



Nematode and Cestode Prevalence, Organel Distribution and Histological Effects Due to Parasitic Infection in Laboratory Rat Strain, Long-Evans (*Rattus norvegicus* Berkenhout, 1769)

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Abstract

Endoparasitic infection and histopathological effects in the laboratory rat, Long-Evans (*Rattus norvegicus* Berkenhout 1769) was evaluated. Five species of helminth parasites from two taxonomic groups were identified. They were -Cestodes (*Vampirolepis nana* Siebold, 1852 and *Hymenolepis diminuta* Rudolphi, 1819) and Nematodes (*Citellina dispar* Prendel, 1928; *Heterakis spumosa* Schneider, 1866 and *Syphacia muris* Yamaguti, 1941). All the worms were collected from the alimentary tract of the Long-Evans. The prevalence of infection was found highest in caecum (95.83%) and the intensity of infestation was found highest in anterior parts of the intestine (51.33±10.63). The histopathological study of helminth infected alimentary canal showed that the intestinal wall was severely damaged.

Key words: Nematodes, Cestodes, Prevalence, *Vampirolepis nana*, *Hymenolepis diminuta*, *Citellina dispar*, *Heterakis spumosa* and *Syphacia muris*.

Introduction

Rats and mice harbor a number of helminth parasites, which can be transmitted to man and other vertebrates (Oldham, 1931). Helminth parasitized rats were studied to identify the species and for determination of prevalence and intensity of helminths (Stanly and Virgin, 1993; Alam *et al.*, 2003; Khanum and Arefin, 2003).

Cestode and nematode parasites in rat have been reported from all parts of the world. *Vampirolepis nana* and *Hymenolepis diminuta* are commonly found in rats and mice and potentially transmissible (*Zoonoses*) to man. The occurrence of *H. diminuta* and *V. nana* in certain rodents is of interest since the possibility exists that rats and mice may serve as reservoir hosts and aid in the dissemination of these worms to domestic animals and man (Jawdat and Mahmoud, 1980); causing zoonoses.

In Bangladesh, several studies have been carried out on identification of the parasites of rats and mice but no histopathological investigation have been done (Huq, 1969; Shaha, 1974; Bhuiyan *et al.*, 1996; Alam *et al.*, 2003 and; Khanum and Arefin, 2003). The effects of parasites on their host can also be examined by pathological condition. In spite of several pathological works on parasitic infestation in our country no pathological investigation

have so far been undertaken on histopathology of the infestation on Long-Evans.

The present study was carried out on identification of parasite species prevalence and histopathological effect of parasites on their host and for securing additional information on the helminth parasites of laboratory rat.

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. To collect the parasites tested Long-Evans were dissected, the viscera were collected and brought to the parasitology laboratory of the Department of Zoology, University of Dhaka.

A histopathological investigation was carried out on thin sections of tissues. Then permanent slides were prepared from the tissues and permanent slides were prepared by Cable, 1963.

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Results and Discussion

The intestine of the Long-Evans (*Rattus norvegicus*) was infested by cestode parasites *Vampirolepis nana* (Siebold, 1852) and *Hymenolepis diminuta* (Rudolphi, 1819) and nematodes *Citellina dispar* (Prendel, 1928); *Heterakis spumosa* (Schneider, 1866) and *Syphacia muris* (Yamaguti, 1941).

A total of 1643 nematodes were collected from 46 infested hosts and 1911 cestodes from 38 infested hosts. The prevalence of cestodes and nematodes were 79.17% and 95.83% respectively. Prevalence of nematodes was higher than the cestodes. Intensity of cestodes and nematodes were 50.29 ± 14.13 and 35.71 ± 7.89 respectively.

The parasites were most abundant in anterior part of intestine. No parasites were found in stomach. In duodenum 46 (43.75%) parasites were collected and 1848 (75%) parasites were collected from anterior intestine, 729 (77.08%) parasites from posterior intestine and 931 (95.83%) parasites were collected from caecum. Lower intensity of infestation was found in duodenum (2.19 ± 0.42). The highest intensity was found in anterior intestine (51.3 ± 10.63). Slightly higher intensity of infestation was found in caecum (20.23 ± 2.60) and in posterior intestine (19.70 ± 2.37) respectively (Table I).

