A SURVEY OF HELMINTH INFECTION
IN RATS (RATTUS SPP) FROM CHIANG MAI MOAT

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Abstract. An investigation of helminths in the Norway (brown) rat, Rattus norvegicus, and roof rat, Rattus rattus, from Chiang Mai Moat during May to August 1995, was done. Thirty-three out of thirty-eight trapped rats were infected (86.84 %); 16 R. norvegicus (100 %) and 17 / 22 R. rattus (77.27 %). The rat was infected with 10 helminth species; 4 trematodes, Centrocestus sp (2.63 %), Echinostoma ilocanum (10.52 %), Echinostoma malayanum (10.52 %) and Quinqueseralis quinqueseralis (39.47 %); 2 cestodes, Raillietina sp (36.64 %) and Taenia sp (cysticercus) (7.89 %); and 4 nematodes, Angiostrongylus cantonensis (42.10 %), Nippostrongylus sp (34.21 %), Rictularia sp (52.63 %) and egg of Capillaria hepatica (7.89 %). The helminths were found in the small intestine (84.21 %), large intestine (42.10 %), lung (36.64 %), stomach (28.94 %), heart (23.94 %), and liver (15.78 %). The female Norway rats were infected with 10 species of helminths and the males with 6 species.

INTRODUCTION

Helminths parasitized rats are of special interest due to the role of rat as reservoirs of many important parasites of man. There have been a number of reports of helminthic infection in rats in Thailand, but few have been reported from Chiang Mai (Titatsut and Poonvit, 1969; Bhaidikul et al, 1984). The present study carried out species identification, determination of prevalence and intensity of helminths. The investigation was carried out for the purpose of securing additional information on the helminths of local rats and the possibility that the information may contribute to public health or veterinary interest.

MATERIALS AND METHODS

Rats were collected from Chiang Mai Moat during May to August 1995. Their visceral organs, heart, lungs, livers, stomach, small intestine, and large intestine were examined for helminths. The worms were removed, counted, fixed and preserved in 10 % formalin. For identification, trematodes and cestodes were stained with Borax’s carmine or hematoxylin, counter-stained with fast-green and mounted in Canada balsam. Nematodes were cleared and temporarily mounted in alcohol - glycerine.

RESULTS

Thirty-eight rats consisting of 16 Norway (brown) rats, Rattus norvegicus, and 22 roof rats, Rattus rattus, were trapped. The results are shown in Table 1. A total of 33 specimens (86.84 %) were found to be positive for parasites; 16 R. norvegicus (100 %) and 17 R. rattus (77.27 %). Ten species of helminths were recovered; 4 trematodes, 2 cestodes, and 4 nematodes. The number of helminthic species found in female and male R. norvegicus, were 10 and 6 respectively while 7 and 6 were found in female and male R. rattus.

Table 1

Prevalence of helminths infection in rats collected from Chiang Mai Moat.

<table>
<thead>
<tr>
<th>Species of rat</th>
<th>No. examined</th>
<th>No. positive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rattus norvegicus</td>
<td>16</td>
<td>16 (100.00)</td>
</tr>
<tr>
<td>Female</td>
<td>10</td>
<td>10 (100.00)</td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>6 (100.00)</td>
</tr>
<tr>
<td>Rattus rattus</td>
<td>22</td>
<td>17 (77.27)</td>
</tr>
<tr>
<td>Female</td>
<td>13</td>
<td>9 (69.23)</td>
</tr>
<tr>
<td>Male</td>
<td>9</td>
<td>8 (69.23)</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>33 (86.84)</td>
</tr>
</tbody>
</table>
The prevalence and intensity of helminths are shown in Table 2. The parasites were dominated by nematode *Rictularia* sp (Figs 1-4), the other parasites frequently found were *Angiostrongylus cantonensis*, *Quinqueseralis quinqueseralis* (Fig 5), *Raillietina* sp, *Nippostrongylus* sp, *Echinostoma ilocanum*, *E. malayanum*, *Taenia* sp (cysticercus), *Capillaria hepatica* (eggs) and *Centrocestus* sp (Fig 6). The worms were found in small intestine (84.21 %), large intestine (42.10 %), lung (36.64 %), stomach (28.94 %), and liver (15.78 %).

Table 2

Site of infection, prevalence and intensity of helminth infection in rats collected from Chiang Mai Moat.

