Cestodes of Dogs and Cats in North America

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KEYWORDS

• *Taenia* • *Echinococcus* • *Dipylidium* • *Mesocestoides*
• *Diphyllobothrium* • *Spirometra* • Cystic echinococcosis
• Alveolar echinococcosis

CESTODES

Cestodes are hermaphroditic flatworms consisting of a scolex, neck region, and repeating segments. Cestodes lack a mouth, intestine, and body cavity. Life cycles are indirect, with the definitive host acquiring the adult form of the tapeworm by the ingestion of the larval metacestode stage contained in an intermediate host. This process usually occurs in the form of a predator-prey relationship. Cestode infection in dogs and cats in North America is common, involving various species including cyclophyllidean (*Taenia*, *Dipylidium*, *Mesocestoides*, *Echinococcus*) and pseudophyllidean (*Diphyllobothrium*, *Spirometra*) tapeworms. Dogs and cats most often serve as definitive hosts (ie, carry the adult tapeworms in the small intestine) but on occasion are infected as intermediate hosts (ie, carry the immature metacestode stages in various tissues). The presence of adult tapeworms in the canine or feline small intestine is usually well tolerated, producing little or no clinical signs of disease. The major consequence of such infections is the shedding of eggs and proglottids which, at best, is aesthetically abhorrent and unacceptable to pet owners and, at worst, a serious economic or zoonotic health threat. The presence of the immature (metacestode) stages of tapeworms occurring in various tissues can result in life-threatening disease in dogs, cats, and humans.

Cyclophyllidean Tapeworms

In this group of tapeworms the scolex is characterized by the presence of muscular suckers, with or without an armed rostellum. Eggs pass out of the definitive host contained in a gravid proglottid (segment) that detaches from the tapeworm ribbon to pass to the outside.

Taenia spp

Although recent data are lacking, necropsy surveys in the past have indicated *Taenia* infection was fairly common in dogs and cats in North America, with a reported

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prevalence as high as 35% in dogs and 33% in cats.[1–3] Fecal flotation surveys report much lower infection rates (0.5%–7.4%), but this reflects the poor detection sensitivity of this technique for cyclophyllidean tapeworm infection.[2,4–6] The scolex of *Taenia* has four muscular suckers and a rostellum armed with 2 rows of hooks. The segments have an irregularly alternating single lateral genital pore (**Fig. 1**). Species of *Taenia* that infect dogs include *Taenia pisiformis*, *Taenia crassiceps*, *Taenia hydatigena*, *Taenia multiceps*, *Taenia ovis*, and *Taenia serialis*. Cats may be infected with *Taenia taeniaeformis* and (rarely) *T pisiformis*. All of these species occur worldwide. In North America, *T pisiformis* is the most common, and *T multiceps* and *T ovis* are the least commonly encountered in dogs.[7,8] Adult *T taeniaeformis* are 15 to 60 cm and *T pisiformis* 60 to 200 cm in length.[9–11] Metacestode stages of *Taenia* include cysticerci (bladderworm, a single invaginated scolex inside a fluid-filled bladder), strobilocerci (scolex has evaginated and segmentation has begun), and coenuri (bladderworm contains multiple invaginated scolices).

Dogs acquire infection by the ingestion of cysticerci in the viscera of rabbits (*T pisiformis*), rodents (*T pisiformis*, *T crassiceps*), domestic and wild ruminants, horses, and pigs (*T hydatigena*), or the muscle of sheep (*T ovis*). Infection in dogs also occurs by the ingestion of coenuri in the brain or spine of sheep (*T multiceps*), or in subcutaneous and intramuscular connective tissues of rabbits and rodents (*T serialis*).[9–11] Cats acquire infection of *T taeniaeformis* by ingestion of strobilocerci contained in the tissues of rodents.[9–11] Hunting and freedom to roam are risk factors for acquiring infection with *T pisiformis*, *T crassiceps*, *T hydatigena*, and *T serialis* in dogs; proximity to a farm with livestock, particularly sheep, is a risk factor for *T hydatigena*, *T multiceps*, and *T ovis* infection in dogs.[12] Opportunity to roam and hunt is the sole risk factor for *Taenia* spp infection in cats. Infected animals pass gravid segments in the feces, or the actively motile segments may exit through the anus on their own. The prepatent period is 34 to 80 days for *T taeniaeformis* in cats and 42 to 56 days for *T pisiformis* in dogs.[13,14] Proglottid shedding tends to be irregular and persists for months to years.[14–16] The eggs contain a hexacanth embryo and are immediately

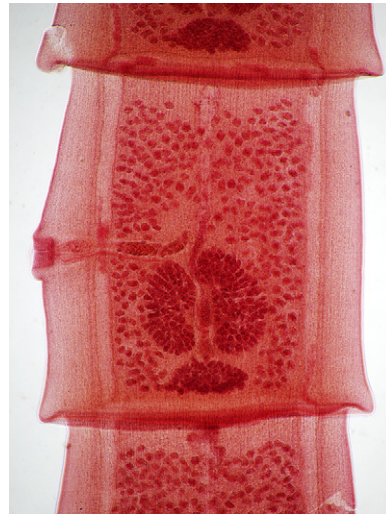

Fig. 1. Mature *Taenia* sp segment showing a single lateral genital pore (Semichon's acetic-carmine stain, original magnification ×18.5).