STUDIES ON THE PARASITIC HELMINTHS OF KOREA III. NEMATODES AND CESTODES OF RODENTS

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There are many reports of rat parasites in different parts of the world; Balfour (1922) in England, Cram(1928), Price and Chitwood(1931) and Luttermoser(1936) from U.S.A., Tubangui(1931) in Manila and Wu(1930) and Chen(1933) in China. Recently Schacher and Cheong(1960) studied nematode parasites in Malaya, and Ash(1962) reported helminth parasites in Hawaii. Oldham (1931) reported in his summary of works on rat parasites from common rats, total number of 109 helminth species comprising of 27 trematodes, 41 cestodes, 40 nematodes and one acanthocephalid.

In Korea, several workers 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, Park(1938) reported Echinostoma hortense in Seoul. Recently, Seo et al. (1964 a) reported several trematodes of rodents. They found Echinostoma hortense, E. cinetorhiris, Plagiorchis muris, Euparyphium murinum and Fibriola seoulensis. Seo et al.(1964 b) also reported ten species of helminths from 325 house rats in Seoul. Most recently, Kamiya et al. (1968) reported the results of a survey on worm parasites of rats in southern Amami Island, Japan.

For wild rats, however, few studies have been undertaken in Korea except for the new description of Raillietina (R.) coreensis by Honda (1939) from a field mouse, Apodemus agrarius coreae. It is the purpose of this survey to study the helminthic fauna of wild rats in Korea.

MATERIALS AND METHODS

A total of 300 rodents of 7 species was examined. These comprised of 219 Apodemus agrarius, 33 Rattus norvegicus, 8 Rattus alexandrinus, 14 Mus musculus yamashinai, 4 Microtus fortis pellceus, 21 Crocidura rusula and a Cricetulus triton nester. The rats were trapped from areas of Chulwon, Kumwha, Chungpyong, Pochun and Paju districts of southern Korea. All the rats were autopsied in the laboratory.

The viscera were exposed by a midventral incision and inspected macroscopically. Then the liver, lung, urinary bladder and entire digestive tract were removed and these were opened separately for detection of parasites. Particularly the intestinal contents transferred to several large petri dishes and helminths were collected in normal saline solution with the aid of binocular dissecting microscope. Cestodes were fixed in hot alcohol-formalin-
acetic acid solution and stained in Semichon’s acetocarmine, and permanent mounts were prepared. Nematodes were fixed in hot Travassos fixative and cleared in lactophenol or glycerine and studied unmounted.

RESULTS AND DISCUSSIONS

Helminths were found in 287(95.7%) out of 300 wild rats. A list of the different parasites found and their infestation rates are given in Table 1. Each species is discussed with the infestation rates of other investigators in different parts of the world.

NEMATODA

Genus Heterakis Dujardin, 1845
Heterakis spumosa Schneider, 1866

This species was first reported from the cecum of Berlin rats by Schneider (1866). This nematode parasite of the cecum and large intestine of rats is cosmopolitan in distribution. In Asia, Tubangui (1931) found 0.4 per cent in Philippines and Chen(1933) 1.2 per cent in China. Ash(1962) however, reported 46 per cent in Hawaii. Recently Seo et al. (1964 b) found 49.9 per cent of this parasite from 325 house rats in Seoul and Kamiya et al.(1968) reported 18 per cent infestation with this parasite from 83 Rattus rattus and R. norvegicus in southern Amami Island, Japan. In the present survey, it was found in the three species of the rats, R. norvegicus, A. agrarius and R. alexandrinus, the infestation rates of 24.2 per cent, 6.4 per cent and 37.5 per cent respectively at the areas of Pochun, Chulwon, Kumwha and Paju.

Genus Syphacia Seurat, 1916
Syphacia obvelata(Rudolph, 1802) Seurat, 1918

Syphacia obvelata in rat has been only of academic interest in parasitology for close relations with the Enterobius vermicularis of man. Attention was, however, called to it in view of its recorded occurrence in a sample of human stool. Riley(1919) identified this parasite from an American child in Philippines.

Syphacia obvelata is an abundant nematode parasite of rodents all over the world. It is found in the cecum and large intestine of rats and mice. Syphacia obvelata, the type species of the genus, is a well-known vole parasite in Europe. Rausch (1952) reported this nematode parasite from Alaska and Ash 44 per cent from Hawaii. Seo et al. (1964 b) found this parasite in 17 per cent of house rats.

