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***Otodectes cynotis* (Hering, 1838) Canestrini, 1894**

(Figures 5-26 through 5-28)

ETYMOLOGY: *Oto* = Ear and *dektes* = a beggar; along with *cynotis*, Greek for "of the dog"

SYNONYMS: The synonyms are listed by Sweatman (1958). *Sarcoptes cynotis* Hering, 1838; *Sarcoptes auricularum* Lucas & Nicolet, 1849; *Sarcoptes auricularum* var. *cati* Lucas & Nicolet, 1849;; *Symbiotes canis* Bendz, 1859; *Symbiotes felis* Huber, 1860; *Chorioptes caudatus* Mégnin, 1896; *Chorioptes caudatus* var. *catotis* Mégnin, 1877; *Chorioptes caudatus* var. *furonis* Mégnin, 1878; *Psoroptes auricularis* var. *canis* Sewell, 1891; *Symbiotes auricularum* var. *canis* Neumann, 1892; *Symbiotes auricularum* var. *cati* Neumann, 1892; *Symbiotes auricularum* var. *furonis* Neumann, 1892; *Sarcoptes auricularum* var. *canis* Railliet, 1893; *Otodectes furonis* Canestrini, 1894; *Chorioptes cynotis* var. *canis* Neumann, 1914; *Chorioptes cynotis* var. *felis* Neumann, 1914; *Chorioptes cynotis* var. *furonis* Neumann, 1914; *Otodectes cynotis* var. *canis* Neveu-Lemaire, 1938; *Otodectes cynotis* var. *cati* Neveu-Lemaire, 1938; *Otodectes cynotis* var. *furonis* Neveu-Lemaire, 1938, Sweatman felt that there was no difference between the different varieties occurring in the cat, the dog, the ferret, and other hosts.

HISTORY: This mite has been long known to occur in the ears of canids, foxes, cats, and ferrets. At times, different species names have been assigned to the forms occurring in different hosts, but there is little evidence that they are separate species. Mites from cats have been transferred to dogs, and the infections have been found to persist for varying lengths of times in the canine host (Railliet and Cadiot, 1892; Sweatman, 1958; Tonn, 1961; authors, unpublished observations)

GEOGRAPHICAL DISTRIBUTION: This mite is found around the world. Reports from different areas include Americas (Foley, 1991); Europe (Raschka *et al.*, 1994; Trotti *et al.*, 1990); Asia (Fukase *et al.*, 1991; Tacal JV & Sison JA, 1969); Middle East (Ismail *et al.*, 1982); and Australia (Coman *et al.*, 1981).

LOCATION IN HOST: The mites live in the ear canal of the cat. Large numbers of mites (greater than 1,000) can be present in each ear without any apparent mites appearing on the surface of the feline host.

IDENTIFICATION: Identification is relatively simple, no other non-burrowing mites of this large size are typically found in the ears of the cat. The living mites appear as small white organisms that can be seen moving about within the ears or on swabs of detersitus removed from the ears. The larval mites have a length of 138-224 µm. The adult male is 274 to 362 µm in length. The ovigerous female is between 345 to 451 µm in length (Fig. 5-26). An examination of the distal portions, pretarsi, of the anterior pairs of legs will reveal the "wine-glass" shaped caruncle on a short pedicel. The male mites have a caruncle on all four pairs of legs, while the third and fourth pairs of legs on the female terminate in long hairs or setae. The posterior of the body the male also possesses two ventrally situated suckers that are used

for the attachment of the male mite to a deutonymph as part of the life cycle (Fig. 5-27). The eggs are white, oval, slightly flattened on one side, and are 166 to 206 µm long (Fig. 5-28).

LIFE CYCLE: Almost all the work on the life cycle was performed by Sweatman (1958). He showed that the eggs laid by the female mites are glued to the ear canal by a secretion from the female mite. The eggs typically required four days of incubation prior to hatching. The life cycle includes a larva, a protonymph, and a deutonymph. Each stage takes a minimum of around 3 to 5 days to develop, and the development is followed by a quiescent period of about 24 hours during which time the mites molt and shed their cuticles (ecdysis). As soon as the adult male emerges from a deutonymph cuticle, it will seek out and for a pair with a deutonymph. Sweatman showed that the male mites could not distinguish between male and female deutonymphs, and sometimes formed attachments with deutonymphs that developed into males. He also showed that unless the female deutonymphs developed in the presence of a male, the females were infertile, and later matings did not occur. Sweatman was under the opinion that copulation occurred at the time when the adult female first shed its deutonymphal exoskeleton. He found that the complete egg to egg cycle took approximately 18 to 28 days, or about three weeks. More recent work by Shustrova (1988) revealed that upon transfer of female mites to cats in Leningrad in August, December, and May that eggs were laid 2 days and 8 to 10 days after transfer. The larvae hatched in 2 to 4 days in May and August by in 6 to 7 days in December. They felt the full life cycle took 13 to 15 days in the warmer months and three weeks in the colder months. They also found that the mites were found at greater depths during colder temperatures.

