

Occurrence of Helminths Infection in Norway Rats (*Rattus norvegicus*) from Mueang District, Chiang Mai Province

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Abstract Helminths of Norway rats (*Rattus norvegicus*) in the community may affect the health of animals either directly or indirectly. Therefore, the purpose of this study was to investigate the occurrence of helminths in Norway rats (*R. norvegicus*) from Mueang District, Chiang Mai Province. It is expected that the main findings of the present research will be applied for effective programs for curbing helminthes infection and monitoring the distribution of parasitic diseases that may occur in humans and animals. Thirty rat specimens were randomly collected from Mueang District, Chiang Mai Province, during the period from March to June 2011. Then the examination of for helminths under light microscope was carried out. The results showed that, three species of helminths were discovered and the total prevalence and intensity were determined as follows: *Railletina* sp. (33.33% and 4.50), *Capillaria* sp. (70.00% and 28.50) and the strobilocercus larvae (20.00% and 3.00), respectively. Furthermore, adult cestodes and nematodes were found in duodenum and jejunum. The strobilocercus larvae and *Capillaria* sp. eggs were found in the liver tissue. **Chiang Mai Veterinary Journal 2014; 12(3):159-165**

Keywords: helminthes, Norway rats, prevalence, intensity, Chiang Mai Province

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Introduction

Norway rats (*Rattus norvegicus*) harbor a number of helminth parasites, which can be transmitted to human and higher vertebrates (Oldham, 1931). This emerging rodent-borne

disease has captured world wild attention. This is because rats act as a natural reservoir of the serious zoonotic parasitic infections (Seong et al., 1995). There are many reports of the rat parasites in different parts of the world

such as Mexico, Sri Lanka, Thailand, Korea, Iran, Italy, and *etc.* (Seo, et al., 1981; Seo et al., 1986 a; Namue and Chalobol, 1997; Milazo et al., 2010; Vivas et al., 2011; Sumangali et al., 2012). Oldham (1931) reported in his summary of works on rat parasites from common rats that a total number of 109 helminth species comprise of 27 trematodes, 41 cestodes, 40 nematodes and one acathocephalans.

In Korea, several studies have reported rat parasites over past years. Nakamura and Kobashi (1935) found *Cysticercus fasciolaris* and *Capillaria hepatica*. Ogura (1936) found *Hymenolepis diminuta* and *H. nana*. Recently, Seo et al. (1964 a) reported several trematode species of rodents. They found *Echinostoma hortense*, *E. cinetorchis*, *Plagiorchis muris*, *Euparyphium murinum*, and *Fibricola seoulensis*. Moreover, they also reported ten species of helminths from 325 house rats in Seoul (Seo et al., 1986 b). Therefore, the significance of zoonotic infections from rat is much emphasised nowadays. Little data about helminth diversity in rats of Thailand is available at the moment. Thus, the present study aims to fill this gap and also increase the knowledge of

helminthes fauna of Norway rat (*R. norvegicus*), a synanthropic rodent that only established itself in Chiang Mai Province, Thailand, it is expected that this study would contribute enormously to the development of effective control programs.

Materials and Methods

Thirty Norway rats (*Rattus norvegicus*) were collected from Mueang District, Chiang Mai Province during the period of March to June 2011. Their visceral organs, comprising heart, lungs, livers, stomach, and intestines were examined for helminths. Then, the worms were removed, counted, fixed and preserved in 4% formalin. After that, the specimens were stained with Delafield's haematoxylin and borax carmine, dehydrated in an alcohol series, cleared with xylene, and mounted in permount. Using camera lucida, illustrations were made to record information for a morphological characteristic study. The prevalence and intensity value were used to evaluate the abundance of parasites infected in rat specimens. The formula value of prevalence and intensity would be concluded in the next section.

$$\begin{aligned} \text{prevalence (\%)} &= \frac{\text{number of Norway rat were infected with helminths}}{\text{number of Norway rat were examined}} \times 100 \\ \text{intensity} &= \frac{\text{number of Norway rat were infected with each helminth}}{\text{number of Norway rat were infected with each helminth}} \end{aligned}$$

Results

Out of 30 Norway rats collected from Mueang district, Chiang Mai province, 3 species of helminths were infected including *Raillietina* sp. (Figure 1), *Capillaria* sp. (Figure 2) and *strobilocercus* larvae (Figure 3) with a total prevalence of 100%. The helminths species with the highest prevalence was *Capillaria* sp. (77.67%) while *strobilocercus* larval and *Raillietina* sp., were pres 33.33% and 20.00%, respectively.

Prevalence, abundance and mean intensity of each helminth species are given in table 1.

