

Observations on certain aspects of the biology of the fowl tapeworm *Cotugnia digonopora* (Pasquale, 1890) Diamare 1893

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(Received for publication; April 16, 1970)

A survey of various helminths of poultry in Kerala has revealed that nearly 8% of the chickens were infected with the tapeworm, *Cotugnia digonopora*. However, very little is known of the biology of this important tapeworm. Some information on the life-cycle of this cestode has been made available by Chand (1964); he found that the species of ants involved in the life-cycle is *Monomorium (Holcomyrmex) scabriceps* in North India (personal communication). The present report deals with two species of newly discovered ants which serve as the intermediate hosts and prepatent period of this tapeworm and periodicity in the discharge of ripe proglottids by host birds.

Materials and Methods

During a routine screening of various species of ants from different poultry farms in Trivandrum, Kerala, for the cysticercoids of *Raillietina tetragona*, two species of ants were found to harbour a different type of cysticercoids. Studied alive and after clearing in lactophenol, these cysticercoids were identified to be those of *C. digonopora*. The cysticercoids were fed to 15 twentyfour-day old White Leghorn chickens in normal physiological saline with the aid of a clean dropper. Seven birds were given one cysticercoid each

This research has been financed by a grant, FG-In-387, by the United States Department of Agriculture, under PL-480.

and eight birds 30 cysticercoids each. The infected birds were maintained on adequate diet. The faeces were collected from tenth day after infection of the birds, twice a day, at 9 a.m and 3 p.m. After the birds started passing gravid segments, the faeces were collected six times a day, at 6 a.m., 9 a.m., 12 noon, 3 p.m., 6 p.m., and 9 p.m. and the segments were counted to determine the periodicity of segment discharge by the host birds. The specimens recovered on autopsy were stained and identified to be *C. digonopora*. Two birds, given one cysticercoid each, were subjected to 96 hours of starvation, ten days after the maturity of the tapeworm and afterwards brought back to normal feeding. Segment count was made during these periods.

Results

The two species of ants which harboured the cysticercoids of *C. digonopora* were found to be *Monomorium gracillimum* (F. Smith) and *M. destructor* (Jerdon). Of 633 ants of the former species, 142 (22.3%) yielded a total of 489 cysticercoids and of 655 ants of the latter species, 5 (0.76%) yielded only 10 cysticercoids. The number of cysticercoids in *M. gracillimum* and *M. destructor* varied from 1 to 11 and 1 to 3 respectively.

The cysticercoids are elliptical, with a sharp notch at one of the poles marking the invaginated scolex. The calcareous corpuscles

are more or less of uniform size and evenly distributed except on the sides of the notch, where they occur in large numbers. Rostellum is armed with a double row of hooks and suckers are unarmed and highly muscular (Fig. 1).

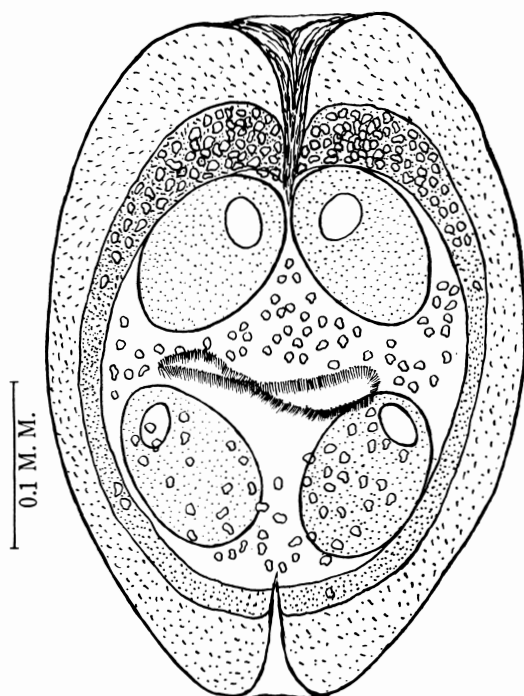


Fig. 1 Cysticercoid of *C. digonopora*.

The cysticercoids took, on an average, 24.2 days to attain maturity with a range of 22 to 26 days. Twelve of the 15 experimental birds took up infection (80%). The gravid segments measure 3.5-6.5×1.5-3.5 mm and are rectangular, creamy-white, fleshy and opaque. It was noted that maximum number of gravid segments was passed between 6 a.m. and 12 noon. Birds with single worm infection discharged greater number of segments than birds with several worms. On autopsy, 1 to 18 worms were recovered from the birds which had received 30 cysticercoids each. Average number of worms harboured by a bird was 8.5.