Transmission between hosts is probably by direct contact. The mites seem to require a relatively high relative humidity for survival and seem to rapidly desiccate at typical room humidities. Sweatman (1958) found that he could maintain mites for months *in vitro* by placing them in a 35°C incubator with a relative humidity of 80%. Tonn (1961) found by examination of brushings of the hair of the posterior body and flanks of naturally infested cats, that the collected material could contain living mites. Thus, it is possible that mites can be found on the surface of their feline host.

Sweatman (1958) fed mites maintained *in vitro* detritus collected from the ears of dogs and cats and he was convinced that the mites were basically scavengers not requiring either blood or tissue fluids from the host. The ability to complete the entire cycle *in vitro* would suggest that there is some validity in this observation. Powell *et al.* (1980), on the other hand, felt that the presence of feline antigens in mites indicated that the mites were actively feeding on fluids or blood from their feline host.

CLINICAL SIGNS AND PATHOGENESIS: Cats vary remarkably in their abilities to serve as hosts for *Otodectes cynotis*. Observations on a number of cats at necropsy has revealed that some cats can have what appear to be severe lesions with significant quantities of dark cerumen and sometimes even blood present in their ears but only one or two mites. Other cats will have very clean ear canals, almost devoid of cerumen and detritus, and have 50 to 100 mites present. Still other cats can be host to huge numbers of mites, almost 2,000 per ear, and still will have shown very little in the way of outward signs of infection. Over 8,500 mites have been found at necropsy in a single auditory tube of an infested cat (Preisler, 1985). Ears of cats with very large numbers of mites tend to contain a dry waxy parchment-like material that occurs as sheets throughout the ear canal. These layers of sheets will contain mites throughout and consist in part of rafts of eggs that are embedded in the material. These ears tend not to contain large quantities of wax.

Powell *et al.* (1980) transferred 30 mites into the right ear of 4 laboratory-reared cats. By 7 to 14 days after infestation, an accumulation of red-brown cerumen appeared in the right horizontal ear canal of all 4 cats. In two cats, red-brown cerumen appeared in the left ear along with mites; in one case 49 days after the infestation of the right ear and in the other case 62 days after the infestation of the right ear. Observations showed that the cats maintained their infestations without spontaneous clearing for at least 9 months and apparently without secondary invasion by bacteria or fungi. These authors also showed that the infested cats developed IgE antibodies to *Otodectes cynotis* by day 14 after infestation. Earlier work by this group (Weisbroth *et al.*, 1974) had shown that there are probably 5 major histologic components associated with ear mite infestations: (1) the epithelial surface was overlaid with a crusty, waxy, crumbly material; (2) the epithelium had hyperkeratotic and hyperplastic areas; (3) ceruminous and sebaceous glands appeared to have undergone dramatic reactive hyperplasia; (4) inflammatory cells (particularly mast cells and macrophages) were present in greatly increased numbers; and (5) the blood vessels, particularly venules, underlying the dermis were generally dilated.

Lesions on the body due to generalized infestations with *Otodectes cynotis* have been reported in cats and dogs (Kraft *et al.*, 1988). Guaguere (1992) reports on a case of miliary dermatitis in a 4-year old cat with lesions on the neck and the back. The cat was treated with Amitraz, and the lesions were noted to have significantly regressed and the coexistent ear-mite infestation to have cleared six-weeks later upon reexamination.

DIAGNOSIS: The mites can be recognized on otoscopic examination by observing movement. Another means of diagnosis is to swab the ear with a cotton tipped applicator and to place the swab in a glass vial serum vial with a small drop of water. After about an hour, the mites will begin to migrate out of the cerumen and detritus and can be observed walking on the walls of the glass vial or on the applicator stick. Smearing the ear swab onto a glass slide and examining under 400 X magnification usually reveals the mites also.

TREATMENT: The products approved for the treatment of ear mites in cats in the United States of America include pyrethrin containing compounds (Otomite Allerder/Virbac, Nolvamite® Fort Dodge; Eradimite® Solvay; Aurimite® Schering Plough) and rotenone containing compounds (Ear Miticide Phonenix; Ear Mite Lotion Durvet; Ear Miticide Vedco). Also, Otomax, a mineral-oil based otic ointment containing gentamicin sulfate, betamethasone valerate, and clotrimazole, has been shown to have some apparent effect against ear mites in cats (Pappas and Katz, 1995). As part of a trial testing the efficacy of another mineral-oil based compound, one of the authors (Bowman) used 2 ml of mineral oil and 30 seconds of external massage of the base of the ear in the control cats, and found that after two treatments one week apart, there were no mites found in any of the control cats three-weeks after the second treatment. This large volume of mineral oil tended to leak from the ear, and the hair on the head of the cat would appear oiled for the first day or so after treatment.

