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Endoparasitic Infection in Laboratory Rat Strain, Long-Evans (*Rattus norvegicus* Berkenhout, 1769)

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Abstract

In the present study, five helminth parasite species from two taxonomic groups were identified from Long-Evans (*Rattus norvegicus* Berkenhout, 1769). The cestodes were *Vampirolepis nana* Siebold, *Hymenolepis diminuta* Rud and nematodes were *Citellina dispar* Prendel, *Heterakis spumosa* Schneider and *Syphacia muris* Yamaguti. *C. dispar* is a new finding in Bangladesh. The highest prevalence of *H. diminuta* was recorded but the highest intensity was recorded in *V. nana.* The prevalence and intensity of *V. nana* was 56.25% and 65.11±13.23; *H. dimisnuta* was 72.92% and 4.37±0.89; *C. dispar* was 62.50% and 19.63 ±2.10; *H. spumosa* was 66.67% and 9.06±1.85; and *S. muris* was 64.58% and 24.65±2.60 respectively. Differences in prevalence and intensity due to sexes and seasons were also evaluated.

Key words: Cestodes, Nematodes, Helminth, Prevalence, Intensity.

Introduction

Rat is the most widely used laboratory animal. Long-Evans is one of the important strains of laboratory rat (*Rattus norvegicus* Berkenhout, 1769) harbored in most of the animal houses in Bangladesh. Throughout the world, necessary steps have been taken in order to detect and identify the ecto and endo parasites of laboratory animals and to keep them physically fit by controlling or by eradication of parasites.

Rats and mice harbor a number of helminth parasites, which can be transmitted to man and other vertebrates (Oldham, 1931). Infection with *Syphacia muris* Yamaguti, (1935) show the symptoms like poor condition, rough hair coats, reduced growth rate, prolapsed of rectum. Experimentally with *S. muris* infected animals grew slower than uninfected animals (Wagner, 1988). *Vampirolepis nana* Siebold, 1853 and *Hymenolepis diminuta* Rud, 1819 are com-

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monly found in rats and mice and potentially transmissible to man (Jawdat and Mahmoud, 1980). Spindler (1930) recovered *V. nana* in 3.6% of 2152 people examined from South-West Virginia. Senekiji *et al.* (1940) recorded the incidence of *V. nana* was 2.1% of 1000 people examined in Iraq and Salem *et al.* (1968) reported 42.4% of 204 young people from Mosul area of Iraq.

In Bangladesh, very few studies have been carried out on identification of the parasites and worm burden of rats and mice. These include the work of Huq (1969), Shaha (1974), Bhuiyan *et al.* (1996), Alam *et al.* (2003) and; Khanum and Arefin (2003). The present work was undertaken to identify prevalence and intensity of the helminth parasites of the Long-Evans.

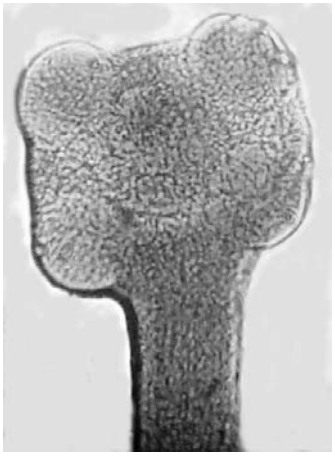
Materials and Methods

During the study period from April 2007 to March 2008, a total of 48 Long-Evans were collected weekly and monthly basis from Animal Research Section of the Institute of Food Science and Technology (IFST) of Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka. The hosts were reared in cages and special type of food and water were supplied. Food materials which supplied for the rearing of Long-Evans were Rice polish, Wheat bran, Maize, Protein, Soybean pulses, Coarse flour, Salt, Soybean oil (Tir), G. S. Vitamin, Treacle etc. After measuring the length and weight of the studied rats, the parasites were collected. In order to collect the parasites the intact digestive organs were removed carefully from the body and brought from the animal house to the parasitology laboratory of the Department of Zoology, University of Dhaka.

The cestodes were dipped quickly in a dishof hot fixation (AFA) when the scolices were in extended condition. Heavily coiled cestodes were fixed under the pressure of glass slides by the fixatives running beneath them. After 10 minutes, cestodes were preserved in 3% formalin or 70% ethyl alcohol in vials. Nematodes were fixed in 70% alcohol or glacial acetic acid, the latter was used only for comparatively larger nematodes (10-20 mm). For identification, the worms were dehydrated in an ethanol series (70%-100% Gl) and the helminths were cleared in lactophenol, stained in borax carmine and mounted in DPX (Cable 1963). They were identified following the key given by Yamaguti (1959 and 1961).

