

# CASE REPORT

## A Coenurus in the Brain of a Cat

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### Introduction

A coenurus is a polycephalic cestode larva produced by certain members of the genus *Taenia* (14, 17). The adult stage is a tapeworm in the small intestine of a carnivore (14, 17). Coenuri usually develop in soft tissues of an herbivorous intermediate host, but may occasionally develop in the brain of unusual hosts such as man (8), monkey (13), mouse (9) and cat (7). In Europe, cerebral coenurosis (gid) is common in sheep, the usual intermediate host of *Taenia multiceps* (1, 14). *T. multiceps* probably no longer occurs in North America (1) but *T. serialis*, the coenuri of which occur in lagomorphs, is widespread (10). This report describes the occurrence of a coenurus, believed to be *Taenia serialis*, in the cerebrum of a cat in Saskatchewan.

### Clinical Findings

On February 12, 1976 a two and one-half year old castrated male domestic short-haired cat was presented to the Western College of Veterinary Medicine, University of Saskatchewan, for evaluation of a gait abnormality and personality change. The cat had lived in the Saskatoon area throughout its life with two dogs and with a cat acquired six months previously from rural Ontario near Ottawa. All animals were fed commercial pet diets.

The cat had been hit by a car on two occasions, nine and five months prior to admission; minor, superficial trauma to the head resulted. Four days before admission, the owners observed a sudden onset of ataxia characterized by a wobbly gait with falling to either side. The cat became lethargic two days later but ataxia persisted. Episodes of viciousness in which the cat attacked the owner and one of the dogs, occurred intermittently. On the day before admission, the cat began to bump into objects in the house and marked extensor rigidity occurred each time the cat fell over.

Abnormal physical findings were limited to the central nervous system. The cat had an altered state of consciousness; it would circle to the left and walk into objects when placed on the floor. A menace reflex was absent in the right eye but present in the left eye. Intermittent, positional, vertical nystagmus was evident. The left pupil responded more slowly than did the right during both the direct and consensual pupillary light reflexes. No abnormalities were evident in other cranial nerve functions nor on fundoscopic examination of the eyes. Knee jerk reflexes were bilaterally exaggerated and crossed extensor reflexes were elicited in all limbs.

All hematological and blood chemical measurements (complete blood count, blood urea nitrogen concentration, serum alkaline phosphatase activity, serum glutamate pyruvate transaminase activity and concentrations of serum albumin,  $\alpha$ ,  $\beta$  and  $\gamma$  globulins) were within normal ranges. A test for feline leukemia virus was negative. A cisterna magna puncture yielded less than 1 ml of cerebrospinal fluid which contained 1,400 mononuclear white cells/mm<sup>3</sup>, 510,000 red blood cells/mm<sup>3</sup> and 2.0 grams of protein/100 ml.

Radiographs of the head revealed osseous replacement resulting from a previous fracture around the left frontal sinus but no abnormality of the calvarium was evident. The cat developed respiratory arrest during anesthesia for electroencephalography and was euthanized.

### Necropsy Findings

Significant lesions were restricted to the cranial cavity. Grossly, the cerebellar vermis was coned from herniation into the foramen magnum. The left cerebral hemisphere was enlarged and partially herniated below the falx cerebri. A rounded cavity, 1.5 to 2.0 cm in diameter, was centred within the left parietal lobe above the lateral ventricle (Figure 1). The overlying left longitudinal gyrus was widened and centrally transparent. The cavity contained a loosely adherent, semiopaque, fluid-filled parasitic cyst. The lateral ventricle was compressed and displaced ventro-medially (Figure 1).

Histologically, the brain tissue surrounding the cyst was compressed, with destruction and phagocytosis of neurons and myelin by macrophages (gitter cells). Increased numbers of glial cells and marked perivascular cuffing with lymphocytes and plasma cells were present in these regions.