Treatment with a phyto-aromatic gel, canidor (a mixture of 15 volatile oils) has been examined for its ability to treat ear-mite infestations in cats (Mignon and Losson, 1996). This aromatherapy treatment of four cats on days zero, one, two three, 10, 11, 12, and 13 seemed to be highly effective in removing the mites from the ears of these animals.

Lindane-containing solutions have been examined for their ability to control *Otodectes cynotis* in cats (Gassner *et al.*, 1995). These studies showed that the same preparation with and without lindane was highly effective in removing the mites from the ears of cats, although neither solution was 100% effective. The treatments were administered daily to both ears over a 6-day period.

Ivermectin injectable, although not approved for use in cats, has been used to treat feline infestations with *Otodectes cynotis* (Blakstad, 1993; Foley, 1991; Song, 1992). Typical dosages are 0.2 to 0.225 mg/kg injected on one occasion or on two occasions with a three-week interval between injections. Some cats given over 0.5 mg ivermectin per kilogram body weight have developed signs of ivermectin toxicity (Song, 1992). There have also been reports of toxicity in kittens receiving off-label injections of ivermectin (Frischke and Hunt, 1991; Lewis *et al.*, 1994), and one of these kittens died 7 days after the administration of ivermectin (Lewis, 1994). Another approach has been the direct application of the ivermectin into the ear canals of the cats. This method was described by Jeneskog and Falk (1990) as used in the successful elimination of infestations with *Otodectes cynotis* from a laboratory cat breeding colony. Gram *et al.* (1994) compared subcutaneous administration of 0.3 mg ivermectin per kg body weight *versus* the topical application of 0.5 mg of ivermectin into the ear canal. When additional treatments were required, they were given at one or two week intervals. Cats were otoscopically negative for mites after 2.2 injections or 3.4 topical treatments. To cure cats of their mite infestations (as determined by two consecutive otoscopic examinations one to two weeks apart), an average of 4.2 subcutaneous treatments were required while the average for the topical application was 5.4 treatments. Five of the 14 topically treated cats had an apparent recurrence of their mite infestation during the follow-up period.

EPIZOOTIOLOGY: As mentioned above, it appears that the cycle may take longer in cold weather than in warm weather (Shustrova, 1988). Grono (1969) surveyed dogs for the presence of ear mites by examination at necropsy. Grono had 22 of 350 dogs in Australia which had mites in one ear and suppurative otitis externa without mites in the other ear. He felt that this was indicative of the mites causing a progression wherein they initiated conditions conducive to otitis externa, but then disappeared when the site of infestation was no longer favorable for survival.

It is not known which stage of the mite typically initiates infestations in naturally infested cats. Adults, eggs, and larvae appear to be capable of causing infections under experimental conditions. It is expected, however, that one stage is likely to possess a greater ability to seek out other hosts than the other stages, but this may not actually occur.

HAZARDS TO OTHER ANIMALS: *Otodectes cynotis* is transmissible to other household pets, most notably dogs and ferrets. Thus, if these hosts are present in a household, it is necessary to treat all of these animals on the premises.

HAZARDS TO HUMANS: Two individuals have been found to be infested with mites identified as *Otodectes cynotis*. Herwick (1978) reports on a rather anecdotal case of ear mites biting a Californian lady on the torso and the extremities who recently received a new cocker spaniel that was infested; no mites were actually found on the woman. A second case (Heyning & Thienpoint, 1977) reported on otitis in a Belgian farmer's wife. In this case, one adult male, one adult female, and four larvae were recovered from crusts on the eardrum of the right ear.

CONTROL AND PREVENTION: It is very important that all susceptible animals be treated if a case of otodectic mange is diagnosed in a household. Animals with clean ears containing no detritus can harbor mites, and thus, even if no signs of infestation are present it is important that the animal be treated. When very heavy levels of infestation are present, it may be warranted to try and bathe the infested animals, especially in those cases where topical treatment methods are employed.

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Figure 5-26. *Otodectes cynotis*. Living adult female mite. An egg is apparent within the body of this mite.

Figure 5-27. *Otodectes cynotis*. Adult male. The suckers on the posterior end of the body are quite evident in this prepared specimen.

Figure 5-28. *Otodectes cynotis*. Eggs in detritus removed with a swab from a cat's ear.

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