<p>| Table 1. Nematode and Cestode Parasites found and the Infestation Rates of 300 Various Rodents |
|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|</p>
<table>
<thead>
<tr>
<th>Hosts/Parasites</th>
<th>No.</th>
<th>Rattus norvegicus (33)</th>
<th>Apodemus agrarius (219)</th>
<th>Rattus alexandrinus (8)</th>
<th>Crocidura russula (21)</th>
<th>Mus musculus yamashinai (14)</th>
<th>Microtus fortis pellœns (4)</th>
<th>Cricetulus triton mester (1)</th>
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</thead>
<tbody>
<tr>
<td>Heterakis spumosa</td>
<td>8(24.2%)</td>
<td>14(6.4%)</td>
<td>3</td>
<td>1(4.8%)</td>
<td>7(50%)</td>
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<tr>
<td>Syphacia obvelata</td>
<td>12(36.4%)</td>
<td>90(41.4%)</td>
<td>2</td>
<td>10(47.6%)</td>
<td>7(50%)</td>
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<tr>
<td>Nippostrongylus muris</td>
<td>20(60.6%)</td>
<td>171(78.1%)</td>
<td>4</td>
<td>5(23.8%)</td>
<td>7(50%)</td>
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<tr>
<td>Protostrongylus muris</td>
<td>1(3.03%)</td>
<td>40(18.3%)</td>
<td>3(14.3%)</td>
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<tr>
<td>Capillaria hepatica</td>
<td>4(12.1%)</td>
<td>17(7.8%)</td>
<td>1</td>
<td>2(14.3%)</td>
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<tr>
<td>Capillaria sp.</td>
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<tr>
<td>Heligmosomum sp.</td>
<td>3(9.1%)</td>
<td>32(14.6%)</td>
<td>1</td>
<td>3(14.3%)</td>
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</tr>
<tr>
<td>Heligmosomoides sp.</td>
<td>7(21.2%)</td>
<td>29(13.2%)</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Rictularia sp.</td>
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<td>Gongylonema sp.</td>
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<td>CESTODA</td>
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<tr>
<td>Hymenolepis nana</td>
<td>2(6.1%)</td>
<td>10(4.6%)</td>
<td>1</td>
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<tr>
<td>Hymenolepis diminata</td>
<td></td>
<td>7(3.2%)</td>
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<tr>
<td>Cysticercus fasciolaris</td>
<td>5(15.2%)</td>
<td>2(0.9%)</td>
<td>2</td>
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<td></td>
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<tr>
<td>Reallletina Coreenis</td>
<td></td>
<td>1(0.5%)</td>
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<tr>
<td>Paranoplocephala sp.</td>
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</table>
from Seoul. Schacher and Cheong (1960) found two female worms of *Syphacia* sp. in Malaya, which were impossible to be determined if they belonged to *S. muris* or *S. obvelata*. Hussey (1957), however, presented the key to *S. muris* v.s. *S. obvelata*, and Kamiya et al. (1968) reported *S. muris* in Japan. In the present survey, from all the localities *R. norvegicus* were parasitized by this nematode with an infestation rate of 36.4 per cent, *A. agrarius* 41.4 per cent, *R. alexandrinus* 25 per cent, *Crocidura russula* 4.8 per cent and *Mus musculus yamashinai* 50 per cent. In some cases of *A. agrarius*, massive infections, more than 100 worms, were observed in a single host.

**Genus Nippostrongylus** Lane, 1923  
*Nippostrongylus muris* (Yokogawa, 1920)  
Lane, 1923

A great abundant materials of *Nippostrongylus muris* was collected from the upper part of the intestine of almost all species of the rodents. In 2 rats, *A. agrarius*, there were found more than 100 worms of this parasite in a single host. Specimens of *Nippostrongylus muris* in this survey have been obtained from the various hosts and localities and in the following infestation rates; *A. agrarius* in 171 of 219(78.1\%), *R. norvegicus* in 20 of 33 (60.6\%), *R. alexandrinus* in 4 of 8, *Mus musculus yamashinai* in 7 of 14(50\%). Ten rats showed positive examinations out of 21 *Crocidura russula*, an infestation rate of 47.6 per cent. Tubangui (1931) discovered 58 per cent in the small intestine of *R. norvegicus* in Philippines and Chen (1933) 28.8 per cent in Canton. Schacher and Cheong (1960) reported 3.8 per cent from common house rats in Malaya. While in Hawaii (Ash, 1962), the rats showed the infestation rate 17.0 per cent. Seo et al. (1964 b), however, found 49.2 per cent in Seoul.

