

## Identification of endoparasites in rats of various habitats

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### Abstrak

**Latar belakang:** Tikus merupakan hewan yang habitatnya berdekatan dengan lingkungan manusia. Keberadaannya merupakan faktor resiko penularan beberapa jenis penyakit zoonosis. Penelitian ini bertujuan untuk mengetahui jenis tikus di habitat pemukiman, kebun, sawah, dan pasar di Kabupaten Banjarnegara, serta mengidentifikasi zoonotik endoparasit yang terdapat pada organ hati, lambung, usus dan sekum tikus.

**Metode:** Penangkapan tikus dilakukan di 3 kecamatan selama Juli - Oktober 2012. Observasi endoparasit dilakukan pada organ hati dan saluran pencernaan yang meliputi lambung, usus dan sekum. Analisis data secara deskriptif dengan menggambarkan spesies tikus dan endoparasit yang didapat.

**Hasil:** Spesies tikus yang tertangkap dalam penelitian ini adalah *Rattus tanezumi*, *Rattus exulans*, *Rattus tiomanicus*, *Rattus argentiventer*, *Rattus norvegicus* dan *Suncus murinus*. Spesies endoparasit yang menginfeksi hati tikus adalah *Capillaria hepatica* dan *Cysticercus Taenia taeniaeformis*. Endoparasit yang menginfeksi organ lambung tikus adalah *Mastophorus sp.* dan *Gongylonema neoplasticum*. *Nippostrongylus brassilliensis*, *Hymenolepis diminuta*, *Hymenolepis nana*, *Moniliformis sp.* dan *Echinostoma sp.* ditemukan menginfeksi organ usus tikus, sedangkan *Syphacia muris* ditemukan menginfeksi organ sekum. Tidak ditemukan jenis endoparasit yang menginfeksi lebih dari satu jenis organ tikus.

**Kesimpulan:** Endoparasit tikus yang bersifat zoonosis dalam penelitian ini adalah *Capillaria hepatica*, *Gongylonema neoplasticum*, *Hymenolepis diminuta*, *Hymenolepis nana* dan *Syphacia muris*. Tiap jenis endoparasit menginfeksi organ yang spesifik pada tikus. (*Health Science Indones 2014;1:49-53*)

**Kata kunci:** tikus, endoparasit, zoonosis.

### Abstract

**Background:** Rat is an animal living around people. It is a risk factor for several types of zoonotic diseases. The aims of this study were to determine the rat species from various habitats including houses, gardens, rice fields, and traditional market from a district in Central Java province and to identify endoparasites that infected the liver, stomach, intestine and caecum of these rats.

**Methods:** The rats were caught in three sub districts in Central Java from July to October 2012. The study was analysis descriptively by describing the species of rats and endoparasites.

**Results:** Rat species caught were *Rattus tanezumi*, *R. exulans*, *R. tiomanicus*, *R. argentiventer*, *R. norvegicus* and *Suncus murinus*. Endoparasites that infected the liver were *Capillaria hepatica* and *Cysticercus Taenia taeniaeformis*. Endoparasites infecting the stomach were *Mastophorus sp.* and *Gongylonema neoplasticum*. *Nippostrongylus brassilliensis*, *Hymenolepis diminuta*, *Hymenolepis nana*, *Moniliformis sp.* and *Echinostoma sp.* were endoparasites found in the intestinal tract. *Syphacia muris* was found in the caecum. No endoparasite species were found in multiple organs.

