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PREVALENCE OF SOME HELMINTHS IN RODENTS CAPTURED FROM DIFFERENT CITY STRUCTURES INCLUDING POULTRY FARMS AND HUMAN POPULATION OF FAISALABAD, PAKISTAN

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ABSTRACT

The aim of the present study was to investigate prevalence of zoonotic helminths from human, *Rattus rattus (R. rattus)*, *Rattus norvegicus* (*R. norvegicus*) and *Mus musculus* of eight different structures, namely grain shops in grain market, departmental stores, railway godowns, food processing plants (bakeries), poultry farms, houses in kachi-abadies, houses in departmental colonies and posh residences and banglows in Faisalabad city. All the structures were sampled for 2 months each and completed in 16 months. Highest prevalence (70%) of *Vsmpirolepis* spp. was observed in *R. rattus* sampled from poultry farms, which was significantly higher ($P<0.05$) than the prevalence of all the helminths recovered from other structures. *Hymenolepis nana* (*H. nana*) was observed in 60% of the sampled *Mus musculus* collected from kachi-abadies, which was significantly higher ($P<0.05$) than all other structures studies for *H. nana*, except *R. rattus* from kachi-abadies (55%) and *R. norvegicus* from grain shops in grain market (55%). The rodent's endo-parasites viz., *Hymenolepis nana*, *Teania taenaeformis*, *Entrobius spps* and *Trichuiris spps* observed in *R. rattus*, *R. norvegicus* and *M. musculus* at different percentages were also recorded in human stool samples with an incidence of 48, 21, 76 and 10%, respectively.

Key words: Zoonotic helminthes, protozoa, *H. nana*, *R. norvegicus, R. rattus, Mus musculus,* Pakistan.

INTRODUCTION

The arthropod ectoparasites of rodents are important vectors of many pathogenic microorganisms and can also act as important reservoirs for parasitic zoonoses, like trichinellosis and capillariosis (Stojcevic *et al*., 2004). Increased rodent population in an area can be directly related to the increased zoonotic diseases in human population (Bradshaw, 1999).

In addition to be infested with zoonotic helminthes, rats and mice are infected with several zoonotic bacteria (Mushtaq-ul-Hassan *et al*., 2008). Human infection occurs by the consumption of food or water contaminated with embryonated eggs, previously released from rat liver through cannibalism, predation or decomposition of carcasses.

Some parasites are transmitted through contact with infected rodent urine or faeces, others through arthropods (Beg *et al*., 1983). *Rattus rattus*, *Rattus norvegicus* and *Mus musculus* can serve as vectors of zoonotics and many other diseases and may represent a serious risk to the human and domestic animals health (Webster and MacDonald, 1995). Rats are usually infected with a number of zoonotic parasites, including Cryptosporidium, Pasturella, Listeria, Yersinia and Hantavirus, and represent a potential risk to the health of humans and domestic animals. The brown rats *(Rattus norvegicus)* from Doha, Qatar have been reported as infested by *Hymenolopis diminuta* (Abu-Madi *et al*., 2001).

The present work was undertaken to isolate and make a preliminary investigation on zoonotic helminths from *R. rattus*, *R. norvegicus* and *Mus musculus* from eight different city structures in Faisalabad (Pakistan), and thereby assess the public health risks.

MATERIALS AND METHODS

The trapping of rats and mice was carried out for 16 months from February, 2003 to May, 2004 using metallic snap traps (17 x 9.5 cm) for rats and (11.5 x 4.5 cm) for mice and live trap cages. Eight different structures *i.e*., grain shops in grain market, departmental stores, railway godowns, food processing plants (bakeries), poultry farms, houses in kachi-abadies, houses in departmental colonies and posh residences and banglows were sampled for commensal rats and mice in Faisalabad city. Each structure was sampled for two months.

Rats and mice were autopsied and gastrointestinal (GIT) contents were examined grossly for the presence of adult helminths. The GIT contents were removed into Petri's dish containing normal saline and transferred onto glass slides to examine under microscope at 10X (Chaudary *et al.*, 2007). The eggs of helminthes were examined and identified following Melby and Altman (1974). Floatation and sedimentation techniques, as described by Tasawar *et al*. (2007), were used to examine the parasites in the faecal samples. To determine the incidence of rodent

born endo-parasitic infestation in human, the results of 600 stool tests from different local health laboratories were collected.

