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ROLE OF RATS IN TRANSMISSION OF SOME HELMINTHS IN BENI-SUEF GOVERNORATE

(With 4 Tables and 4 Figures)

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(Received at 3/12/2008)

دور الجرذان في نقل بعض الديدان في محافظة بنى سويف

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كثرة انتشار الجرذان في أماكن التجمعات البشرية فان هذه الدراسة تلقي الضوء على الديدان التي تصيب الجرذان في محافظة بنى سويف . تم فحص ١٢٠ جرذا حيث وجد ان ٣٠ % من الجرذان من نوع راتس راتس و (٢٨,٥٧ %) من نوع راتس فراجيفورس مصابة بانواع مختلفة من الديدان. هذه الديدان هي ٣ ديدان شريطية هي: هيمينوليس نانا وهيمينوليس دايميوتا ويرقات الاستروبيلوسركس فاشيولاريس. وديدان اسطوانية هي سيفشيا اوبفيلتا ونيبوستروجيلس برازيلينسس. وجد ان دودة نيبوسترونجيلس برازيلينسس هي الاكثر انتشارا في الجرذان. وللتعرف على الطور البالغ ليرقة الاستروبيلوسركس فاشيولاريس تم اجراء عدوى تجريبية في القطط وتم الحصول على الاطوار البالغة لديدان التتيا تينيفورمس. من هذه الدراسة وجد ان الجرذان تعمل كعوائل خازنة لديدان هيمينوليس نانا وهيمينوليس دايميوتا والتي يمكن ان تنتقل الى الانسان وكذلك هي عوائل وسيطة لديدان التتيا تينيفورمس والتي تصيب القطط.

SUMMARY

The population distribution and zoonotic potential of gastrointestinal helminths in naturally infected population of rats (*Rattus rattus* and *Rattus frugivorus*) in Beni-Suef are studied. One hundred and twenty rats were investigated, 30.00 % of *R. rattus* and 28.57 % of *R. frugivorus* were found infected by helminths. These helminths were 3 cestodes; *Hymenolepis nana*, *Hymenolepis diminuta* and *Strobilocercus fasciolaris* larva; 2 nematodes; *Syphacia obvelata* and *Nippostrongylus brasiliensis* from both species of rats. The most prevalent helminth was *Nippostrongylus brasiliensis* in rats. Experimental infection of free cats by larvae of *Strobilocercus fasciolaris* to obtain adult worms of *Taenia taeniaeformis* was done. The study revealed that rats act as reservoir of infection for human by *Hymenolepis nana* and *H. diminuta* and for cats by *Taenia taeniaeformis*.

Key words: Rats, helminthes, cestodes, nematodes

INTRODUCTION

Rats carry several zoonotic pathogens and because rats and humans live in close proximity in urban environments, there exists potential risk for transmission (Easterbrook *et al.*, 2007). It is important to survey the parasites of rats for understanding the source of the zoonotic infections, because rats can be natural reservoir of serious zoonotic parasitic infections (Seong *et al.*, 1995).

Many helminths were reported from rats as; *Hymenolepis nana*, *Hymenolepis diminuta*, *Syphacia obvelata*, *Nippostrongylus brasiliensis* and *Strobilocercus fasciolaris* (Mafiana *et al.*, 1997; Namue and Wongsawad, 1997; Abdel-Wahed *et al.*, 1999; Ito and Itagaki, 2003; Syed-Arnez and Mohd-Zain, 2006 and Waugh *et al.*, 2006).

Rats are a reservoir of many parasitic diseases specially zoonotic helminths as *Hymenolepis nana* which is the common zoonotic disease in children and institutionalized groups (El-Ridi *et al.*, 1987, Mohamed *et al.*, 1987, Rauch, 1993 and Alvez *et al.*, 2003). *H. diminuta* has been reported from various areas of the world (El-Ridi *et al.*, 1987, Mohamed *et al.*, 1987 and Ishih *et al.*, 2003).

Rodents are intermediate hosts for *Taenia taeniaeformis* and become infected by ingestion of eggs of this worm where they develop as *Strobilocercus fasciolaris* or *Cysticercus fasciolaris* (Sohn and Chai, 2005 and Mahesh Kumar *et al.* (2006). *Strobilocercus fasciolaris* were found in the liver and peritoneum of muskrat especially in adult rats (Borqsteede *et al.*, 2003).

This work aimed to detect the parasitic helminths in rats in Beni-Suef Governorate and which of these parasites could be infectious to other hosts specially human.

