Med. J. Malaysia Vol. XXXII No. 2, December, 1977

Moniliformis moniliformis Bremser (Moniliformis dubius, Mayer) and its prevalence in Rattus spp. in Penang, Malaysia

by Khairul Anuar, A.
School of Biological Sciences
Universiti Sains Malaysia
PENANG

Introduction

MONILIFORMIS MONILIFORMIS which was formerly included in the Nemathelminthes is now recognised as a separate phylum, which is placed in immediate sequence to the Cestoidea, to indicate that the Acanthocephala are more closely related to the tapeworms than to any other group in the Animal Kingdom (Van cleave in Faust and Russel, 1964).

Though *Moniliformis moniliformis* is cosmopolitan in its distribution till now there is no publication pointing out its existence in Malaysia, though the parasite Acanthocephala has been reported (Dunn *et al* 1968; Sandosham, 1953, 1957) in Malayan rats. There has been no attempts made to describe the various species.

In the present paper the author presents the first record of the parasite namely *Moniliformis moniliformis* in this country.

Materials and methods

The parasites were obtained from rats caught on the Island of Penang. A total of 180 host animals were examined. Most of the parasite were found in the anterior region of the small intestine. The parasites were removed carefully from the small intestine without damaging the proboscis. The parasites were placed in tap water for at least 2 hours until the proboscis were fully extended without retraction. Later the parasites were fixed in 10% formalin. Some were stained with Acetocarmine and Creosote before mounting in Canada balsam. Drawings were made from stained and fresh specimens with the aid of micro-slide projector. Measurements were made from 50 females, 25 males and 100 eggs.

Description of the parasites

Adult Worms

The body is whitish or creamy-white in colour, attenuated at both extremities. The worm is elongated, cylindrical with pseudocoel. The body of the worm is divided superficially into a series of pseudosegments, except at anterior and posterior ends (Fig. 1).

The size is variable, the male is smaller than the female. The male measures 32–89 mm (mean 60.5) in length with a maximum width of 0.6 – 1.2 mm (mean 0.9) and have a capsulated bursa while the female measures 100–183 mm (mean 142) in length and a maximum width of 0.99 – 2.7 mm (mean 1.8). The cylindrical proboscis is protrusible, slightly spindle shaped, armed with 12 longitudinal rows of curved hooks, 9–11 hooks to each row, each measuring 0.018 – 0.024 mm. The proboscis measures from 0.503 – 0.635 mm, and maximum diameter of 0.095 – 0.108 mm (Fig. 1B and C). The proboscis is connected to the proboscis receptable, which is a closed muscular sac. Its wall contains two layers of diagonally arranged muscle fibres showing a spiral pattern. This structure measures 0.738 – 1 mm by 0.297 mm. The retractor muscle runs from near the base of the proboscis through the receptable and is inserted on the trunk wall. Near the base of the receptacle the nerve ganglion is vaguely visible as a dense spot and measures 0.476 mm by 0.214 mm from which the two retinacula originate.

There are two elongated structures of unknown function called lemnisci (Fig. 1) which lie in the body cavity and measures 3.3 – 5.5 mm long by 0.130 – 0.150 mm wide.

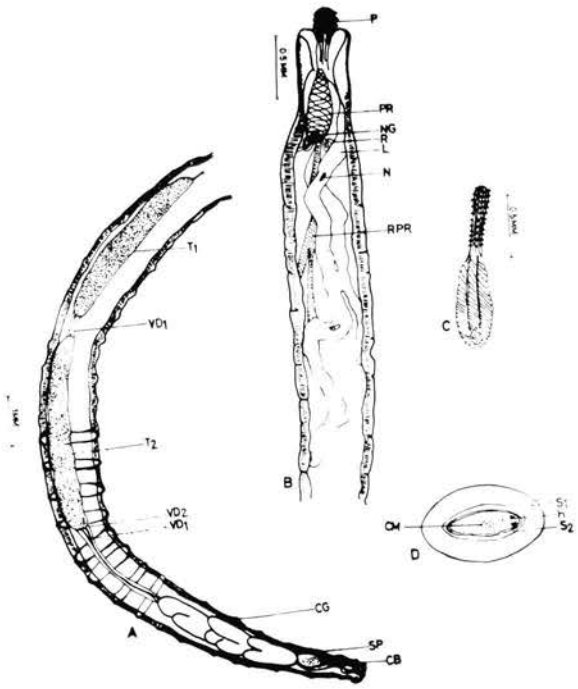

Fig. 1 *Moniliformis moniliformis,* **Bremser**
A. Posterior end of male; B. Anterior end; C. Proboscis and proboscis receptacle; D. Egg; CB. Copulatory bursa; CG. Cement glands; CM. Central nuclear mass; H. hooks; L. Lemnesci; N. Giant nucleus; Ng. Nerve ganglion; P. Proboscis; PR. Proboscis receptacle; R. Retinaculum; R.P.R. Retractor muscle; S1. Outer shell; S2. Inner shell; SP. Saefftigen's pouch; T1. and T2. Testes; VD1 and VD2. Vasdifferens.

The males have two testes. The testes which are long and bean shaped, deposited one behind the other and measures 3 – 4 mm by 0.75 mm. The testes are connected by vasdeferens.

