# CAPILLARIASIS IN WILD RATS OF INDONESIA

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## INTRODUCTION

Nematodes of the genus *Capillaria* have been reported as the cause of liver disease in a wide variety of mammals including man (Levine, 1968). *Capillaria* hepatitis has also been reported in man (Ewing and Tildan, 1956) and *C. philippinensis* has recently been incriminated as the etiological agent of a potentially fatal intestinal disease of man in the Philippines (Whalen *et al.*, 1969). To our knowledge, the present paper documents *Capillaria* hepatitis in the Indonesian Archipelago for the first time in rodents; the only previous report being *Capillaria (Hepaticola)* from the stomach of an unspecified *Rattus* (Adiwinata, 1955).

## MATERIALS AND METHODS

Between 1971 and 1974, a systematic survey of rodent parasites was conducted throughout Indonesia. Rats were routinely necropsied. If macroscopic evidence of liver pathology was seen, a portion of this organ was preserved in 10% formalin. The tissues were embedded in paraffin, sectioned at 5 microns, stained with hematoxylin and eosin and examined with a light microscope.

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## RESULTS

A total of 6,498 rats from the Indonesian Archipelago were examined for helminths and *Capillaria hepatica* was found in 31 specimens of the species of *Rattus* (0.5%). The number of infected rats by species is given in Table 1.

Table 1

*Rattus* species found positive for hepatic capillariasis in Indonesia.

| Rats | No. pos./ No. exam. | Per cent positive |
|---|---|---|
| *Rattus argentiventer* | 2/240 | 0.8 |
| *Rattus bartelsii* | 6/220 | 2.7 |
| *Rattus diardii* | 5/812 | 0.6 |
| *Rattus exulans* | 6/3182 | 0.2 |
| *Rattus niviventer* | 2/83 | 2.4 |
| *Rattus sabanus* | 2/13 | 15.4 |
| *Rattus rattus palelae* | 1/926 | 0.1 |
| *Rattus marmosurus* | 1/66 | 1.5 |
| *Rattus hellwaldi* | 3/20 | 15.0 |
| *Rattus hoffmanni* | 1/209 | 0.5 |
| *Rattus musschenbroekii* | 1/4 | 25.0 |
| *Rattus edwardsi* | 1/1 | 100.0 |
| *Rattus* sp. | 0/722 | |
| Total | 31/6498 | |

Hepatic capillariasis was not found in 18 species examined: *R. tiomanicus*, *R. fulvescens*, *R. norvegicus*, *R. chrysocomus rallus*, *R. dominator*, *R. nitidus*, *R. canus*, *R. cremoriventer*, *R. infraluteus*, *R. rajah*, *R.*

Table 2

Geographic locations of rats with hepatic capillariasis in Indonesia.

| Location | Latitude | Longitude | Elev.(m) | No. pos./No. exam.* | Per cent |
|---|---|---|---|---|---|
| **Java** | | | | | |
| Cibodas | 6°45′S | 107°00′E | 1,350 | 12/409 | 2.9 |
| Cikurai | 6°12′S | 105°56′E | 60 | 4/151 | 2.6 |
| Ciloto | 6°43′S | 107°01′E | 1,180 | 2/4 | 50.0 |
| **Kalimantan** | | | | | |
| Tamban Luar | 3°13′S | 114°22′E | 10 | 1/8 | 12.5 |
| **Sulawesi** | | | | | |
| Lake Lindu | 1°19′S | 120°05′E | 950 | 8/449 | 1.8 |
| Eno | 2°16′S | 119°53′E | 1,140 | 1/20 | 5.0 |
| **Sumatra** | | | | | |
| Pangkalan Sudu | 4°67′N | 98°13′E | 10 | 1/23 | 4.3 |
| Prapat | 2°40′N | 98°56′E | 950 | 1/15 | 6.7 |
| Labuhan Ruku | 3°12′N | 99°33′E | 10 | 1/31 | 3.2 |

* Number examined includes all rats necropsied, including those whose liver tissues were examined histologically.

*surifer*, *R. mulleri*, *R. whiteheadi*, *R. ramboinensis*, *R. alticola*, *R. celebensis*, *R. adspersus* and *R. rattus sumbae*. Because of the low overall prevalence, failure to detect the disease in these species could have been due to chance.

Geographic location and disease prevalence are shown in Table 2. The highest prevalence rate—where hundreds of animals were available for study—was at Cibodas, W. Java (2.9%).

*Capillaria hepatica* has been found in rats from the major Indonesian islands (Java, Kalimantan, Sulawesi and Sumatra) (Table 3) at elevations varying from sea level to 1,350 meters. Infections were found in urban and rural areas of Java, in remote high mountain valleys of Sulawesi, and in rural areas of Kalimantan (Borneo) and Sumatra. The higher observed prevalences on Java and Sumatra, although statistically significant ($P < .05$), differed little from the overall rate.

No adult worms were removed intact. Eggs, viewed in stained sections, were measured and are tabulated in Table 4. Variation in egg size may have been due to shrinkage and compaction during formalin fixation and processing.