### Parasitology

The cyst contained approximately 2.5 ml of clear fluid. The wall was thin except for approximately 60 protoscolices clustered in two main regions of the cyst wall. Individual protoscolices

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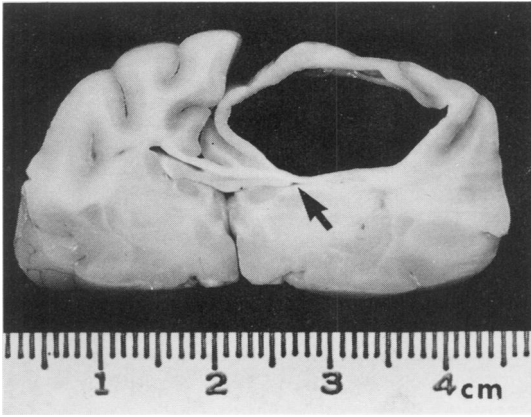


FIGURE 1. Midcerebral section showing the large cavity in the left hemisphere from which the coenurus was removed. There is displacement of the lateral ventricle (arrow) and herniation of the hemisphere across the midline.

were up to 0.5 mm long, opaque white and distributed in close linear arrangements (Figure 2). Squash preparations of protoscolices, cleared and stained with Semichon's acetic-carmin, revealed that they were still immature, and lacked rostellar hooks. Histological sections of other segments of the cyst contained one scolex with irregular, anomalous hook development. In these sections, stained with hematoxylin and eosin (H & E) and periodic acid-Schiff (PAS), a thick cuticle was evident overlying loose PAS-positive parenchyma containing numerous calcareous corpuscles, characteristic of cestode larvae. Immature scolices were located in invaginations of the cyst wall many of which contained mononuclear cells and other inflammatory debris. The cyst was identified as a polycephalic larva (coenurus) of the genus *Taenia*, based upon the morphology (2).

*Discussion*

Morphological features of this tapeworm cyst allowed confident identification as a taeniid coenurus (2, 14), but immaturity of scolex and underdevelopment of hooks prevented specific determination. Such difficulties are commonly experienced with coenuri, especially those found in aberrant hosts (7, 8, 13). However, the morphological characteristics observed indicated that, of the coenurus producing cestodes prevalent in this region, it was likely *Taenia serialis*.

The family Taeniidae has been considered to contain several genera, including *Echinococcus*, *Taenia*, *Multiceps* and *Hydatigera* (17). The last three were differentiated largely on the basis of the morphology of their larvae; they produce a cysticercus, coenurus or strobilocercus, respectively (5, 14, 17). *Multiceps* and *Hydatigera* have recently been included within the genus *Taenia* (5, 12) because the morphology of their larvae varies depending on host and tissue of location (3, 5, 9),

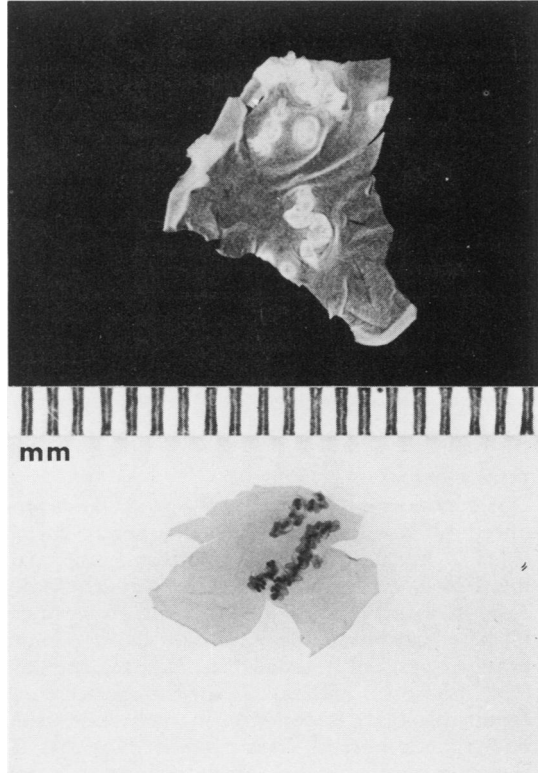


FIGURE 2. Appearance of formalinized (above) and stained (below) portions of the coenurus. Note the linear clustered arrangement of protoscolices.

and because differences in the adult stages are insufficient to justify distinction at the generic level (5, 12).