**Genus Protospiura** Seurat, 1914  
*Protospiura muris* (Gmelin, 1790) Seurat, 1915

This nematode found in the stomach of rodent is cosmopolitan in distribution. Schöbl (1913) has observed as being not uncommon in the intestine of Philippine rats. Its natural habitat is the stomach, but after the death of the host it often migrates into the small intestine. In this survey, only two species of the rodents from the areas of Pochun, Kunwha, Paju, and Chulwon were parasitized by this nematode. *A. agrarius* showed positive examinations in 18.3 per cent and one of 33 *R. norvegicus* was found infected by this worm. Tubangui (1931) reported 1.3 per cent from *R. norvegicus* of Philippine. Schacher and Cheong (1960) collected 598 specimens in Malayen house rats.

But they faced difficulties to separate this specimens from *Mastophorus* species.

**Genus Capillaria** Zeder, 1800  
*Capillaria hepatica* (Bancroft, 1893)  
Travassos, 1915

*Capillaria hepatica* could be easily recognized by the presence of irregular whitish or yellowish appearance on the surface of the liver, which is due to the presence of eggs deposited by the adult, living in parenchyme of the liver. In human beings, up to date, 11 cases have been diagnosed in several parts of the world, either ante or postmortem.

Nakamura and Kobashi (1935) found this nematode in 36.0 per cent of house rats from Seoul. Tubangui (1931) reported 90.0 per cent of the brown rats in Philippines. In China, Wu (1930) and Chen (1933) found in Soochow (30.4\%) and Canton (7.1\%) respectively. Momma (1930) found in 1,272 (57.2\%) house rats out of 2,222 examined in Osaka, Japan. Ash (1962) found 28 per cent in Hawaii. Schacher and Cheong (1960) found 1.5 per cent infection with this parasite in Kuala Lumpur, Malaya. Seo et al. (1964 b) reported this worm as one of the most common parasites of brown rats in Korea. They found 88 per cent in Seoul. Most recently, Kamiya et al. (1968) found 34 per cent infection with this parasite from 83 *R. rattus* and *R. norvegicus* in sou-
thern Amami Island, Japan.

From wild rats, however, there have been few reports of this parasite. In the present survey, no other wild rats were infected by this worm, but only *R. norvegicus* was found to be infected in the infestation rate of 12.1 per cent at the areas of Pochun and Chungpyong.

**Capillaria** sp.

There were found 9 parasites of the *Capillaria* species from the stomach and small intestine of 5 *Crocidura russula* out of 21 examined, and all of the worms were female, three of which were immature.

**Description:** (Measurements in millimeter)

Male: unknown

Female: Length 6 to 8.8, 0.046 to 0.049 wide just posterior to the vulva, maximum width 0.066, esophagus terminates 3.1 to 3.4 from the anterior end of the body, vulva slightly posterior to the esophago-intestinal junction, 3.15 from the anterior tip, labia inconspicuous, vulva divides body 1.0 : 1.5, posterior extremity bluntly rounded, anus almost terminal. A pair of postanal papillae present, eggs lemon-shaped with opercular plugs 0.059 by 0.026.

**HOST:** *Crocidura russula*

**LOCATION:** Stomach and small intestine

**LOCALITY:** Pochun, Chulwon and Kumwha

The measurements of this species were based on five adult female worms. Rausch (1952) collected one specimen of *Capillaria* species from a vole of Alaska, of which specific determination was impossible. Schacher and Cheong (1960) found a female worm of *Capillaria* species in the intestine of *R. norvegicus* in Malaya. The contained ova in utero showed typical, prominent opercular plugs and measured 24 by 50 microns. Kamiya et al. (1968) report 16 per cent infection with *C. bacillata* from *R. rattus* and *R. norvegicus* in Japan. Comparing with the capillarids from North American mammals by Read (1949 a,b) the specimens were quite different in many characteristics. The specimens, however, were closely related to *C. traveriae* (Ash, 1962) which resembles in regard to size, esophagus and eggs. But *C. traveriae* gave salient labia, subterminal anus and no papillae. This also differs from the specimens in hosts, locations and vulva positions.

Chitwood et al. (1968) report *Capillaria philippinensis* sp. n. from the intestine of man in the Philippines. The species is characterized by small size, male, with caudal alae, 2.3 to 3.17mm long and female 2.5 to 4.3mm long. The female worms contained thin-shelled eggs and embryos as well as normal eggs in utero. They prove the first case of intestinal capillariosis of man.