MATERIALS and METHODS

1. Animals.

A total of 120 rats (50 *Rattus rattus* and 70 *Rattus frugivorus*) were collected between April 2008 and August 2008 from different localities in Beni-Suef Governorate, Egypt. These animals were captured alive by metal trap, then transferred to the Lab of the institute. The animals were identified according to Osborn and Helmy (1980). They were anesthetized by diethyl ether inhalation after that the vertebral column was dislocated. Then they were dissected and gastrointestinal tract, liver, lungs, kidneys, gonads, body cavity and subcutaneous tissues were examined for helminths infections using stereomicroscope.

2. Parasites.

Adult worms and/or larvae of different helminths were collected. Cestodes were flattened, fixed in 10% formalin and stained with acetocarmine (Pritchard & Kruse, 1982), while nematodes were fixed in 70% glycerol alcohol and mounted in glycerol jelly. Taxonomic identification of helminths was based on Yamaguti (1958).

2.1. Experimental infection of cats for identification of larvae:

Faeces of 3 cats (*Felis catus*) were examined to ensure that they were free from parasitic helminthic infection especially *Taenia* species. They were fed on the part of livers of rats that contained the obtained cysts. Each cat was infected by 5 cysts. After 5 weeks post infection, faeces of cats were examined weekly for the presence of *T. taeniaeformis* eggs by using floatation technique (Soulsby, 1982). Cats were sacrificed at 55 days post infection and the intestine was examined for the presence of the adult worms. Adult worms were collected, counted and identified.

RESULTS

1. Incidence of infection among the examined rat species

In this work, 120 rats were examined, 35 (29.16%) were found harboring helminths. 50 *R. rattus* were examined and the infection rate was 30% while on examination of 70 *R. frugivorus*, 28.57 % were infected (Table 1).

Regarding the helminths infection among rat species, cestode helminths were recorded at highest rates, 24% and 21.43% in *R. rattus* and *R. frugivorus* respectively. The nematode infection was 16% and 21.43% in *R. rattus* and *R. frugivorus* respectively (Table 2).

Table (3) illustrated the helminths in *R. rattus*: *Nippostrongylus brasiliensis* was the most common type of infection among the infected rats (20%), followed by *Hymenolepis nana* (16%), *H. diminuta*, (14%) *Syphacia obvelata*, (10%) and lowest infection rate was *Strobilocercus fasciolaris* 6%.

Table (4) showed the detected helminths; the highest helminth infection rate in *R. frugivorus* was by *N. brasiliensis* (21.43%), followed by *H. diminuta* (20%)

2. Identification of helminths and larvae.

The helminths of the infected *R. rattus* were three cestodes; *H. nana*, *H. diminuta* (Fig. 1) and *Strobilocercus fasciolaris* larva (Fig. 2), two nematodes; *Syphacia obvelata* (Fig 3) and *N. brasiliensis* (Fig. 4), while those in *R. frugivorus* were: three cestodes, *H. nana*,

H. diminuta and *Strobilocercus fasciolaris* and two nematodes; *Syphacia obvelata* and *N. brasiliensis*.

3- Complete identification of obtained larva by the experimental infection of cat.

The obtained larva was *Strobilocercus fasciolaris* (*Cysticercus fasciolaris*), the cysts were found on the liver of both rats. It was white cyst located on the parietal surface of liver containing the larvae (0.5cm in diameter). When the cyst was ruptured the segmented white larvae appeared (5cm in length) in which the scolex was evaginated and connected to the bladder by a segmented strobila, resembling a small tapeworm and also was known as a *strobilocercus*. The scolex carries hooks in two rows as adult worm (Fig. 2).

A group of 3 cats each was infected with 5 cysts. After 48 days post infection eggs of *Taenia taeniaeformis* were detected in the faeces of all infected cats. All cats were sacrificed at one week post eggs detection in their faeces. The mean adult *T. taeniaeformis* was 3 ± 1 in the infected cats. Adult *T. taeniaeformis* is about 50cm in length, has a scolex armed with hooks in two rows, mature segment contained bilobed ovary and numerous testes scattered in the segment and gravid segment had several lateral branches (5-8 branches) (Fig. 2).

Table 1: Rate of infection among examined rat species.

Rat species/	Exam. No.	Infect. No.	% of infection
<i>Rattus rattus</i>	50	15	30.00
<i>R. frugivorus</i>	70	20	28.57
<i>Total</i>	120	35	29.16

Table 2: Incidence of infection with helminths in infected rat species.

Rat spp.	<i>Rattus rattus</i> (n=50)		<i>R. frugivorus</i> (n= 70)	
	Inf. No.	%	Inf. No.	%
Cestodes	12	24	15	21.43
Nematodes	8	16	15	21.43

Table 3: The helminth parasites in the examined *R. rattus*.