In species mix distribution the highest prevalence of *V. nana* was recorded from anterior intestine (53.33%). While, lower prevalence was found in duodenum (41.66%). The highest prevalence of *H. diminuta* was found also in anterior intestine (50%). The lower prevalence was recorded in duodenum 4.16% and in posterior intestine (4.17%). But duodenum and caecum contain higher and equal prevalence (20.83%). On the other hand, 0% prevalence was found in stomach, duode-

num and anterior intestine in case of *C. dispar*, *H. spumosa* and *S. muris*. The highest prevalence of *C. dispar* was found in caecum (60.42%) and comparatively lower in posterior intestine (52.08%). But the highest prevalence (62.50%) was found in caecum both in case of *H. spumosa* and *S. muris*. The lower prevalence of them was found in posterior intestine 39.58% and 54.17% respectively.

The intensity of *V. nana* showed the highest intensity in anterior intestine (61.71) while, parasites were totally absent in stomach, posterior intestine and caecum. Lower intensity was found in duodenum (2.2). The highest intensity of *H. diminuta* was found in anterior intestine (5) and lower intensity (1) was found in duodenum, posterior intestine and caecum. The highest intensity of *C. dispar* and *S. muris* were found in caecum (11.79 and 13.83) and slightly lower intensity was found in posterior intestine (9.88 and 13.42). *H. spumosa* showed the highest intensity in posterior intestine (6.84) and comparatively lower intensity were found in caecum (5.33) (Table II).

The intestine of Long-Evans is a coil and long tube and its wall consists of serosa, muscularis, submucosa and mucosa. These layers are arranged serially one below the other. The muscularis consists of thick circular and thin longitudinal muscle layer. The parasites were found firmly attached to the intestinal wall with their adhesive organs bearing gland cells or hooks by which they remain attached to the host mucosa. The parasites damaged the walls at the sites of their attachment. This disruption was mainly due to the action of sucker of helminth parasites. As a result the intestinal wall was heavily destroyed. In some cases, tissues were found to disappear completely (Fig. 1-3). Thus vacular structure appeared. Fibrosis or necrosis and few pigments were also observed.

Table I. Organ wise prevalence and intensity of helminth parasites in Long-Evans.

Organ	Total no. of hosts examined	Total no. of hosts infected	Prevalence (%)	Total no. of worms collected	Intensity (\pm SD)
Stomach	48	0	0	0	0
Doudenum	48	21	43.75	46	2.19 ± 0.42
Ant. Intestine	48	36	75	1848	51.33 ± 10.63
Post. Intestine	48	37	77.08	729	19.70 ± 2.3
Caecum	48	46	95.83	931	20.23 ± 2.60

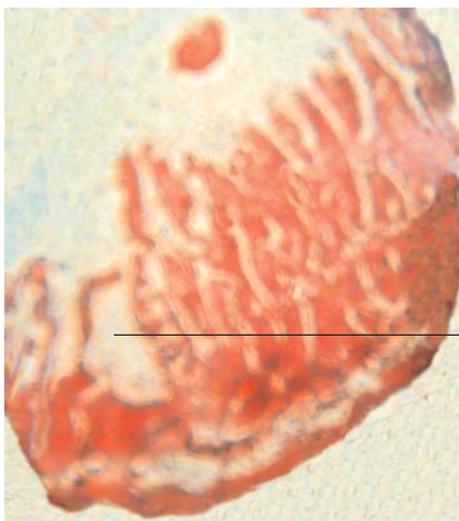
Table II. Prevalence and intensity of organ wise each species of helminth parasites in Long-Evans.

Organ		<i>V. nana</i>	<i>H. diminuta</i>	<i>C. dispar</i>	<i>H. spumosa</i>	<i>S. muris</i>
Doudenum	No.of hosts infected	20	2	0	0	0
	No. of worms collected	44	2	0	0	0
	Prevalence %	41.66	4.16	0	0	0
	Intensity	2.20	1.00	0	0	0
Ant. Intestine	No.of hosts infected	28	24	0	0	0
	No. of worms collected	1728	120	0	0	0
	Prevalence %	53.33	50.00	0	0	0
	Intensity	61.71	5.00	0	0	0
Post. Intestine	No.of hosts infected	0	2	25	19	26
	No. of worms collected	0	3	247	130	349
	Prevalence %	0	4.17	52.08	39.58	54.17
	Intensity	0	1.50	9.88	6.84	13.42
Caecum	No.of hosts infected	0	10	29	30	30
	No. of worms collected	0	15	342	160	415
	Prevalence %	0	20.83	60.42	62.50	62.50
	Intensity	0	1.50	11.79	5.33	13.83

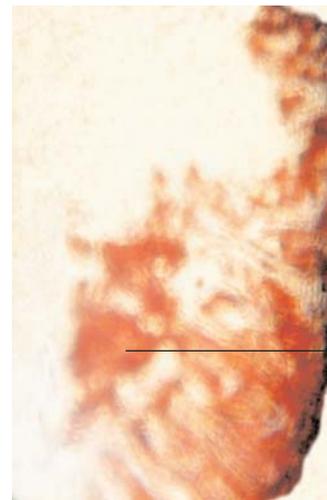
Total number of host examined was 48, No parasite was found in the stomach.