*Taenia multiceps*, *T. serialis* and *T. mustelae* are the only coenurus producing species recorded in Canada and the U.S.A. (1, 6, 10, 11, 12). The first two are parasites of dogs and wild Canidae (10, 15, 17). The intermediate stage of *T. serialis*, (*Coenurus serialis*) occurs in the subcutis and muscles of lagomorphs, while *Coenurus cerebralis*, the intermediate stage of *T. multiceps*, affects the brain of sheep (1, 14). *Taenia multiceps* is considered extinct in North America (1) where *C. cerebralis* has not been recorded in sheep for over 40 years (1, 8). *Coenurus serialis*, which is difficult to distinguish morphologically from *C. cerebralis* (1), is common and widespread (10). Each species has many protoscolices clustered together, usually in rows in *C. serialis* (hence the name) (1, 17). They are best differentiated by transmission to dogs whereby the adult stages can be identified, although they are closely similar (15). The two species have been considered as one (*T. serialis*) by some authors (3, 5, 10), whereas others distinguish between them on morphological grounds (1, 15, 17). There is, at least, little doubt that they differ biologically (1, 8, 13, 14). Speciation of coenuri by location of development (i.e. designating cerebral

coenuri to be *C. cerebralis*) is considered invalid because location depends more on the host than on the larval species (9, 14).

*Taenia mustelae*, which produces cystercerci and coenuri in wild rodents (6, 11), occurs in the adult stage in mink and other mustelids throughout North America (10). The coenuri, which have relatively few unclustered scolices (up to 21), occur in the liver and in other soft tissues of the intermediate host (6). They have not been recorded in man or domestic animals.

We speculate that the coenurus found is likely *T. serialis* because of the large number of linearly clustered scolices (which are not described in *T. mustelae*), and because *T. multiceps* apparently does not occur in this region.

The brain is a preferred site for development by coenuri in unusual hosts. At least 55 human cases of coenurosis have been recorded; of these, 16 involved the brain (8). All cerebral cases have occurred in temperate regions while 33 non-cerebral cases have occurred in tropical Africa (8). Cerebral coenurosis is common in sheep and cattle in Europe (1, 14), and has been recorded in nonhuman primates imported into the U.S.A. (13). Eggs of *T. serialis*, originally derived from lagomorph coenuri, developed into coenuri both in the brain and connective tissues of laboratory mice (9). Coenuri of *T. mustelae* occasionally occur naturally in the brain of wild rodents (11). In carnivores, coenuri are rare in any location but a coenurus has been found in a lateral ventricle of a cat's brain (7).

The neurological sequelae to intracerebral development of coenuri or other cestode larvae, such as cysticerci or hydatids, are serious. Cerebral coenurosis, while less common than either cysticercosis or hydatid disease, has caused the deaths of two young children in the United States (8). The occurrence of coenurosis in this cat indicates that a *Taenia* sp. in Canada is capable of larval development in unusual hosts and may have zoonotic potential.

#### Summary

A larval cestode (coenurus) was found in the cerebrum of a cat in Western Canada. Clinical and postmortem findings are described. Morphological and epizootiological evidence suggests that it was *Taenia serialis*.

#### Résumé

Les auteurs ont décelé un cénure dans le cerveau d'un chat de la Saskatchewan. Ils décrivent les observations cliniques et les lésions macroscopiques relatives à ce cas de cénurose. Les données morphologiques et épizootiologiques semblent indiquer qu'il s'agissait de *Taenia serialis*.

#### Acknowledgments

The assistance and advice of Dr. Robert L. Rausch, who kindly examined the parasite, is gratefully acknowledged.

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