The data were analyzed through Chi-square for comparison of prevalence of different species of helminths in different rodents species captured from eight structures.

RESULTS

Seven species of endoparasites (helminths) were found in the intestinal tracts of the commensal rats and mice (Table 1). Briefly, *H. diminuta* was significantly highly prevalent in *R. norvegicus* sampled from railway godowns, whereas the prevalence of *H. nana* was higher (P<0.05) in *R. norvegicus* (grain shops in grain market), *R. rattus* (poultry farms), *R. rattus* (kachi-abadies) and *R. rattus* (kachi-abadies) than other rodent species sampled from different structures under study. The prevalence of *T. taeniaeformis* was significantly higher (P<0.05) in *R. rattus* from grain shops in grain market compared with other structures under study. The infestation by the endo-parasites in the house mouse was significantly higher (P<0.05) than other rodent spp. under study. Out of seven species found to occur on *R. rattus*, six were found in *M. musculus*. The most frequently occurring endo-parasite was *H. nana* (19-60%), which was present in the mice captured from all city structures. *H. diminuta* (20-60%) were only found in mice captured from poultry farms and kachi-abadies, while *T. taenaeformis* (18-57%) and *Protospirura* spp. (14-30%) were present only in the mice captured from kachi-abadies. *Rictularia* spp. were absent in *Mus musculus*, whereas *Vampirolepis* and *Trichuiris* spp

Table 1: Occurrence of endo-parasites (helminths) in commensal rats and mice (n = total no. of specimens)

Structure	Harbouring rodents	Helminths						
		H. diminuta	***H. nana***	***Rictularia spp.***	***T. taeniaeformis***	***Vampirolepis spp.***	***Protospirura spp***	***Trichuris spp***
Grain shops in grain market	*R. rattus* (n = 7)	2(29)b	3(43)b	-	4(57)a	4(57)a	1(14)c	3(43)a
	R. norvegicus (n = 44)	12(27)bc	24(55)a	-	-	11(25)	11(25)b	11(25)c
	M. musculus (n = 15)	-	4(27)c	-	-	3(20)c	-	6(40)a
Departmental stores	*R. rattus* (n = 9)	-	2(22)c	-	2(22)c	-	-	-
	M. musculus (n = 15)	-	4(27)c	-	-	-	-	-
Railway godowns	*R. rattus* (n = 51)	10(20)c	9(45)b	13(25)	17(33)c	20(40)b	10(20)c	20(40)a
	R. norvegicus (n = 5)	3(60)a	2(40)b	1(20)	-	1(20)c	-	1(20)c
	M. musculus (n = 30)	-	9(30)c	-	-	6(20)c	-	6(20)c
Bakeries	*R. rattus* (n = 11)	2(18)c	2(18)c	-	2(18)c	-	-	-
	M. musculus (n = 59)	-	12(20)c	-	-	-	-	-
Poultry farms	*R. rattus* (n = 63)	22(35)b	38(60)a	-	29(46)b	44(70)a	19(30)a	32(51)a
	M. musculus (n = 20)	6(30)b	8(40)b	-	-	3(15)c	-	6(30)c
Houses in kachi-abadies	*R. rattus* (n = 44)	9(20)c	24(55)a	-	18(40)b	27(60)a	9(20)c	13(30)c
	M. musculus (n = 132)	26(20)c	79(60)a	-	26(20)c	26(20)c	33(25)b	52(40)a
Houses in departmental colonies	*R. rattus* (n = 12)	-	3(25)c	-	-	3(25)c	-	-
	M. musculus (n = 32)	-	6(19)c	-	-	-	-	-
Posh residences and banglows	*M. musculus* (n = 5)	-	1(20)c	-	-	-	-	1(20)c

NB: The percent occurrence is given in parenthesis; Value with different superscripts within a column are significantly different (P<0.05).

were found in the mice present in all structures, except departmental stores, food processing plants (bakeries), houses in departmental colonies and posh residences, while *Trichuiris* spp. (20-51%) were found in rats captured from posh residences and banglows. *Rictularia* spp (20-25%) were present only in rats captured from railway godowns.