**Conclusion:** Zoonotic endoparasites were *Capillaria hepatica*, *Gongylonema neoplasticum*, *Hymenolepis diminuta*, *Hymenolepis nana* and *Syphacia muris*. Each endoparasite infected a spesific organ. (*Health Science Indones 2014;1:49-53*)

**Key words:** rats, endoparasites, zoonoses

Rats are rodents that live around human (commensal rodentia). It may spread many diseases to human, cattle and pets. Some mechanisms of disease transmission include through saliva, urine, and feces of their parasites.<sup>1,2</sup>

Parasite is an organism that lives on or in a host and feeds itself by undermining its host. Based on its manifestation, parasites are grouped into ecto and endoparasites. Ectoparasites live on the host's surface, some of which are known as vector transmits *Yersinia pestis* and rickettsia.<sup>3,4</sup> Endoparasites live in body of their host, a majority of them are helminths. Several kinds of rat endoparasites have the potential to transmit to human. Zoonotic cases of these parasites have been reported in many countries.<sup>5-7</sup>

In 2010, thirty elementary school students in a sub district of Banjarnegara in Central Java Province were screened for helminthic infection. The report revealed that five students (17%) were infected, one of which was infected by *Hymenolepis nana*. Even though it was debatable, helminth transmission from rats to human in the sub districts remains possible.

The aim of this research was to identify endoparasites infecting liver, stomach, intestine, and caecum in rats trapped in commensal areas in Banjarnegara, Central Java Province.

## METHODS

Rats were caught using single traps from July until October 2012 in four different habitats which were houses, gardens, rice fields, and traditional markets. The 150 single traps were distributed to 50 houses for 5 days. The 50 single traps were spread in the gardens of nearby homes. In rice fields, rats were trapped by Linear Trap Barrier System (LTBS) method within 2 weeks. The LTBS is a trap of stretched fence, 100 meters in length and 0.6 meters in height supported by bamboo sticks every 1 meter and with intermittent traps every 10 meters.<sup>8</sup> The LTBS was stretched along irrigation channels which crisscrossed the rice fields with different ages of paddy. In the traditional markets, rats were trapped by 200 live traps that were distributed in stalls and hallways in the traditional markets. Rat trapping in this area was conducted for 10 days.

Trapped rats were anesthetized by using atropine and ketamine. The identification of trapped rat was based on taxonomic keys.<sup>2</sup> Necropsies were carried out

immediately after anesthesia. Rats were dissected in order to expose their liver, stomach, intestine, and caecum. The selected organs were examined for adult endoparasites under a dissecting microscope. The endoparasites were collected and preserved in AFA solution (90% alcohol, 5 % formalin, and 5 % acetate acid). Nematode specimens were examined in lactophenol. Cestode, Trematode and Acanthocephala specimens were stained in semichon's carmin and were identified based on descriptions by Yamaguti.<sup>9</sup>

## RESULTS

In total, 147 rats were successfully trapped. Five species of rat were identified, namely *Rattus tanezumi*, *R. exulans*, *R. tiomanicus*, *R. Argentiventer*, and *R. norvegicus*. *Rattus tanezumi* was the dominant species (82.3%) which was spread mostly in houses, rice fields and traditional markets. *Rattus exulans* and *R. tiomanicus* were only trapped in gardens. *Rattus argentiventer* was trapped in rice fields and *R. norvegicus* was trapped in traditional markets. Based on trapping location, rats were trapped mostly in traditional market followed by houses, gardens, and rice-fields (Table 1).

Ten species of endoparasites (Helminths) were found in the intestinal tracts of the commensal rats (Table 2). They were classified as Nematodes (5 species), Cestodes (3 species), Trematoda (1 species) and Acanthocephala (1 species). Every species was examined from specific organs. Three zoonotic species of Nematodes were *Syphacia muris*, *Gongylonema neoplasticum* and *Capillaria hepatica*. Two zoonotic species of Cestodes were *Hymenolepis diminuta* and *Hymenolepis nana*.

In Nematodes, the dominant preference for *Capillaria hepatica* was the liver, followed by *Syphacia muris* in the caecum. *Masthoporus* sp. and *Gongylonema neoplasticum* were examined from the stomach. *Nippostrongylus brassilliensis* was found in the intestine of rats. In the Cestode subclass, *H. diminuta* was examined in all species of rats, of which the highest prevalence was *R. tanezumi* (20 rats). *Hymenolepis nana* infected the intestine of eight *R. tanezumi* (5.4%). *Rattus tanezumi* was a species of rat that was mostly infected by endoparasites. All endoparasites were found in this species. *Rattus exulans* was the least infected rats by endoparasites, with a number of three infected species of rats, namely *Masthoporus* sp., *Capillaria hepatica*, and *Hymenolepis diminuta*.