Helminths	Exam. No.	Inf. No.	Prevalence of infection (%)
<i>Hymenolepis nana</i>	50	8	16
<i>H. diminuta</i>	50	7	14
<i>Strobilocercus fasciolaris</i>	50	3	6
<i>Syphacia obvelata</i>	50	5	10
<i>Nippostrongylus braziliensis</i>	50	10	20

Table 4: The helminth parasites in the examined *R. frugivorus*

Helminths	Exam. No.	Inf. No.	Prevalence of infection (%)
<i>Hymenolepis nana</i>	70	10	14.29
<i>H. diminuta</i>	70	14	20
<i>Strobilocercus fasciolaris</i>	70	8	11.43
<i>Syphacia obvelata</i>	70	7	10
<i>Nippostrongylus braziliensis</i>	70	15	21.43

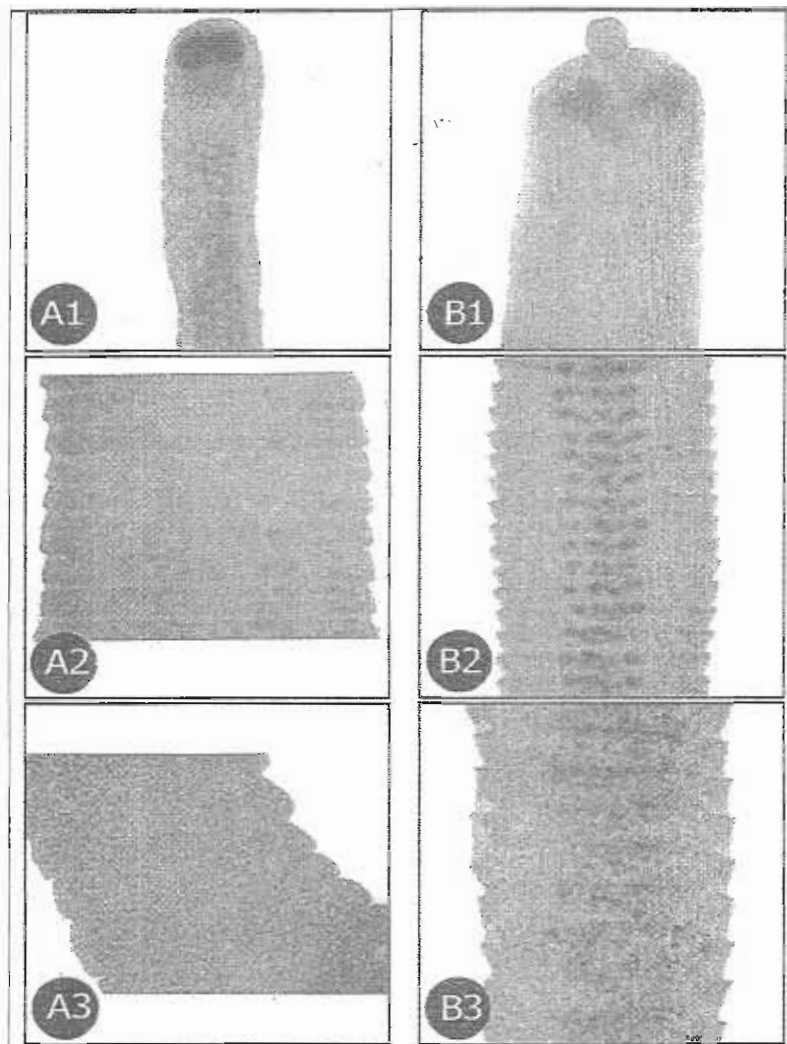


Fig. 1: (X10) **A1.** Scolex of *H. diminuta*. **B1.** Scolex of *H. nana*
A2. Mature segments of *H. diminuta* **B2.** Mature segment of *H. nana*
A3. Gravid segments of *H. diminuta* **B3.** Gravid segment *H. nana*