Table 3

Prevalence of hepatic capillariasis in rats on various islands of Indonesia.

| Island | No. pos./ No. exam. | Per cent positive |
|---|---|---|
| Ambon | 0/19 | 0.0 |
| Kalimantan | 1/114 | 0.9 |
| Ceram | 0/1 | 0.0 |
| Flores | 0/11 | 0.0 |
| Java | 18/2,021 | 0.9 |
| Sulawesi | 9/4,063 | 0.2 |
| Sumatra | 3/137 | 2.2 |
| Timor | 0/132 | 0.0 |
| Total | 31/6498 | |

Grossly, the infected livers evidenced multiple, white pinpoint foci which could be found in all lobes. Microscopically, eggs were generally in clusters replacing hepatocytes and elicited a mild fibroblastic granulomatous response (Fig. 1).

Table 4

Capillaria infection in the liver of Indonesian rats: egg measurements in microns.

| Species | No. of eggs measured | Measurements in microns | | | | | |
|---|---|---|---|---|---|---|---|
| | | Length | | | Width | | |
| | | Range | Mean | S.D. | Range | Mean | S.D. |
| *Rattus bartelsii* | 6 | 63-66 | 64 | 1.6 | 30-36 | 32 | 2.7 |
| *Rattus sabanus* | 10 | 50-53 | 52 | 1.6 | 23-30 | 27 | 2.9 |
| *Rattus exulans* | 10 | 50-56 | 53 | 2.0 | 23-30 | 26 | 2.1 |
| *Rattus diardii* | 5 | 46-53 | 50 | 2.9 | 26-33 | 30 | 2.9 |
| *Rattus niviventer* | 10 | 50-53 | 52 | 1.3 | 26-30 | 28 | 2.1 |
| *Rattus musschenbroekii* | 0 | - | - | - | - | - | - |
| *Rattus hellwaldi* | 10 | 53-59 | 56 | 1.7 | 23-30 | 27 | 2.5 |
| *Rattus hoffmanni* | 10 | 53-59 | 57 | 2.4 | 23-30 | 26 | 1.8 |
| *Rattus edwardsi* | 3 | 53-56 | 54 | 1.7 | 23-26 | 25 | 1.7 |
| *Rattus argentiventer* | 7 | 50-53 | 52 | 1.5 | 26-30 | 28 | 2.1 |
| *Rattus rattus palelae* | 10 | 50-56 | 52 | 2.5 | 23-30 | 25 | 2.3 |
| *Rattus marmosurus* | 10 | 50-59 | 56 | 2.6 | 23-30 | 29 | 2.5 |

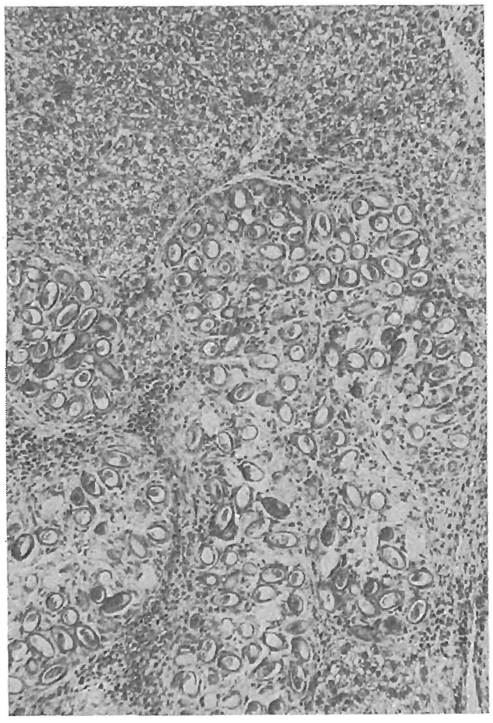

Fig. 1—*Capillaria* hepatitis in an Indonesian rat. Note the mild granulomatous response consisting of sparse fibroplasia and lymphocyte accumulation. H & E x100.

## DISCUSSION

*Capillaria* eggs compatible with the description of *C. hepatica* (Wright, 1961) occurred in a wide variety of *Rattus* spp. in Indonesia. To our knowledge, the only other extensive examination for rodent helminths in Indonesia was limited to one geographical area near Bojolali in Central Java at altitudes of 900-1,900 meters (Cross *et al.*, pers. comm., 1974). *C. hepatica* eggs were not observed in over 1,000 rat livers examined from that region. Hepatic capillariasis, however, is obviously widespread throughout the Indonesian islands and has been reported in one of 55 rats of unknown species by the Museum Zooligicum Bogoriense. Prevalence rates are low; this agrees with data available from Malaysia where infections were not found in *R. norvegicus* from Singapore or Kuala Lumpur (Schacher and Cheong, 1929). Only very low infection rates were seen in *R. r. diardii* (1.8%) and *R. exulans* (0.6%) from Kuala Lumpur. Furthermore, the latter two species from Singapore were also found to be negative.

No human cases of capillariasis have been reported in Indonesia, although the disease has been reported in humans in the Philippines, Hawaii and India (Marcial-Rojas, 1971).

## SUMMARY

Hepatic capillariasis, presumably due to *Capillaria hepatica*, occurred in 12 species of *Rattus* from four major islands of Indonesia: Java, Kalimantan, Sulawesi and Sumatra. Prevalence rates were generally less than 1% where statistically significant numbers of animals were available for study. However, at individual locations where a diagnosis of capillariasis was made, prevalence rates were sometimes higher.

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