<table>
<thead>
<tr>
<th>Helminth species</th>
<th>Site of infection</th>
<th>Prevalence (%)</th>
<th>Intensity range (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Trema</em> sp</td>
<td>SI</td>
<td>2.63</td>
<td>0-3 (0.080)</td>
</tr>
<tr>
<td><em>Centrocestus</em> sp</td>
<td>SI</td>
<td>23.68</td>
<td>1-23 (1.50)</td>
</tr>
<tr>
<td><em>Echinostoma ilocanum</em></td>
<td>SI</td>
<td>10.52</td>
<td>1-261 (7.70)</td>
</tr>
<tr>
<td><em>Echinostoma malayanum</em></td>
<td>SI</td>
<td>8.52</td>
<td>1-231 (25.70)</td>
</tr>
<tr>
<td><em>Quinqueseralis quinqueseralis</em></td>
<td>LI</td>
<td>39.47</td>
<td>1-231 (25.70)</td>
</tr>
<tr>
<td><em>Cestode</em> sp</td>
<td>SI</td>
<td>36.84</td>
<td>1-6 (1.10)</td>
</tr>
<tr>
<td><em>Raillietina</em> sp</td>
<td>SI</td>
<td>7.89</td>
<td>0-1 (0.080)</td>
</tr>
<tr>
<td><em>Taenia</em> sp (cysticercus)</td>
<td>LI</td>
<td>7.89</td>
<td>0-1 (0.080)</td>
</tr>
<tr>
<td><em>Nematodes</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Angiostrongylus cantonensis</em></td>
<td>H, L</td>
<td>42.10</td>
<td>1-53 (5.90)</td>
</tr>
<tr>
<td><em>Nippostrongylus</em> sp</td>
<td>SI</td>
<td>34.21</td>
<td>1-21 (2.10)</td>
</tr>
<tr>
<td><em>Rictularia</em> sp</td>
<td>SI, SI, ST</td>
<td>52.63</td>
<td>1-102 (12.6)</td>
</tr>
<tr>
<td><em>Capillaria hepatica</em> (eggs)</td>
<td>LI</td>
<td>7.89</td>
<td>-</td>
</tr>
</tbody>
</table>

* H = Heart, L = Lung, Li = Liver, SI = Large intestine, SI = Small intestine, ST = Stomach

DISCUSSION

Trapped rats in this study area belonged to two species, *R. norvegicus* and *R. rattus*. The high prevalence rate of individual infection (86.84 % in *R. norvegicus* and 77.27 % in *R. rattus*) and rather high susceptibility to helminthic infections (10 species) indicate that rats in this area are highly infected with various parasites, some of which are transmittable to man such as *E. ilocanum* (Radomys et al, 1982; Cross and Basaca-Sevilla, 1986), *E. malayanum* (Sornmani, 1969; Cross and Basaca-Sevilla, 1981), and *A. cantonensis* (Margono and Ilahude, 1974).

The parasitic infection of two species of rats appeared to be dominated by nematode *Rictularia* sp (Figs 1-4). Twenty of 38 rats (52.63 %) contained this worm in the small intestine, large intestine and stomach. The identification of *Rictularia* of mammals and rodents was based mainly on comblike spines, oral papillae, buccal capsule and caudal papillae. Only two species of *Rictularia* were found in rats (Rattus sp) : *Rictularia ratti* (in *R. norvegicus*) and *Rictularia tani* (in *R. norvegicus* and *R. whartoni*) (Yamaguti, 1961). Our specimens were compared in detail, number of combs and spines, caudal papillae, and spicules, with *R. tani* and males *R. taterillii* (Linquist and Li, 1954), they were closest to *R. tani*. However, the difference between the size of *R. tani* and the present materials difficult to determined to species. In addition, *R. tani* was first reported from *R. r. diardii* and *R. bartelsii* (Wiroreno, 1978). Our study also shows the first record of *Rictularia* infection in *R. rattus* in Chiang Mai.
Fig 1-4 Rictularia sp: 1-2. Anterior and posterior part of female 3-4. Anterior and posterior part of male

Fig 5 - Quinquerseralis quinquesseralis WM

Fig 6 - Centrocestus sp WM

Angiostrongylus cantonensis, a rat lung worm causing eosinophilic in man and widely distributed in Southeast Asia and Pacific area, was found highly prevalent (42.10%) in rats examined. In this survey, the worms were recovered from lungs (36.64%) and heart (23.68%). A. cantonensis has been reported in 3 species of rats, R. exulans, R. rattus and Bandicota indica, in some districts of Chiang Mai and Lampoon Province (Titasut and Poovnt, 1969), and in R. rattus and B. indica from Phitsanulok and Khon Khaen Province, Thailand (Impand et al., 1983). The larvae of this worm have been observed in terrestrial and aquatic molluscs; Achatina fulica, Laevicaulis alte and Pila scutata (Margono and Ilahude, 1974). The high prevalence of A. cantonensis in this study indicates that the snails, the intermediate host, are highly infected, so the life cycle and host-parasite relationship of this worm in Chiang Mai should be studied further.