The endo-parasitic infestation also varied with respect to structures. The larger number of rats and mice captured from grain shops in grain market (*H. nana* 55%, *Vampirolepis* spp 57%, *Trichuris* spp 43%), railway godowns (*H. nana* 45%, *H. diminuta* 60%, *Vampirolepis* spp 40%, *Trichuris* spp 40%), poultry farms (*H. nana* 60%, *Vampirolepis* spp 70%, *Trichuris* spp 51%) and houses in kachi-abadies (*H. nana* 60%, *Vampirolepis* spp 60%, *Trichuris* spp 40%) were infested. In departmental stores, food processing plants (bakeries), houses in departmental colonies and posh residences, less endoparasitic infestations were observed (Table 1). Only 1 to 3 species were recorded *i.e*., *H. nana*, *T. taeniformis*, *Vampirolepis* and *Trichuiris* spp., which occurred less frequently.

To determine the incidence of rodent born endo-parasitic infestations in humans, the results of 600 stool tests from different local health laboratories were collected. It was noted that three species of rodent's endoparasites were present in the human stools. These were *H. nana*, *T. taeniformis* and *Trichuiris* spps with an incidence of 48, 21 and 10%, respectively (Table 2). The occurrence of *Entrobius* spps in human stool was 76%, which is significantly higher ($P<0.05$) than the occurrence of *H. nana*, *T. taeniformis* and *Trichuiris* spp. The occurrence of *H. nana* was significantly lower ($P<0.05$) than the occurrence of *Entrobius* spp, whereas it was higher than that of *T. taeniformis* and *Trichuiris* spp. Unfortunately, economic status or status of structures of the infested humans could not be assessed, as there was no such record in the stool test reports of the patients.

DISCUSSION

The house rat (*R. rattus*) greatly infested the older and relatively low density structures of grain shops of the grain market and railway godowns. These results are in agreement with Langton *et al*. (2001), who reported higher population of brown rats (*R. norvegicus*) in old and thinly populated structures with eatables available there.

Different authors have reported a wide range of parasites as most of the investigations were carried out in tropical areas. We have found 7 helminth species in commensal rats and mice captured from different structures at Faisalabad, whereas Nama and Parihar (1976) reported 8 helminth species in 149 trapped rats in India. Yen *et al.* (1996) found 29.6% overall endo-parasite infection in rats in China, whereas 86.8% infection rate was recorded in Thailand (Namue and Wongsawad, 1997). In Egypt, Abdel-Wahed *et al*. (1999) reported 54% overall parasitic infection rate. In the present study, we have reported 15-70% helminth infection in commensal rats and mice, which is in agreement with Yen *et al.* (1996), Namue and Wongsawad (1997) and Abdel-Wahed *et al*. (1999).

The results obtained from the present study revealed higher occurrence of helminths in rats and mice of structures with higher population of intermediate host *i.e.*, poultry farms and houses in kachi-abadies. Similar findings have been reported by Flynn (1973) and Khan (1990) that the endo-parasitic infection due to both nematodes and cestodes is related with the availability of intermediate host in confined indoor conditions of houses, stores and godowns. However, Webster and MacDonald (1995) studied the parasites of wild rats on a farm in UK and found 22% *H. diminuta* eggs and 11% of *H. nana* in 225 wild rats examined.

Several species of helminth parasites are common to both man and rodents. Some are accidental infections and have little public health importance, while the others naturally occur in a number of rodents and play a significant role in the prevalence of some of the important human parasites (Flynn, 1973). The genus Hymanolepis is most notorius for causing pathologic effect of human health importance (Ceruti *et al*., 2001). In the present study, *H. nana*, *T. taenaeformis*, *Entrobius* spp. and *Trichuiris* spp. were found quite frequently in human stool samples. These species of helminths were also found in GIT contents of commensal rats and mice in the present study, which confirms the findings of Flynn (1973) and Ceruti *et al*. (2001).

Table 2: Percent occurrence of endoparasites (helminths) in commensal rodents and human stool samples (total samples of human stools tested were 600)

Species	*R. rattus*	*R. norvegicus*	*M. musculus*	Human stool
H. nana	34	78^{a}	33^{a}	48^{b}
T. taeniaeformis	27	--	3^{c}	21^{c}
Entrobius spp.	--	--	--	76^{a}
Trichuris spp.	21	23^{c}	19^{b}	10^{c}
Average	27	50^{b}	18^{b}	39^{b}

Value with different superscripts within a column are significantly different ($P<0.05$).

Conclusions

The parasitic infestation in rodents was significantly high in the structures of kachi-abadies with poor environmental/hygienic conditions. These helminths from rodents can serve as a source of human infection, whereas *Entrobius* spp. was not found prevalent in rodents but were present in human.

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