Pea sized, whitish capsules of 1- 9 mm diameter were found in the liver of 6 specimens. They were either embedded deep in the liver parenchyma or attached to the surface where each capsule contained a wellcoiled *strobilocercus* larva. Moreover, a *Capillaria* egg was also found in liver tissue with the high intensity.

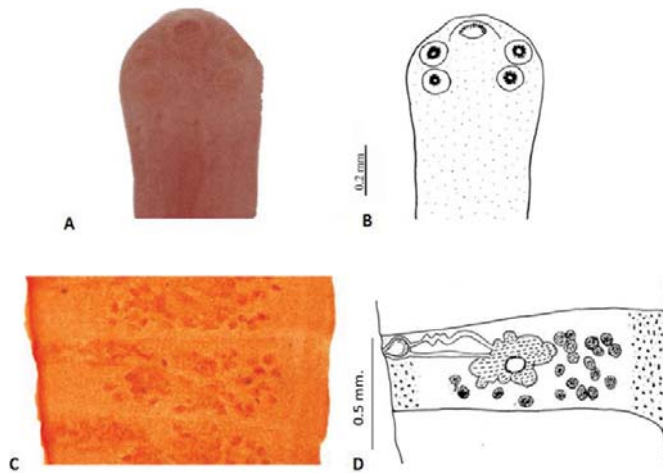


Figure 1. The illustration demonstrates morphology of *Raillietina* sp. (A-B) scolex, (C-D) mature proglottid.

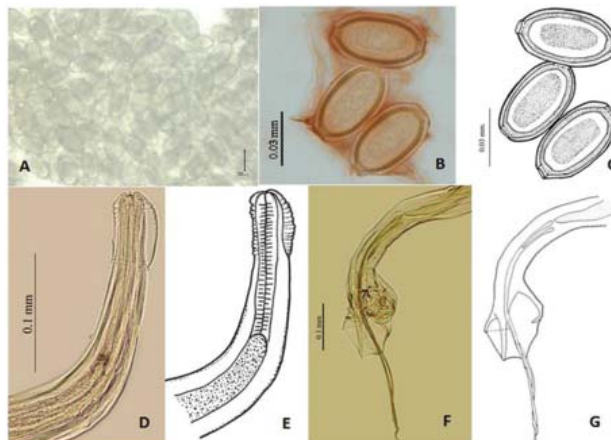


Figure 2. The illustration demonstrates morphology of *Capillaria* sp. (A-C) egg in liver tissue, (D-E) anterior part of body, (F-G) posterior part of body.

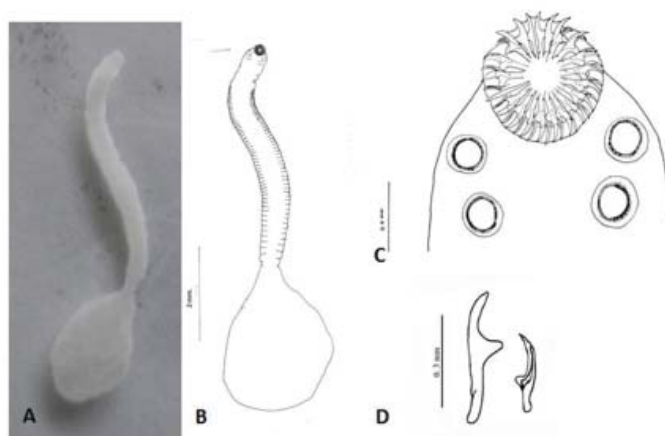


Figure 3. The illustration demonstrates morphology of strobilocercus larval (A-B) whole of body tissue, (C) scolex, (D) rostellum hook.

Table 1. Prevalence and intensity of helminth infected in *R. norvegicus* from Mueang district, Chiang Mai Province

Helminth species	No. of hosts infected	No. of parasite infected	Prevalence (%)	Intensity
<i>Raillietina</i> sp.	10	32	33.33	4.50
<i>Capillaria</i> sp.	21	233	70.00	28.50
<i>Strobilocercus</i> larval	6	14	20.00	3.00

Discussion

Norway rats (*R. norvegicus*) play an important role as hosts of helminths and reservoirs of many zoonotic diseases. Specifically, *Capillaria* sp. is a dominant parasite, with the highest prevalence. The *Capillaria hepatica* is known to be found in the liver of many kinds of mammals, especially in rats. In humans, however, the infection is very rare in spite of the high prevalence of this parasite in rats (Seong et al., 1995). Nakamura and Kobashi (1935) found 36.00% of this nematode in house rats from Seoul. Tubangui (1931) reported 91.00 % of the brown rat/ Norway rat in the Philippines. In China,

Wu (1930) and Chen (1933) found in Soochow (30.40%) and Chaton (7.10%), respectively. In addition, Seo *et al.*, (1964 b) showed that this worm was one of the most common parasites of brown rats in Korea. Previously, Kamiya *et al.* (1968) found 34.00% infection with this parasite from 83 *R. rattus* and *R. norvegicus* in Southern Amammi Island, Japan.