Nematode of family Heligmonellidae, Nippostrongylus sp were found in 34.21% of the rats examined. The parasite (small red worm, forming flat counter clockwise coils, ventral side located inside, the anterior end with cephalic vesicle) were recovered in the small intestine. There are some reports of Nippostrongylus in Thailand. N. brasiliensis infection was found 9% in R. rattus, R. argentiventer, R. losea and B. indica from Phitsanulok and Khon Khaen Province (Impand et al., 1983) and occurred 26.66% in R. argentiventer and 31.55% in B. indica collected from Nakhon Pathom Province (Achavakom, 1981). In this study, for identification, the descriptions given by Hasegawa (1990) were used.

Capillaria hepatica is cosmopolitan and is found in the liver of many species of rodents. The worms has been reported as the cause of liver disease in a wide variety of mammals including man (Neva and Brown, 1994). The prevalence of this worm can be detected by locating the characteristic eggs with bipolar plugs in the livers of infected rats. In the present study, 7.89% (12.50% in R. norvegicus and 4.54% in R. rattus) of rats examined were found to be infected. No adult worms were recovered but numerous eggs were seen in squashed liver and in stained sections. C. hepatica was found highly prevalence in R. norvegicus from different locations in Malaysia (Lim et al., 1977).

Four species of intestinal flukes, Q. quinqueseralis, E. ilocanum, E. malayanum and Centrocestus sp, occurred in 39.47%, 23.68%, 10.52%, and 2.63%, respectively. The monostome trematode, Q. quinqueseralis, which is easy to recognize by the monostome holdfast organ, oval shaped, transverse uterus, position of genital pore and filamentous eggs (Fig 5), has been found in muskrats, Ondatra zibethica, meadow voles, Microtus pennsylvanicus, and jumping mice, Zapus hudsonius, in the United States and Canada, and the worm are able to mature in 15 species of rodents (Olson, 1974). In Thailand, the worm has been reported from Nakhon Pathom Province as a natural infection in the cecum of R. argentiventer and B. indica (Achavakom, 1981). There is no report of Q. quinqueseralis infecting in man in Thailand before, and this is the first report of Q. quinqueseralis in R. norvegicus and R. rattus in Chiang Mai Province.

By studying the morphology of adult Echinostoma worms, we have identified them as E. ilocanum and E. malayanum. Intestinal echinostomiasis caused by E. ilocanum is reported from several Asian countries. The parasite is common in Ilocano, Northern Luzon, in the Philippines and sporadically found elsewhere in the country. The snails, Gyraulus sp and Pila luzonica were found to be first and second intermediate hosts in the Philippines (Cross and Basaca-Sevilla, 1986). In Thailand, the first infection in man of this worm was reported from ten patients in the Northeast (Rabomys et al., 1982). And E. malayanum has been reported infecting in man in Thailand. The life cycle of E. malayanum has been completed in the laboratory; snails, Indoplanorbis exustus, served as the first intermediate host, either I. exustus; Lymnea rubiginosa or tadpoles were second intermediate host and the metacercaria developed to adults within 21 days in mice (Sornmani, 1969). In Indonesia, freshwater snails, Viviparous javanicus and Pila scutata were reported as the secondary intermediate host of E. malayanum (Hadidjaja and Oemijati, 1969). Little is known about echinostome larva in Chiang Mai, so that the snails in the moat should be searched for Echinostoma larva.

Only one of all rats (2.63%) was found infected with Centrocestus sp (Fig 6). This is the first time that the minute intestinal fluke Centrocestus sp has been found in a rat in Chiang Mai. The worm is commonly found in mammals and birds, with the infective stage, metacecaria, in freshwater fish (Yamaguti, 1958).

The cestode infections, including 2 species, Raillietinia sp (36.64%) and Taenia sp (cysticercus) (7.89%), were found in both rats. The larval form (cysticercus) of Taenia sp was found in the liver of 3 rats. Our observation show that this parasite is common in R. norvegicus.

Forty-two adults, of Raillietinia sp were recovered from the small intestine of 10 R. norvegicus (62.50%) and 4 R. rattus (18.18%). This cestode is commonly found in birds (Yamaguti, 1959). The infection of Raillietinia sp in man in Thailand has been reported.
In the present study, the environment appears to have influence on the helminths in rats. Trematodes and nematodes were commonly recovered more than cestodes. This is probably due to the food of rats, especially snails, influencing the type of parasites acquired by rats. And it seems that the female rats are more infected than the male in both rats. The prevalence of helminthic infections between two species of rats, suggested that R. norvegicus were heavily infected with many helminth species of medical significance (100%). However, the number of rats examined was small because of difficulty to collect them.

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