Khanum and Arefin (2003) reported that in laboratory mice the prevalence of infestation was highest in anterior intestine (70.5%) and the lowest in stomach (5.83%). The intensity of infestation in laboratory mice was found lowest in duodenum and the highest in anterior intestine.

From the above investigation indicates that the intestine and caecum is the favorite niche of most parasites where they were heavily abundant.



Disrupted tissue of Mucosa



Hemorrhages and lesion of villi

Fig 2. Transverse section of infected intestine of Long-Evans (40 x 10).

Abundance of *V. nana* was highest in anterior part of the intestine (small intestine) in Long-Evans in present observation supports Jawdat and Mahmoud (1980) who also found similar distribution.

From histopathological investigation it was observed that, the intestine was affected and tissues were damaged seriously by *V. nana* and *H. diminuta*. Degenerated tissues were observed within the folds around the parasites. The muscularis mucosa was found to be disrupted and damaged by the parasites.

Fig 1. Transverse section of infected intestine of Long-Evans (40 x 10).

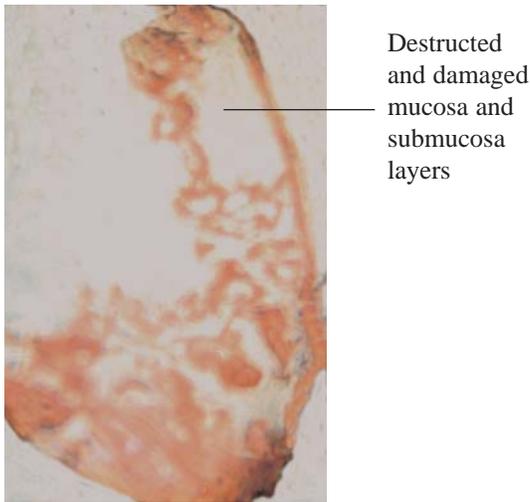


Fig 3. Transverse section of infected intestine of Long-Evans (40 x 10).

Conclusion

The histopathological observation showed that the presence of parasites within the organs causes hazard to the host in many ways. Heavy infection to the intestine may cause perforation and thereby physiological function might be abnormal. Damage of villi tissues may cause many reactions to the host.

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References

- Alam M. S., Khanum H., and Nessa Z. (2003) Helminth infection in laboratory rat strain, Long-Evans (*Rattus norvegicus* Berkenhout, 1769). *Bangladesh J. Zool.* **31**(2): 221-225.
- Bhuiyan A. I., Ahmed T. A., and Khanum H. (1996) Endoparasitic Helminths in *Rattus rattus* Linnaeus and *Bendicota bengalensis* Gray. *J. Asit. Soc. Bangladesh, Sci.* **22**: 189-194.
- Cable R. M. (1963) An illustrated laboratory manual for Parasitology. Burgess Publishing Company, Minneapolis. PP. 169.
- Huq M. M. (1969) A survey of the helminth parasites of roof rats *Rattus rattus*, digger rats *Bendicota bengalensis* and mole *Scalopus scalopus* in Mymensingh district, East Pakistan. *Pak. J. Vet. Sci.* **3**: 65-68.
- Jawdat S. Z., and Mahamoud S. N. (1980) The incidence of cestoidean and acanthocephalan parasites of some rodents in Iraq. *Bull. Nat. Hist. Res. Centre.* **7**(4): 55-71.
- Khanum H., and Arefin N. (2003) Helminth Burden in Laboratory mice, *Mus musculus*. *Bangladesh J. Zool.* **31**: 117-123.
- Oldham J. N. (1931) The helminth parasites of common rats. *J. Helminth.* **9**: 49-60.
- Shaha J. G. (1974) Taxonomy of some of the helminths of house rats, house mice and house shrews of Dacca city. M. Sc. thesis. *University of Dhaka, Bangladesh.* PP. 120.
- Stanley S. L. J. R., and Virgin, I. V. H. W. (1993) Scid as models for parasitic infections. *Parasitol Today.* **9**: 406-411.

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