of ear canker, all dogs and cats in contact or in the immediate vicinity of infested animals should also be treated. Pets and farmed animals should be regularly monitored for infestations and preventive measures should be adopted to forestall the spread of infestations. Such measures should include thoroughly cleaning animal holding facilities, bedding, grooming equipment and other potentially-contaminated fomites, possibly even spraying the immediate environment with acaricides with long-lasting residual activity (such as pyrethroids). Animals should be placed in isolation during treatment, new animals should be quarantined before their introduction to farms and households, and wild animals should be excluded from domestic animals by barriers, traps or baits. Disease developing in humans in contact with infested animals usually does not require treatment (although cortico-steroids can be used to ameliorate inflammation) and often resolves spontaneously once animal contact is curtailed or infestations in animals are successfully treated.

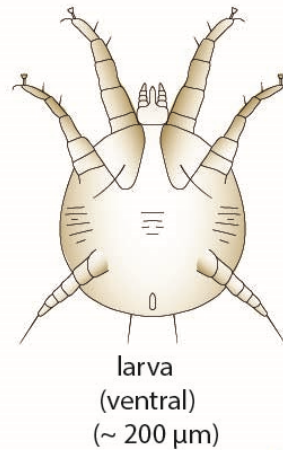
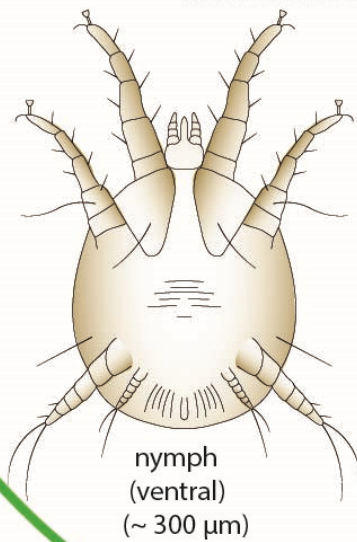
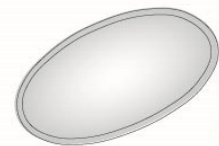
Otodectes

transmission between hosts by close contact
or via contaminated fomites



eggs laid in
ear canal

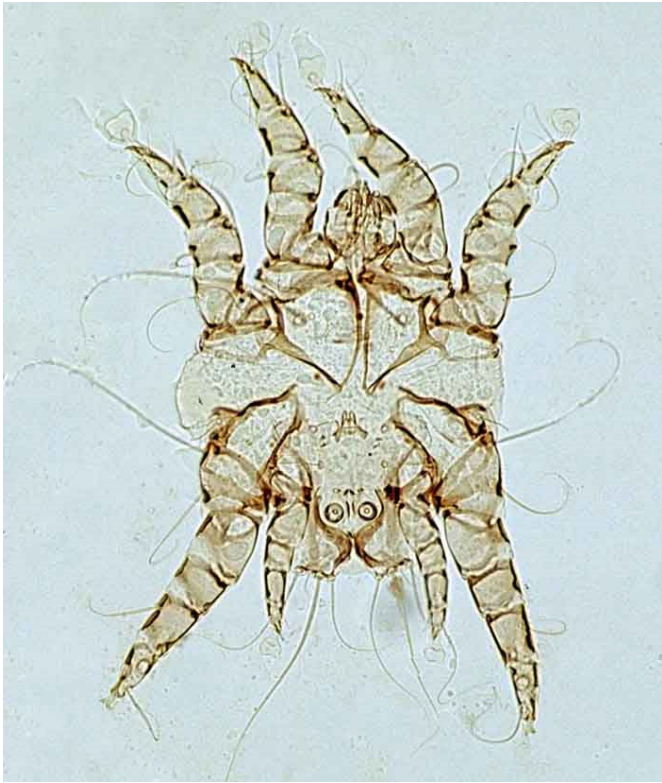
adult males attach to female deutonymphs
and remain *in copula* as they develop



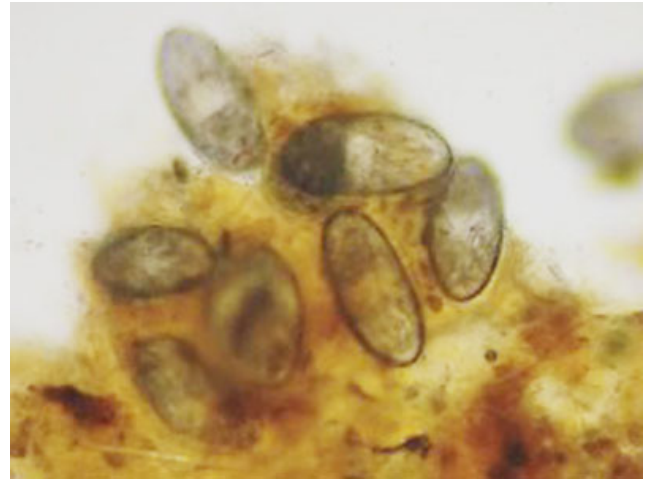
hatch

2 nymphal instars
(proto-, deuto-nymphs)

all motile stages are ectoparasitic
(feed on epidermal tissues/fluids)



Otodectes adult, male



Otodectes eggs