Results and Discussion

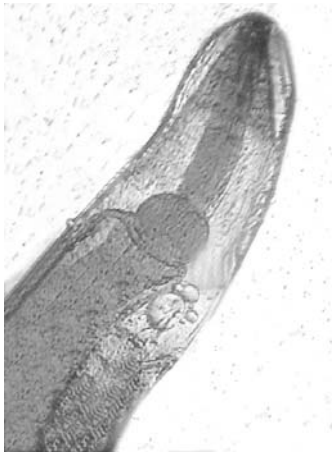
A total of 3554 helminth parasites were collected from 48 hosts, Long-Evans. Mean length of rats was 37.6 cm (from snout to tail) and mean weight was 270.5 gm. A total of 5 helminth parasite species were identified from two taxonomic groups. They were cestodes (*Vampirolepis nana* Siebold, 1853 and *Hymenolepis diminuta* Rud, 1819) and



a. Scolex of *Vampirolepis nana* (40 x 10)

b. Scolex of *Hymenolepis diminuta* (40 x 10)

c. Ant. Part of *Heterakis spumosa* (40 x 10)



d. Ant. part of *Syphacia muriss* (40 x 10)

e. Ant. Part of Citellina dispar (40 x 10)

Fig. 1.Whole mount photographs of the parts of the parasites studied.

nematodes (*Citellina dispar* Prendel, 1928, Heterakis *spumosa* Schneider, 1966 and *Syphacia muris* Yamaguti, 1935) (Figs. 1. a-e). *C. dispar* is a new finding, first time reported in Bangladesh.

The prevalence and intensity of each species of helminth parasites were varied greatly from one another. The highest prevalence (72.92%) was found in *H. diminuta* and lowest prevalence (56.25%) was found in *V. nana*. The prevalence of *C. dispar* was 62.50%, *H. spumosa* was 66.67% and *S. muris* was 64.58%. On the other hand, *V. nana* showed the highest intensity (65.11 ±13.23) followed by *S. muris* (24.65 ±2.60), *C. dispar* (19.63 ±2.10), *H. spumosa* (9.06±1.85) and the lowest was in *H. diminuta* ((4.37±0.89) (Table I).

The prevalence of each species of helminths in male and female were slightly varied but intensity was varied greatly (statistically insignificant) (Table I). The prevalence of *V. nana* was higher in male (58.33%), while, prevalence of *H. diminuta* was higher in

Table I. Prevalence and intensity of helminth parasites in Long-Evans

Parasite	Sex	No. of host infected (n=12 ♂; n=12 ♀)	Prevalence (%)	Total No. of worms collected	Intensity (mean±SD)
Vampirolepis nana	♂	14	58.33	1245	88.93±23.26
	♀	13	54.17	513	39.46±7.10
	Total	27	56.25	1758	65.11±13.23
Hymenolepis diminuta	♂	16	66.67	44	2.75±.055
	♀	19	79.17	109	5.74±1.52
	Total	35	72.92	153	4.37±0.89
Citellina dispar	♂	16	66.67	271	16.94±1.97
	♀	14	58.33	318	22.71±3.81
	Total	30	62.50	589	19.63±2.10
Heterakis spumosa	♂	16	66.67	162	10.13±2.77
	♀	16	66.67	128	8.00±2.52
	Total	32	66.67	290	9.06±1.85
Syphacia muris	♂	16	66.67	346	21.62±2.68
	♀	15	62.50	418	27.87±4.50
	Total	31	64.58	764	24.65±2.60

t=0.49(8df) for No. of hosts and t=0.51(8df) on intensity among male and female; both showing insignificant statistically.

Table II. Prevalence (PV) and intensity (ITS) of helminth parasites in Long-Evans in different seasons.

Parasite	Summer (June-August)			Autumn (September-November)			Winter (December- February)			Spring (March- May)		
	No. of Infected hosts (n=12)	PV (%)	ITS per hosts (±SD)	No. of Infected hosts (n=12)	PV (%)	ITS per hosts (±SD)	No. of Infected hosts (n=12)	PV (%)	ITS per hosts (±SD)	No. of Infected hosts (n=12)	PV (%)	ITS per hosts (±SD)
Vampirolepis nana	9	75.00	72.00 (10.66)	7	58.33	25.00 (5.88)	2	16.67	2.50 (0.50)	9	75.00	103.33 (33.45)
Hymenolepis diminuta	12	100.00	5.83 (1.17)	12	100.00	2.17 (0.44)	2	16.67	1.50 (0.50)	9	75.00	6.00 (2.92)
Citellina dispar	11	91.67	23.64 (4.28)	6	50.00	11.50 (3.53)	12	100.00	21.33 (2.10)	1	8.33	4.00 (0.00)
Heterakis spumosa	12	100.00	11.17 (3.23)	12	100.00	6.00 (1.44)	0	0	0	8	66.67	10.50 (5.30)
Syphacia muris	11	91.67	30.91 (5.38)	6	50.00	20.50 (5.82)	12	100.00	24.58 (2.14)	2	16.67	3.00 (1.00)

Anova showing insignificant value of intensity among seasons (F=2.92) and within species (F=0.87).

female (79.17%). The prevalence of *C. dispar* was higher in male (66.67%), while, equal prevalence (66.67%) of *H. spumosa* was found both in male and female. In case of *S. muris*, the prevalence was slightly higher (66.67%) in male than in female (62.50%). Comparatively higher intensity of *V. nana* and *H. spumosa* was found in male Long-Evans, while, higher intensity of *H. diminuta, C. dispar* and *S. muris* were recorded in female.