Table 1. Habitat and species of rats captured in a sub strict in Central Java Province.

Habitat	<i>Rattus tanezumi</i>	<i>Rattus exulans</i>	<i>Rattus tiomanicus</i>	<i>Rattus argentiventer</i>	<i>Rattus norvegicus</i>	Total	
Houses	33					33	22.4%
Gardens		10	2			12	8.2%
Rice fields	3			8		11	7.5%
Traditional markets	85				6	91	61.9%
Total	121(82.3%)	10 (6.8%)	2 (1.3%)	8 (5.5%)	6 (4.1%)	147	100.0%

Table 2. Endoparasites species examined from rats captured in a sub district in Central Java Province

Endoparasites Species	Rats species					Organ infected	Total	%
	<i>Rattus tanezumi</i>	<i>Rattus exulans</i>	<i>Rattus argentiventer</i>	<i>Rattus tiomanicus</i>	<i>Rattus norvegicus</i>			
Nematoda								
<i>Syphacia muris</i>	14	0	1	0	0	Caecum	15	10.2
<i>Mastophorus</i> sp.	7	1	4	0	0	Stomach	12	8.2
<i>Gongylonema neoplasticum</i>	7	0	0	0	1	Stomach	8	5.4
<i>Nippostrongylus brasillensis</i>	6	0	1	0	1	Intestine	8	5.4
<i>Capillaria hepatica</i>	12	6	0	1	0	Liver	19	12.9
Cestodes								
<i>Hymenolepis nana</i>	8	0	0	0	0	Intestine	8	5.4
<i>Hymenolepis diminuta</i>	20	1	3	1	2	Intestine	27	18.4
<i>Cysticercus Taenia taeniaeformis</i>	51	0	0	1	2	Liver	54	36.7
Trematoda								
<i>Echinostoma</i> sp.	1	0	3	0	0	Intestine	4	2.7
Acanthocephala								
<i>Moniliformis</i> sp.	5	0	0	0	0	Intestine	5	3.4

## DISCUSSION

This study found that *Rattus tanezumi* was the most dominant species trapped in all habitats. This species is known as house rat that lived in houses or buildings including traditional markets and shopping areas. It is easy to determine trapping location for *Rattus tanezumi*, because it usually seeks food in the human environment. It is also easy to select bait for trapping because local people have already known the appropriate bait in their area. In houses, *R. tanezumi* was trapped by using roasted coconut and grilled salted fish, while in the traditional market, the appropriate bait was cucumbers.

Rats were trapped mostly in traditional markets where 91 rats (61.9%) were trapped, they were *R. tanezumi* (85) and *R. norvegicus* (6). Many foods attract these rats to this area, which was compounded by poor, crowded building conditions, with goods

and commodities in the shops were used for nest by the rats. Lack of rat control may heighten its abundance in this location.

A total of 33 *R. tanezumi* were trapped from houses. Two rats species, namely *R. exulans* (10) and *R. tiomanicus* (2) were trapped from gardens. *Rattus exulans* is widely known as Polynesian rat that usually seeks food by digging for tubers in the garden, while *R. tiomanicus* is widely recognized as Malayan field rat. These species have a variety of habitat including coastal forests, especially mangroves, secondary forests, and grasslands. They are also able to adapt to plantations, such as rubber and palm oil plantations.<sup>2</sup> The crops in the location of the survey was dominated by potatoes, carrots, cabbages which were food sources for *R. exulans*. It was possible that *Rattus tiomanicus* trapped in this survey was trying to survive by eating crops because its natural food resources, such as coconut trees, were rarely found

in this area. *Rattus exulans* and *R. tiomanicus* were trapped in the gardens of nearby settlements. This was similar to a survey by Ristiyanto (2008) which found the habitat for both rats were gardens.<sup>4</sup>

Other rat trapping was carried out in rice fields where 11 rats were caught within 14 days. The majority of the rat species in this habitat was *Rattus argentiventer* (8). The species is widely known as rice-field rats. The rats make holes in rice fields or irrigation dikes for their nests. The LTBS trap was based on rat migration in rice field area. When the study was conducted, rats migration has not occurred in the location because of panicles of young paddy has not grown yet. This was why only a few rats caught in this habitat.

