THE ENDOPARASITES OF THE DINGO, *CANIS DINGO*, BLUMB.

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For many years I have endeavoured to obtain from various districts in New South Wales and Queensland endoparasitic material from the warrigal or dingo, my main object being to ascertain whether the adult hydatid tapeworm occurs in this host. The question as to whether the dingo is indigenous to Australia or has been introduced by man, or has gained entrance by means of former land connections prior to the advent of man in our continent, is of considerable interest, but need not be dwelt upon here. Mr. R. Etheridge, Curator of the Australian Museum, Sydney, has recently published a review of the matter (1916). It is worthy of note that the animal does not occur, and apparently has not occurred, in Tasmania, and that remains of a species of *Canis* have been found in post-pliocene deposits at least in New South Wales. One cannot help believing that our wild dog is not a member of our indigenous fauna, but is an invader from the adjacent lands lying to the north.

One difficulty has been to obtain material from pure dingoes since many of the animals are hybrids between *C. dingo* and the domestic dog. Some little time ago Dr. T. L. Bancroft forwarded me some parasites from a dingo shot near Eidsvold, Burnett River.

There are already two species of entozoa recorded from this host, viz., the hydatid and a pentastome, *Linguatula dingophila*, Johnson.

The Hydatid.

Echinococcus granulosus, B., more commonly known as *Tænia echinococcus*, Sieb., was stated by Lendenfeld* (1886) to infest it. This author referred to the common occurrence of the cystic or hydatid stage in human beings in the dry inland districts of Australia where dingoes were plentiful and the water supply scanty, both man and beast depending on water holes whose contents were frequently contaminated. He regarded the dingo as the agent responsible for infecting such water supply, and thus the chief transmitter as far as man was concerned. He examined many dingoes, and in 80 per cent. of those searched, found from one to five cestodes which he regarded as *T. echinococcus* in spite of the fact that they were much longer than the latter, often reaching to 10 or even 30 mm. in length. He mentioned that the hydatid tapeworm† occurred commonly in the domestic dog in the mountainous region of Eastern Australia. Lendenfeld has certainly confused two or more species, as *Echinococcus granulosus* is a very small cestode, the longest that I have from the domestic dog (from New South Wales and South Australia), reaching only 2.5 mm., the average being about 2 mm. Dr. Angas Johnson did not find the species in the one dingo examined by him, nor was I successful when searching the Eidsvold material.

The chief transmitting agent of the hydatid is undoubtedly the domestic dog, but I think that dingoes also harbour the cestode and contribute to its dissemination amongst Australian cattle, sheep, marsupials, etc.

As regards the species which Lendenfeld actually found, I would suggest that it was either a new species,

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*I am indebted to Dr. S. J. Johnston and Miss Marie Erhard, of Sydney University, for forwarding a copy of this paper to me from Sydney, as it was not available in Brisbane.

†The prevalence of hydatids in man and the dog in Australia, especially in the south-eastern corner, had previously been emphasised by Dr. D. Thomas, P.R.S., Lond., 38, 1885, p. 444-57; *Ibid.*, p. 457-8 (in 40 per cent. of the dogs examined by him, and in 50 per cent. of those examined from Melbourne); "Hydatid Disease with special reference to its prevalence in Australia," Adelaide, 1884; Trans. Roy. Soc., S. Austr., 4, 1880-1; *Ibid.*, 6, 1883; etc.

or more probably, that it was one of the several cestodes known to parasitise the domestic dog in Eastern Australia. The most likely species would be *Dipylidium caninum*, or perhaps *Tænia pisiformis* (*T. serrata*). One probably should not take too literally his statement as to the agreement of the dingo tapeworm with the hydatid. Again, the latter helminth, when present in a canine, generally occurs in considerable numbers owing to its mode of development from the cystic stage.

Linguatula dingophila, Johnson.

This parasite, a female, was found and described by Dr. A. Johnson (1910) in the nasal cavity of a pure-bred dingo in South Australia. A figure showing the external characters was given by him, but no information was supplied regarding the anatomy. A comparison of this helminth and *L. rhinaria* (= *L. serrata*) was given in a tabulated form (p. 249), but the only differences of any importance in my opinion are those relating to the sizes of the adults and of the eggs, and the form of the posterior end of the animals. The length of *L. serrata* is given as 8 to 13 cm. ; *L. dingophila*, 3.1 cm., *i.e.*, only about one-third as long. The egg of the latter is stated to be .05 mm. by .025 mm., whilst that of the former is .09 by .07 mm. I suspect that the former egg measurements are incorrect.

The posterior region of a fully adult female, *L. serrata*, is much more elongate than in *L. dingophila*, but I believe the latter name to be based merely on a specimen of *L. serrata*, which had not attained full size. Dr. Cleland and I (1910) found that the larval stage of the latter (often called *Pentastomum denticulatum* in this condition) occurs not uncommonly in the mesenteric glands of cattle in Sydney slaughter-yards and in the Illawarra district (N.S.W.) Dr. Ralph (1865) found it in Victoria as long ago as 1865. The parasite almost certainly occurs in Queensland too, but has not been definitely recorded as yet. These facts are evidence of the presence of the adult in the nasal region of dogs in N.S.W. and Victoria at least. I infected the nose of a Sydney dog with some of the larvæ, and later on a few adult female pentastomes were obtained from it (Johnston, 1911, *a*, *b*).

I consider that *L. dingophila* should be ranked as a synonym of *L. serrata* until some anatomical differences be noted. The latter is known to infest in its adult condition, not only the dog, but also the wolf and fox, and occasionally the domesticated animals and man.

Dipylidium caninum, L.

Dr. Bancroft's material contained a number of specimens —some being only 20 mm. in length—of this cestode which commonly infests cats and dogs in Australia. It is now recorded for the first time as a parasite of the dingo.

Ancylostoma caninum, Erc.

A few specimens, both male and female, of this species of hookworm were found amongst the Eidsvold material. *A. caninum* has already been recorded by me as occurring in dogs and occasionally in cats in Queensland, and in the former host in several other States of Australia.

Other Parasites.

As Australian sheep harbour the cystic stage, not only of the hydatid cestode, but also of *Tænia hydatigena* (*T. marginata*, *Cysticercus tenuicollis*), a parasite sometimes met with in local dogs, it is not unlikely that the dingo may be parasitised by both of these species in sheep country.

In south-eastern Australia rabbits are often infested with the bladderworm stage of *Tænia pisiformis* (syn. *T. serrata*; *Cysticercus pisiformis*) and *Multiceps serialis* (syn. *Tænia serialis*; *Cœnurus serialis*), both of these helminths reaching maturity in dogs. No doubt the dingo becomes infected in Victoria and New South Wales, and perhaps elsewhere, in rabbit-infested districts.

Amongst the nematodes known to parasitise dogs, two are not uncommon in Australia, viz., *Dirofilaria immitis*, Leidy and *Toxocara* (*Toxascaris*) *canis*. The former infests the right heart and has been recorded from the coastal regions of Queensland and from Western Australia, while the latter has been reported from most of the States. It is not unlikely that both may be found in the dingo.

There are then three known parasites of *Canis dingo*, viz., *Dipylidium caninum*, *Ancylostoma caninum* and *Linguatula serrata*, all of which are known in Australia as entozoa of the domestic dog. The hydatid most probably occurs, and the presence of several other cestodes and nematodes is not unlikely*.

LITERATURE.

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*Gilruth, Sweet and Dodd (Parasitology 4, 1911, p. 1) have referred to the presence of bodies resembling *Anaplasma marginale*, Theiler, in the blood of a young dingo, three months old, in the Melbourne Zoological Gardens.