The prevalence of *V. nana* was highest (75%) in summer and spring season but was lowest (16.67%) in winter season and comparatively higher (58.33%) in autumn. Prevalence of *H. diminuta* was found highest (100%) in both summer and autumn but lowest (16.67%) in winter and comparatively higher (75%) in spring. The highest (100%) prevalence of *C. dispar* was recorded in winter season and the lowest (8.33%) was recorded in spring season but higher (91.67%) in summer season and lower (50%) in autumn season. *H. spumosa* was totally absent in winter season but highest (100%) prevalence was found in both summer and autumn. The prevalence of *S. muris* was higher (91.67%) in summer season and was lowest (16.67%) in spring season (Table II).

In case of *C. dispar, H. spumosa* and *S. muris*, highest intensity (23.64±4.28, 11.17±3.23 and 30.91±5.38) were recorded in summer, whereas, in case of *V. nana* and *H. diminuta*, highest intensity (103.33±33.45 and 6±2.92) was observed in spring (Table II).

Ash (1962) reported that the highest prevalence of *V. nana* infection was 50% in *Rattus spp.* Cheng and Xinmei (1990) reported that the prevalence of infection was 21.4% of laboratory mice in China. According to Spatafora and Platt (1982), the intensity of *V. nana* was 47±63.6 on *R. norvegicus* from Maymont Park, Virginia. In the present investigation, the prevalence and intensity of *V. nana* were comparatively higher in male (58.33% and 88.93±23.26) than female (54.17% and 39.46±7.10). Alam *et al.* (2003) reported that the higher prevalence and intensity of *V. nana* were found in male.

In the present observation, the prevalence and intensity of infestation of *H. diminuta* was 72.92% and 4.37±0.89 in the Long-Evans. They were higher in female (79.17% and 5.74±1.52) than male (66.67% and 2.75±0.55). Alam *et al.* (2003) reported that the prevalence and intensity of the same species was 87.5% and 10.9 ±4.31). He also reported that the prevalence and intensity of *Hymenolepis diminuta* was higher in male (91.67% and 11.64±5.78) than male (83.33% and 10.1±1.66).

The prevalence of *H. diminuta* was found highest (100%) in both summer and autumn season and highest intensity (6±2.92) was found in spring season. Abu-Madi *et al.* (2001) studied the infections of urban brown rat (*R. norvegicus*) population in Qatar and they found the prevalence of *H. diminuta* was increasing with host age but not in relation to host sex or season. They also found that in the winter, prevalence and abundance were similar in both host age and sex groups, but in the summer both parameters of infestation were markedly higher among juveniles compared to adults.

In the present observation, prevalence of *H. spumosa* was 66.67% in Long-Evans. The

prevalence of *Heterakis spumosa* was same in male and female. Spatafora and Platt (1982) found higher prevalence of *H. spumosa* (85.2%) in *R. norvegicus.* Huq *et al.* (1985) reported 45.64% prevalence from rats, mice and moles. Khanum and Arefin (2003) reported *H. spumosa* (54.17%) from laboratory mice. Difference in prevalence of infection with other workers may be due to the different ecological habitat of the hosts collected.

The prevalence and intensity of *S. muris* in Long-Evans were 64.58% and 24.65±2.60. The prevalence was comparatively higher in male (66.67%) and the intensity was comparatively higher in female (27.87±4.50). Alam *et al.* (2003) reported that prevalence and intensity of *S. muris* in Long-Evans were 70.83% and 29.06 ±0.29. Jueco and Zabala (1990) observed the prevalence of *S. muris* in laboratory and wild rats and showed that *S. muris* may accidentally infect human beings through contamination of food with faeces of infected murine hosts. Pinto *et al.* (2001) recorded the burden of *S. muris* in three different strains of *R. norvegicus* named Wister, Low M/2 and AM/2/Torr in Brazil. They found that the mean number of *S. muris* per host were 130.9, 269.4 and 434.4 respectively.

Intensity among four seasons and among species of helminths were found statistically insignificant (F=2.92 among season and F=0.87 within season).

Conclusion

The present investigation proved that laboratory rats Long-Evans are infected with various types of parasites instead of their suitable hygienic environmental conditions and proper feeding habit. Probably the reasons for their high prevalence of helminth parasites infestations are: quality of food, non-sterilized water and food supply, over crowding, inadequate ventilation and improper handling by lab-attendant. Such an infected specimen causes zoonotic disease and also remains completely unfit for use in any kind of scientific work. But, throughout the world Long-Evans are widely used for experimental works. The results of the present study emphasized that the living condition of the animal house belonging to the IFST of BCSIR should be improved.

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