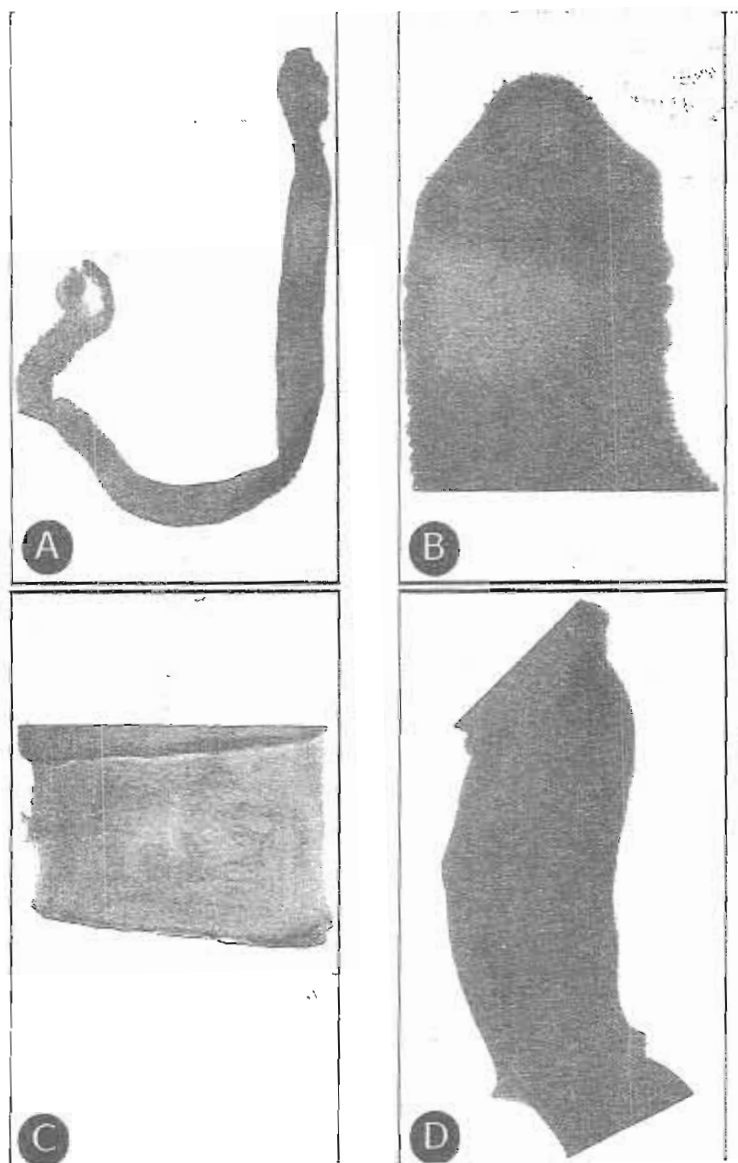


Fig. 2: A. Whole larva of *Strobilocercus fasciolaris*.
B. Scolex of Adult *Taenia taeniformis*.
C. Mature segment of *Taenia taeniformis*.
D. Gravid segment of *Taenia taeniformis* (X 4).

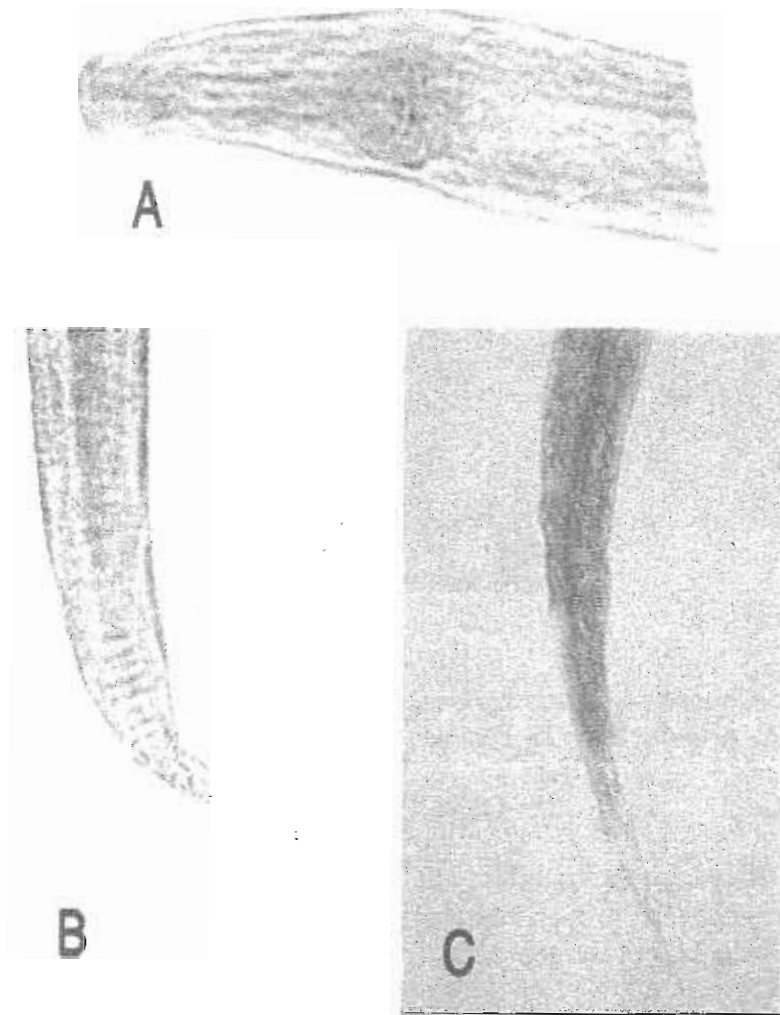


Fig. 3: A. Anterior end of *Syphacia obvelata*.
B. Posterior end of *S. obvelata* (male).
C. Posterior end of *S. obvelata* (Female) (X 100).