**Genus Heligmosomum** Railliet and Henry, 1909

**Heligmosomum** sp.

Several reports on various species of *Heligmosomum* from rats have been made in different parts of the world; *H. braziliense* (Travassos, 1914) originally in Brazil, *H. vexillatum* (Hall, 1916) in Colorado, *H. muris* from Baltimore (Yokogawa, 1922) and from Soochow (Wu, 1930) and *H. costellatum* and *H. hudsonius* (Rausch, 1952) from Alaskan voles.

**Description:** (Measurements in Millimeter)

Male: Body 2.38 by 0.116, and not spirally coiled; head 0.023 in diameter; mouth simple or triangular; cephalic alae 0.033 by 0.495, no circum oral papillae; esophagus 0.28; intestine straight, cuticular folding on whole body especially posteriorly; bursa 0.132 by 0.149; spicules 0.35

Female: 17.0 in body length, vulva 0.099 from the posterior end of the body; anus 0.076 to 0.050 from the posterior end of the body; tail acutely sharp and pointed; eggs 0.072 by 0.033, more than ten in number, in utero.

**HOST:** *R. norvegicus*, *A. agrarius*, *R. alexandrinus*, *Crocidura russula*, *Microtus fortis pellicus*, *Mus musculus yamashinai* and *Cricetulus triton nester*

**LOCATION:** Intestine

**LOCALITY:** Chulwon, Kumwha, Pochun and Paju
The specimens resembled *H. vexillatum* in many characteristics. This, however, is described as having cuticular markings and trilobed bursa with a wide opening at right angle. In the present survey, the *Heligmosomum* sp. found from the following hosts and infestation rates: *R. norvegicus*, 9.1 per cent; *A. agrarius*, 15.1 per cent; *R. alexandrinus*, 12.5 per cent; *Crocidura russula*, 9.5 per cent; *Microtus fortis pelleceus*, 25 per cent; *Mus musculus yamashinai* 14.3 per cent. One *Cricetulus triton nester* was examined and found infected.

**Genus Heligmosomoides** Hall, 1916

*Heligmosomoides* species was found from intestine of 5 *R. norvegicus*, 28 *A. agrarius* and 3 *Microtus fortis pelleceus* in the infestation rates of 24.2 per cent, 12.9 per cent and 75 per cent respectively.

**Description:** (Measurements in millimeter)

Male: Body not spirally coiled 3.1 to 5.9 by 0.132 to 0.089; mouth aperture simple and no cephalic alae; a pair of papillae present; spicules 0.42 to 0.84.

Female: Body spirally coiled, more than ten coils in number, 11.56 long and 0.099 wide, vulva 0.099 to 0.126 from the posterior end of the body, tail ending in a fine terminal, eggs 0.016 by 0.069.

**HOST:** *R. norvegicus*, *A. agrarius* and *Microtus fortis pelleceus*.

**LOCATION:** Intestine

**LOCALITY:** Kumwha, Paju, Pochun and Chulwon.

**Genus Rictularia** Froelich, 1802

*Rictularia* sp.

Thirty-three specimens of male *Rictularia* were found in the small intestine of 17 *A. agrarius* of 219 examined, the infestation rate of 7.8 per cent.

**Description:** (Measurements in millimeter)

Male: Body 30 to 60 in length, 0.336 to 0.782 in width at the middle of the body. In preserved specimens, anterior end bent dorsally, the rest of the body turned toward the opposite direction or rolled into a semicircle, posterior end coiled. Head 0.086 in thickness across the buccal capsule. Mouth with well developed buccal capsule. Oesophagus 0.882 to 0.910 in length. Cloacal aperture 0.066 to 0.112 from the coiled conical tail. There are 42 to 44 pairs of combs. Spicules unequal, the long one curved at right angle, 0.083 to 0.116 in length and the short one, not curved 0.053 to 0.066 in length.

**Female:** unknown

**HOST:** *A. agrarius*

**LOCATION:** Stomach and small intestine

**LOCALITY:** Kumwha, Paju, Pochun and Chulwon.

These measurements were compared with all available known descriptions of male worms of *Rictularia* species. A description of the male was published by Chen (1936) in Canton, China. In Malaya, Schacher and Cheong (1960) described observations on six male and numerous female worms, as *R. tani* Hoeppli, 1929, and they regarded the *R. whartonii* Tubangui, 1931, as a definite synonym of *R. tani*. Kamiya et al. (1968) report 0.8 per cent infestation with *R. tani* in southern Amami, Japan. Lindquist and Li (1955) compared the male *Rictularia* from Guam with descriptions of 9 out of 10 species having unequal spicules. There is no uniformity in the characteristics of male worms described by many authors. In the present survey, there does not appear to be enough evidence to establish a new species nor enough similarity to any other known species, especially in the size of worms, to designate the specimens as a certain *Rictularia* species. Before this determination can be secure, a comprehensive study of these specimens particularly female worms will be necessitated.