When the host birds were starved, there was marked fall in the number of segments discharged and the birds ceased to discharge

segments when starved for 96 hours. During starvation one bird eliminated a strobila measuring 110×4mm and another bird neither eliminated any strobila nor could we recover any worm from it on autopsy. But the bird which had eliminated the strobila, when brought back to normal feeding, began to discharge gravid segments from 11th day onwards.

Discussion

In our studies, although almost equal numbers of the two species of ants, *Monomorium gracillimum* and *M. destructor* were examined for cysticercoids, a higher percentage of incidence was found in the former than in the latter. *M. gracillimum* appears to be a more suitable intermediate host for *C. digonopora* than *M. destructor*. Chand (1964) found only 0.04% incidence in *M. scabriceps* and the maximum number of larvae obtained from ont was 8: whereas we found 22.3% incidence in *M. gracillimum* and 0.76 % incidence in *M. destructor* and the number of cysticercoids obtained from an ant ranged between 1 and 11.

Another interesting finding is that although we obtained large numbers of cysticercoids during March and April 1969, none could be recovered during the rest of the months. Our measurements of the live cysticercoids more or less agree with those of Chand (1964); but the suckers are larger in size and there are more rostellar hooks in our specimens (Table 1).

Chand (1964) reported that the minimum prepatent period for *C. digonopora* is 22 days. We found that the average prepatent period is 24.2 days with a range of 22 to 26 days, and that the infective dose has no appreciable influence on the prepatency. The percentage of cysticercoids developed to maturity was 57 and 21 in the two groups of birds, each of which had received one and several cysticercoids respectively. It was further noted that the former group discharged more gravid segments than the latter.

Chand (1964) found that the largest number

Table 1 Measurements of live cysticercoids of *C. digonopora* in microns

Authors	Entire cysticercoids	Cyst wall (at the middle)	Suckers	Rostellum		
				Diameter	No. of hooks	Length of hooks
Chand (1964)	393×288	—	73-78×62-73	103-46	238-286	10.8-11.2
Present authors (1970)	375-500×250-300	18-37.5	100-124×68-71.3	125-137.5	275-330	12.4-18.0

of segments was shed between 7 a.m. and 3 p.m.; only very few between 3 p.m. and 7 p.m. and none during the night in spite of the fact that the birds were exposed to light to enable them to feed. In our experiments the peak period of segment discharge occurred between 6 a.m. and 12 noon and the number of segments shed during the rest of the period was very much reduced. Contrary to the observation of Chand (1964) our experimental birds, even when maintained in complete darkness, discharged a few segments during night as well.

Gravid segments were found in the droppings of one of the starved birds, from the 11th day after resumption of normal feeding, indicating the ability of *C. digonopora* for regeneration as demonstrated in *Raillietina cesticillus* by Reid (1942 a, b). It was intriguing that no worm was eliminated by the other starved bird and that no part of the worm could be recovered from it on autopsy. Since the scolex of this cestode is big enough to the naked eye, there was little chance for missing it during autopsy. It is likely that the worm might have been digested in the starved birds. We observed a similar phenomenon in our experiments with *Raillietina tetragona* (data unpublished). Reid (1940, 1942 a, b) found that starvation of the host for 24 to 48 hours resulted in the elimination of strobila or partly digested segments and that the scolex of *R. cesticillus* retained the ability for regeneration.

Summary

Two species of ants, *Monomorium gracillimum* and *M. destructor* are recorded from India as intermediate hosts for the fowl cestode *C. digonopora*. The incidence of

cysticercoids is higher in natural populations of *M. gracillimum* (22.3%) than in *M. destructor*. Data based on observations on 15 experimental birds indicated that the prepatent period ranged from 22 to 26 days with an average of 24.2 days. The peak period of segment discharge by the infected birds occurred between 6 a.m. and 12 noon. Starvation of the host birds resulted either in the elimination of strobila or digestion (?) of the entire worm.

Acknowledgements

Grateful acknowledgements are made to Dr. R.I. Sailer of the Entomology Research Division, United States Department of Agriculture for the identification of the ants to species, and to Dr. L.F. Khalil, Commonwealth Bureau of Helminthology for confirmation of the cestode. Thanks are also due to the authorities of Mar Ivanios College, Trivandrum for space and facilities.

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