Five endoparasites species that found in this study were known zoonotics. Three species were Nematodes (*Capillaria hepatica*, *Gongylonema neoplasticum*, *Syphacia muris*) and two species were Cestodes (*Hymenolepis diminuta* and *Hymenolepis nana*). Infection of *Capillaria hepatica* in children was reported in India on 2007.<sup>10</sup> Rat is a natural host for *Gongylonema neoplasticum* and *Syphacia muris* but infection in human has been reported.<sup>11</sup> *Hymenolepis diminuta* and *Hymenolepis nana* were found in infected rats' intestine. Both species have been reported as hymenolepiasis agent in human.<sup>6,7,12</sup>

Non zoonotic Nematodes found in this study were *Masthoporus* sp. and *Nippostrongylus brassilliensis*. This was similar to a previous study in Grenada, India that reported a high prevalence of *N. brassilliensis* (76.8%) from *Rattus norvegicus*.<sup>13</sup> *Masthoporus* sp. was also found in infected rats in Malaysia.<sup>14</sup> *Taenia taeniaeformis* is Cestode found in livers of rats in the larval stage. *Taenia taeniaeformis* infects cats but utilizes rats as an intermediate host. Its larvae, *Cystycercus*, develops in or on the liver.<sup>13</sup>

The study also obtained *Echinostoma* sp. that is grouped as Trematoda. The species was found in the intestine of a *R. tanezumi* and three *R. argentiventer*. The intermediate host for *Echinostoma* genus was freshwater mollusca. It will be transmitted when the intermediate host infected by the larvae is ingested by mammals. The adult stage was found in the rat's gut. Sixty species of *Echinostoma* genus are known as zoonotic species.<sup>15</sup>

*Moniliformis* sp. infected five *R. tanezumi*. This helminth was found in the rat's intestine in the adult form, either male or female. *Moniliformis* sp. is a parasite from the *Acanthocephala* phylum and

*Moniliformidae* family. This species may infect humans, although in rarely. In Saudi, it was reported that a 20-month child was infected by this species.<sup>5</sup> Infection in rats has been reported from all over the world. Definitive host for *Moniliformis* sp. are rodents, cats, dogs and red foxes while intermediate host are beetles and cockroaches.<sup>16</sup>

All endoparasites found in this study have a specific organ predilection. *Cystycercus T. taeniaeformis* and *C. hepatica* were found in the liver. *Masthoporus* sp. and *G. neoplasticum* infected the stomach. *Nippostrongylus brassilliensis*, *H. diminuta*, *H. nana*, *Echinostoma* sp. and *Moniliformis* sp. were found in the intestine, and *S. muris* was found in the caecum. All samples were examined fresh when the endoparasites in the target organ were still alive. In nature, parasites will migrate to survive and attempt to find other food sources. Their habitats do not supply their need when their hosts die. Examinations were conducted fresh to ensure that endoparasites were taken in their original location. In fact, some samples of *H. diminuta* died in the caecum and the rectum of rats. But samples found in the intestine remained alive. It suggests that the organ predilection of *H. diminuta* is the intestine.

In conclusion, rat species trapped in this study were *Rattus tanezumi*, *R. exulans*, *R. tiomanicus*, *R. argentiventer* and *R. norvegicus*. Endoparasites species found in rats may cause zoonotics were *Capillaria hepatica*, *Gongylonema neoplasticum*, *Hymenolepis diminuta*, *H. nana*, and *Syphacia muris*. All species of endoparasites in this study infected a specific organ in the rats.

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