**Genus Gongylonema** Molin, 1857

*Gongylonema* sp.

A single male specimen of this species was ob-
tained from one A. agrarius. Kamiya et al. (1968) found 37 per cent infestation with G. neoplasticum from the esophagus of R. rattus and R. norvegicus in Japan. Gongylonema neoplasticum has received considerable attentions due to the reports of some authors that it is instrumental in production of carcinomatos growth in rats.

Description: (Measurements in millimeter)
Male: Length 15, maximum thickness 0.946 at the middle of the body, cuticle 0.14, pharynx 0.182 by 0.154, anterior portion of esophagus 0.28, posterior portion 1.97, total length of esophagus, therefore, about 1/7 of total body length, tail is spirally coiled, 4 pairs of caudal papillae present, spicules stout and almost equal, 0.616 and 0.7 in length of nearly uniform thickness 0.026 throughout, cloacal aperture 0.49 from the posterior end of the body.

Female: unknown
HOST: A. agrarius
LOCATION: Superior portion of digestive tract.
LOCALITY: Chulwon

An attempt to find Angiostrongylus cantonensis and Trichosomoides crassicauda in lung and urinary bladder has been made through the survey. But all the examinations showed negative results.

CESTODA

Genus Hymenolepis Weinland, 1858
Hymenolepis diminuta (Rudolphi, 1819)
Blanchard, 1891

This is the tapeworm occurring most frequently in rats. Seo et al. (1964 b) reported 16 per cent infestation from 325 brown rats in Seoul. Kamiya et al. (1968) report 14 per cent infestation with this worm from 83 R. norvegicus and R. rattus in southern Amami Island, Japan. Although records of its frequency are very incomplete, it seems to be a common parasite of rats all over the world. This common tapeworm of rats was first reported in man by Weinland (1858). Since that time, a total 83 of cases of human infestation with this parasite has been reported. The rats are normal hosts of this tapeworm; hence we must look upon it as natural reservoir of the infection in man. The present survey also showed that it was the most common and widespread cestode parasite among rodents. In all the localities surveyed they were found among the rat hosts, such as A. agrarius, R. norvegicus, and R. alexandrinus.

Hymenolepis nana (Siebold, 1852)
Blanchard, 1891

In the present study, this dwarf tapeworm was found in the small intestine of just ten rats, A. agrarius, out of 219 examined, the infestation rate of 4.6 per cent from the areas of Pochun, Kumwha and Chulwon. It is a common parasite of rats and mice, and of human beings in many parts of the world. In Korea, Ogura (1936) detected two cases of this parasite out of 3,000 school children in Seoul, and according to Soh et al. (1961) 32 cases of H. nana infections from 14,682 fecal specimens examined have been reported from Severance Hospital in Seoul for three years. Rim (1963) reported 0.6 per cent of its infestation rate from 1963 fecal samples from Korean Army soldiers. Tubangui(1931) found H. nana in 1.7 per cent of the total number of rats examined in Philippines. Kamiya et al. (1968) report 3 per cent infestation with this dwarf tapeworm in Japan. Seo et al. (1964 b) found 1.2 per cent infestation with this parasite from 325 brown rats in Seoul. Chandler(1927) concluded that rats are important epidemiological factors in the dissemination of H. nana.

Genus Raillietina Fuhrmann, 1920
Raillietina (R.) coreensis

Honda (1939) reported this new species from the small intestine of A. agrarius in the vicinity of Seoul, the infestation rate of 3 per cent. Kamiya et al. (1968) found 3.8 per cent infestation with R. celebensis in southern Amami Island, Japan.
Tubangui (1931) found *R. garrisoni* 86.0 per cent in Philippines. In the present survey, two *A. agrarius* from Kumwha and one *Microtus fortis pellceus* from Chulwon showed positive examinations for this tapeworm.

Genus *Paranoplocephala* Lühe, 1910  
*Paranoplocephala* sp.