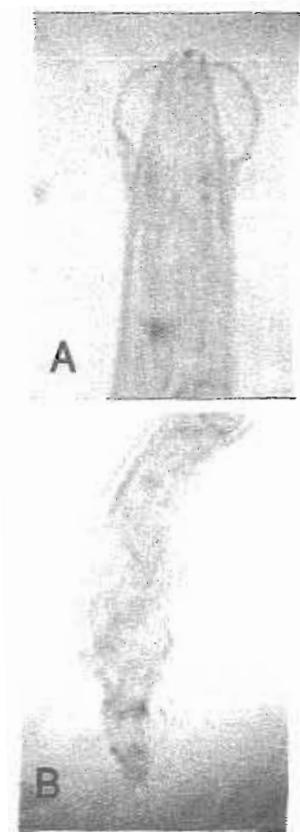


Fig. 4: *Nippostrongylus braziliensis* (X 100)
A- Anterior end B- Female posterior en

DISCUSSION

Rats have an important role in transmission and dissemination of sericus pathogens to man and animals (Shoukry *et al*, 1986). Also they are considered as reservoir hosts for many parasitic diseases (Morsy *et al.*, 1982).

The data of the present study showed that 29.16% of the rats that collected from Beni-Suef Governorate, Egypt were infected with helminths also 30.00 % of *R. rattus* and 28.57 % of *R. frugivorus* were infected with helminths. These helminths are *Hymenolepis nana*, *H. diminuta*, *Strobilocercus fasciolaris*, *S. obvelata* and *N. brazilinsis*.

The most prevalent type of infection was cestodal worms 21.43% (*Hymenolepis nana*, *H. diminuta* and *Strobilocercus fasciolaris*). These species in the present study were similar to the results of other authors like; Samaha and Otify, 1991; Abdel Salam *et al.*, 1994, El Shazly *et al.*, 1994, Seong *et al.*, 1995, Mafiana *et al.*, 1997, Abdel Wahed *et al.*, 1999 and Waugh *et al.*, 2006.

Regarding the nematodes infection, *N. braziliensis* was the most common infection in the infected rats. The same result was reported by Uga *et al.* (1983); Udonsi (1989); Antolin *et al.* (2006) and Syed-Arnez and Mohd-Zain (2006).

S. obvelata (the pin worm of rodents) is widely distributed all over the world and its presence in this study goes parallel with other studies (Abel Salam *et al.*, 1994; Mafiana *et al.*, 1997; Shaheen *et al.*, 1999; Syed-Arnez and Mohd-Zain 2006).

The resulted adult cestode from the experimental infection was identified as *Taenia taeniaeformis* based on its typical taenoid hooks and structure of mature segments and branches of gravid segments. The adult worm was similar to that obtained by Williams and Shearer (1981) and Rossin *et al.* (2004). Also Mahesh Kumar *et al.* (2006) confirmed that the obtained tapeworm cysts from liver of Wistar rats in India as *Strobilocercus fasciolaris* by PCR linked mitochondrial DNA sequencing.

From this study, *Hymenolepis nana* was reported from both species of rats and this worm is a zoonotic parasite, so rats are considered as reservoir and maintaining hosts for spreading of the infection to man by this helminth. This was stated by many studies; Samaha and Otify (1991), Abdel-Salam *et al.* (1994) and Easterbrook *et al.* (2007).

H. diminuta was recorded from examined rats in this study. Many studies considered it as a zoonotic parasite, so rats act as reservoirs and source for human infection by that worm. This view was shown by many works; Samaha and Otify (1991), Abel Salam *et al.* (1994), El Shazly *et al.* (1994), Abd El-Wahed *et al.* (1999) and Waugh *et al.* (2006).

From this study it could be concluded that *R. rattus* and *R. frugivorus* were found infected by many helminths. Moreover the study recorded two parasites as a common zoonotic parasites for human; *H. nana* and *H. diminuta*. Also rats are source of infection for cats by *Taenia taeniaeformis*

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