Kamarasinghe *et al.* (2006) recorded high prevalence of cestodes such as *Hymenolepis diminuta* (38.00%) from Kandy district, Sri Lanka. But the rats examines in our study had *Raillietina* sp. (33.33%). Kulasiri (1954) studied the urban rats in Colombo Municipal area and

reported *R. madagascariensis* from *R. rattus*. In addition, this study found on 20.00 % of the larval of cestode, strobilocercus larval , while Sumangali et al. (2012) reported this parasite in *Rattus* spp. (42.90%).

Many species of cestodes were reported by Cruz and Shanmugasunderam (1971) namely, *Vampirolepis solisoris*, *Vampirolepis montana*, *Hymenolepis sunci* and *Pseudhymenolepis eisenbergi* from shrews and an unidentified *Hymenolepis* sp. from highland spiny rats. Although *Raillietina* sp. infections have long been under debate as a zoonosis, human infections have been recorded around the world from Australia, Africa and Asia (Chandler and Pradatsundarasar, 1957). Therefore, it can be concluded that the Norway rat can be considered an important determinant in monitoring the biomedical and veterinary public health.

Data of the species composition of parasites are a pre-requisite for any study on the epidemiology of the veterinary or biomedical importance of trematodes. Hence, a study of the epidemiological situation of parasitic infection in Norway rats in Chiang Mai province was carried out, based on the original data from a large scale survey of cercaria infections. This is the first step in providing new information on the latest distribution of trematode infection and for the development of the effective control measures in Chiang Mai province. Finally, these results will be applicable to further studies on biology and epidemiology of each trematode species. This study will be applicable for prevention and control of zoonotic trematode infections of high

public health significance.

Conclusion

From our study we can conclude that the Norway rats can be considered an important determinant in monitoring the biomedical and veterinary public health. Further study will apply the experimental infection data for adults to identify the accurate species. However, the molecular methods used for the detection and identification process should be applied in the future research.

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อุบัติการณ์ของหนอนพยาธิในหนูนอร์เวย์ (*Rattus norvegicus*) จากอำเภอเมือง จังหวัดเชียงใหม่

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บทคัดย่อ หนอนพยาธิในหนูนอร์เวย์ (*Rattus norvegicus*) ในเขตแหล่งชุมชนอาจส่งผลกระทบต่อสุขภาพของสัตว์โดยตรงและทางอ้อม ดังนั้นการศึกษาในครั้งนี้มีวัตถุประสงค์เพื่อศึกษาอุบัติการณ์ของหนอนพยาธิในหนูนอร์เวย์จากอำเภอเมือง จังหวัดเชียงใหม่ ซึ่งสามารถนำมาประยุกต์ใช้ในการวางแผนควบคุมการติดเชื้อและการกระจายตัวของโรคพยาธิในสัตว์ได้อย่างมีประสิทธิภาพ โดยทำการสุ่มเก็บตัวอย่างหนูจำนวน 30 ตัว ในเขตอำเภอเมืองจังหวัดเชียงใหม่ ระหว่างเดือนมีนาคม ถึงเดือนมิถุนายน พ.ศ. 2554 จากนั้นทำการตรวจสอบหนอนพยาธิภายใต้กล้องจุลทรรศน์ ผลการศึกษาพบหนอนพยาธิจำนวน 3 ชนิด มีค่าความชุกชุม (total prevalence) และความหนาแน่นรวม (total intensity) ของพยาธิแต่ละชนิดเป็นดังนี้ คือ พยาธิตัวตืดชนิด *Raillietina* sp. (33.33% และ 34.50) พยาธิตัวกลมชนิด *Capillaria* sp. (70.00% และ 28.50) และ ตัวอ่อนพยาธิตัวตืดระยะ Strobilocercus (20.00% และ 3.00), ตามลำดับ สำหรับตัวเต็มวัยของพยาธิตัวตืดและพยาธิตัวกลมพบการติดเชื้อในทางเดินอาหารส่วนต้น (duodenum) และ ส่วนกลาง (jejunum) ส่วนตัวอ่อนพยาธิตัวตืดระยะ Strobilocercus และ ไข่ของพยาธิตัวกลม *Capillaria* sp. พบการติดเชื้อในตับ

คำสำคัญ หนอนพยาธิ, หนูนอร์เวย์ (*Rattus norvegicus*), ค่าความชุก, ความหนาแน่น, จังหวัดเชียงใหม่