Two strobilae were obtained from each of *A. agrarius* and *Microtus fortis pellceus* collected over the area of Kumwha. Excluding the scolex, the strobila had a wedge-shape, 5 millimeters in length and 1.26 millimeters in maximum width, 72 in segment number, margins serrate. The ratio of length to width in mature segments is 4 : 45 and in gravid segments showed 7 : 79. Rausch (1952) described 5 species of the genus *Paranoplocephala* including a new species from microtine rodents of Alaska. A comprehensive study of more specimens will be necessitated for the specific diagnosis in this survey.

Genus *Taenia* Linnaeus, 1758  
The larva of *Taenia taeniaeformis* (Batsch, 1786)  
Wolffhügel, 1911  
*(Cysticercus fasciolaris* Rudolphi, 1808)

The encysted larval form of this tapeworm is exceedingly common in the liver of rats, commonly known as *Cysticercus fasciolaris*. It is practically cosmopolitan in distribution. Seo et al. (1964 b) recovered 20 per cent infestation in Seoul. Kamiya et al. (1968) found 27 per cent infestation with this larva from 83 *R. rattus* and *R. norvegicus* in the southern Amami Island, Japan. Tubangui (1931) reported that the livers of 94 per cent of the animals examined in Manila was infected with this cisticercus. He cited that this encysted parasite is said to be mistaken for tuberculosis, and that there in Jutland exists a folk custom of eating chopped raw mice in cases of retention of urine, and that this parasite is connected with sarcoma in rat liver. In this survey, materials of the larval forms were collected from the areas of Pochun and Chungpyong, and this parasite was found in 5 *R. norvegicus* (15%) and 2 *R. alexandrinus*.

**SUMMARY**

A survey for nematode and cestode parasites of rodents in Korea has been carried out at the areas of Chulwon, Kumwha, Pochun, Paju and Chungpyong, Kyunngi-Do. A total of 300 rodents of seven species was examined, comprising of 219 *A. agrarius*, 33 *R. norvegicus*, 8 *R. alexandrinus*, 14 *Mus musculus yamashinai*, *Microtus fortis pellceus*, 21 *Crocidura russula* and a *Cricetus triton nester*. The following fifteen species belonging to thirteen genera were identified:

**NEMATODA:** *Heterakis spinosa*, *Syphacia obvelata*, *Nippostrongylus muris*, *Protospiura muris*, *Capillaria hepatica*, *Capillaria* sp., *Heligmosomum* sp., *Heligmosomoides* sp., *Rictularia* sp. and *Gongylonema* sp.

**CESTODA:** *Hymenolepis nana*, *Hymenolepis diminuta*, *Raillietina (R.) coreensis*, *Paranoplocephala* sp. and *Cysticercus fasciolaris* (the larva of *Taenia taeniaeformis*).

**REFERENCES**

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韓國의 寄生蠕蟲類에 関한 研究

II. 臉齒類의 縫蟲類 及 類蟲類

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韓國의 寄生蠕蟲類研究의 繼続으로서 縫蟲、金化、抱川、坡州、清州 各 地域에서 捕獲된 臉齒類 300 바리에 寄生하는 縫蟲類及 類蟲類에 對하여 調査하였다.

1) 確診한 臉顱는 Rattus norvegicus 33匹 Apodemus agrarius 21匹, Rattus alexandrinus 8匹, Crocidura russula 21匹, 및 Crictetus triton nester 1匹이었으며 蠕蟲感染率은 95.7%(287匹)이고 發見된 縫蟲類及 類蟲類는 다음과 같다.

2) 縫蟲類：Heterakis spumosa (8.3%), Syphacia obvelata(35.3%), Nippostrongylus muris(70.7%), Protospirura muris (13.7%), Capillaria hepatica (1.3%), Capillaria sp. (1.7%), Heligmosomum sp.(14.3%), Heligmosomoides sp. (13.0%), Rictularia sp.(5.7%), Gongylonema sp.(0.3%).

3) 類蟲類：Hymenolepis nana(3.3%), Hymenolepis diminuta(3.3%), Raillietina R. coreensis(2.3%), Paramphistomum sp.(1.0%), Taenia taeniaeformis의 幼蟲(Cysticercus fasciolaris)(0.3%).

4) 以上 發見된 15種中 7種 (Protospirura muris, Capillaria sp., Heligmosomum sp., Heligmosomoides sp., Rictularia sp., Gongylonema sp., Paramphistomum sp.)은 韓國에서 처음으로 記載되는 것이며 독이 Capillaria sp.와 Rictularia sp는 新種의 可能性이 있으므로 앞으로 더 仔細한 形態學的 検討가 要求된다.