Posterior to the testis are found 8 cement glands which are grouped together and forms a syncytial mass. Immediately after the cement glands are found the Saefftigens pouch through which run the sperm ducts and ducts from the cement glands before they unite at the posterior end. The posterior end is furnished with a bursa.

Eggs

The eggs are ellipsoidal and provided with three characteristic envelopes; the outer shell, inner shell and the middle layer. The egg is embryonated and the embryos possess rostella hooks. The eggs measure 0.102 – 0.119 mm (mean 0.111) by 0.046 – 0.065 mm (mean 0.055) (Fig. 1D).

Discussion

The description of the species *Moniliformis moniliformis* was obtained from the rats collected in Penang, the measurements fits closely the description of Chandler's material (Chandler, 1941; Petrochenko, 1971).

The proboscis is a diagnostic feature of the group. The proboscis is spindle shaped and the number of hooks 12 in longitudinal rows and 9–11 in each row points out that those specimens belong to the species *Moniliformis moniliformis*. This species was obtained from rats and *Moniliformis moniliformis* is a parasite primarily of rodents, (Golvan, 1964).

Slight variation in measurement is expected as Chandler (1941) stated that body size is enormously influenced by the age of the worm, the worm load, presence of worm from prior infection, the position of worm in the intestine of the host and the host itself.

The shape of the egg and measurements tally with that of Chandler's description. Thus this species is confirmed as *Moniliformis moniliformis*.

The prevalence of this parasite on Penang Island is relatively high. The city rat (predominantly *Rattus norvegicus*) carried about 7.3% infection rate while in the field rats (predominantly *Rattus argentiventer* and *R. diardi*) the rate of infection was 21.4%, Table I. The intermediate host of this worm is cockroaches and cockroaches are very commonly found in Penang. Human infections have been reported in some parts of the world (Beck, 1959; Faust and Russell, 1964). As such the existence of a suitable intermediate host and the high prevalance of the worm among the field rats could pose a threat to human health. This also confirms the finding of Khairul Anuar and Paran (1976) that the roaches in the field had a high infection rate of cystacanth.

Table I

Prevalence of Acanthocephala (*Moniliformis moniliformis* Bremser) among City and Field rats in Penang.

PARASITE	No. Infected			
	City Rat		Field Rat	
	No.	%	No.	%
Acanthocephala:				
Moniliformis moniliformis	8 (110)	7.3	15 (70)	21.4

*Number in Parenthesis show the total number of rats examined in the particular area.

Thus there can be little doubt that the materials obtained from *Rattus sp.* in Malaya by previous researchers was also *Moniliformis moniliformis*.

Acknowledgement

The author wishes to express his sincere thanks to Professor C.P. Ramachandran, for his support, to Encik Lim Boo Liat of Medical Ecology, IMR, for his kind suggestion. Special thanks to friends and colleague Dr. T.P. Paran and Dr. S.J. Chapman for their invaluable comments. Thanks also extended to Encik Ibrahim Mohammad and Norma for technical assistance.

References

Beck, J.W. (1959) Report of a possible human infection with Acanthocephalan, *Moniliformis moniliformis* (Syn. *Moniliformis dubius*). Research note, *J. Parasite,* **45:** 510.

Chlandler, A.C. (1941) The specific status of *Moniliformis* (Acanthocephala) of Texas rats, and a review of the species of the Genus in the Western Hemisphere. *J. Parasit.*, **27:** 241–244.

Dunn, F.L., Lim, B.L. and Yap, L.F. (1968) Endoparasite patterns in mammals of the Malayan Rainforest. *Ecology.* **49:** 1179–1183.

Faust, E.C. and Russell, P.F. (1964) Clinical Parasitology. 7th ed. Lee & Febiger, Philadelphia. pp. 698–703.

Golvan, J. (1964) An Illustrated Key to the genera of Acanthocephala, Universite de Paris, Faculte de Medicine, Institut de Parasitologie, 33 pp.

Khairul Anuar, A. and Paran, T.P. (1976) *Periplaneta americana* (L) as intermediate host of *Moniliformis moniliformis* (Bremser) in Penang, Malaysia. *Southeast Asian J. Trop. Med. and Pub. Hlth.*, **7:** 415–416.

Moore, D.V. (1946) Studies on the life history and development of *Moniliformis moniliformis,* 1933. *J. Parasit,* **32:** 257.

Petrochenko, V.I. (1971) Acanthocephala of Domestic and wild animals. Translated by R. Lavoott. I.D.S.T., Jerusalem.

Sandosham, A.A. (1953) Preliminary note on the incidence of worm infection in common hosts. *Stud. Inst. Med. Res. Mal.*, **26:** 23–28.

Sandosham, A.A. (1957) Infection of animals by major groups of helminths: An interim tabulation. *Stud. Inst. Med. Res. Mal.*, **28:** 403–408.

Schacher, J.F. and Cheong Chee-Hock (1960) Nematode parasites of three common house rat species in Malaya with notes on *Rictularia tani* Hoeppli, 1929. *Stud. Inst. Med. Res. Mal.*, **29:** 209–216.