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Full Length Research Paper

A study on prevalence of gastrointestinal parasites of laboratory animals in Addis Ababa

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A study on prevalence of gastrointestinal parasites of laboratory animals was conducted from November 2009 to March 2010 at the Ethiopian Health and Nutrition Research Institute (EHNRI), Addis Ababa. For this study, faecal samples were collected from a total of 210 laboratory animals which include 140 mice (Swiss albino), 56 rats (Wistar) and 14 guinea pigs (*Cavia porcellus*). The collected faecal samples were examined by simple faecal flotation techniques for isolation of parasitic eggs and/or oocysts. Out of 210 faecal samples examined, 79 (37.62%) were infected with gastrointestinal parasites. There was significant difference (P<0.05) in prevalence of gastrointestinal parasites in rats, mice and guinea pigs with prevalence of 41.07, 30 and 100%, respectively. Nematodes, cestodes and *Eimeria caviae* have been detected. Among nematode parasites, the prevalence of *Aspiculuris tetraptera* and *Syphacia obvelata* were found with prevalence of 21.43 and 1.43%, respectively. The highest prevalence of nematodes was found in mice (28.57%) followed by rats (7.14%). *Hymenolepis nana* and *Hymenolepis diminuta* were cestodes detected with the highest prevalence in rats (33.93%) followed by mice (1.43%). In mice, the highest prevalence of helminths was at 10 weeks of age (21.43%) while the lowest was in 4 weeks of age (2.14%). There was significant difference (P<0.05) in prevalence of helminths among the different age groups. *E. caviae* were detected only from guinea pigs at 16 weeks of age.

Key words: Gastrointestinal parasites, laboratory animals, prevalence.

INTRODUCTION

Laboratory animals have contributed greatly to our knowledge of biological structure and function (Clark et al., 1997) and are essential tools in biomedical research and training (Tsegaye and Shiferaw, 1999). They are used extensively in the safety evaluation of different therapeutic drugs, foods, chemicals and in a broad variety of biological investigations (Clark et al., 1997), for the diagnosis of infectious diseases, in the production of vaccines, sera and other biological substances of public health and veterinary importance (Tsegaye and Shiferaw, 1999; Tanideh et al., 2010). It is well established that, the use of disease free animals can often lead to a substantial reduction in the number needed for any given experiment (John and Michael, 1976; Fox et al., 2002). Therefore, in order to obtain the optimum benefit from them, laboratory animals must be of an appropriate quality (Tsegaye and Shiferaw, 1999).

Laboratory animals can get infected by many diseases and results in consequent loss of time, money and research effort. Like all animals kept in captivity,

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laboratory animals become a prime target for parasite infection if appropriate preventive measures are not practiced (Baker, 2007; Tanideh et al., 2010). They can be heavily parasitized both externally and internally. It has been most useful to verify that, among the commonly used laboratory mammals from several supplying animal houses; some are heavily parasitized with helminths at the time of delivery, or become infected in the laboratories of destination, where they are sometimes kept for long periods (Hugot, 1980). There is only little information available regarding laboratory animal situations in Ethiopia. It is doubtful that the required standard is met. Systemic assessment of the problems and evaluating its magnitude are essential steps to improve the situation. Therefore, the study was carried out to identify and determine the prevalence and associated risk factors of gastrointestinal parasites of laboratory animals.

MATERIALS AND METHODS

Study area

The study was conducted in Ethiopian Health and Nutrition Research Institute (EHNRI), Addis Ababa from November 2009 to March 2010. Addis Ababa is a high land area with an altitude of 2, 300 m.a.s.l., average annual rainfall of 1800 mm and temperature of 14 to 21°C.

Study animals and management system

The study was conducted on laboratory animals; mice (Swiss albino), guinea pig (*Cavia porcellus*) and rat (Wistar) of both sexes and different age groups kept in EHNRI for laboratory practices. The laboratory animals were kept in separate cages in the vicinity of EHNRI. They were fed *ad libitum* with diet of hay with a small daily portion of mixed green vegetables and concentrate pellets by their attendants and potable water was provided adlib.

Study design and sampling methodology

This study was a cross-sectional study with a purposive sampling of all laboratory animals in EHNRI. Faecal samples were collected from 210 animals for investigation of gastrointestinal parasites. The explanatory variables considered were the species difference, age and sex of animals. Animals were grouped into four age groups: 4, 6, 8, and 10 weeks of age. By putting each animal separately in a cage, 3 g of faecal samples was collected using cleanly kept test tubes for protozoan parasites and using formalinized universal bottles for gastrointestinal parasites. The samples were transported to the EHNRI parasitology laboratory for coproscopic examination

Coproscopical examination

Faecal samples were examined for presence of helminth eggs and/or protozoan oocysts by simple faecal flotation technique as described by Foryet (2001). 3 g of faeces was mixed with 42 ml of supersaturated sodium salt solution, the sample was strained through a tea strainer, pipetted into the slide, and the eggs or protozoa were identified after letting the suspension stand for 5 min (Kahn, 2005). Identification of parasitic eggs and oocysts was carried out as described by Kassai (1999) and Charles and Hendrix (2006).

Data analysis

Data obtained were analysed using Stastical Packages for Social Science (SPSS Version 17). Chi-square test statistics was used to evaluate the prevalence of gastrointestinal parasites among the study animals. In all the analyses, confidence level was held at 95% and ($P \leq 0.05$) was considered as significance.

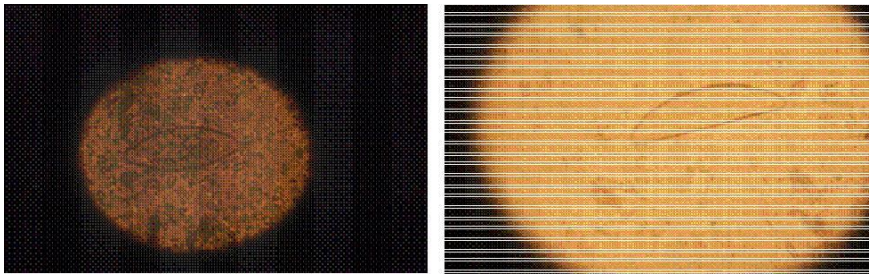
RESULTS

A cross-sectional study was conducted on gastrointestinal parasites of laboratory animals from November 2009 to March 2010 at Ethiopian Health and Nutrition Institute (EHNRI). Addis Ababa and the study were carried out on the total of 210 laboratory animals of which 140 mice (Swiss albino), 56 rats (Wistar), and 14 guinea pigs (*C. porcellus*). Out of the 210 faecal samples examined, 79 (37.62%) were found positive for gastrointestinal parasites. Highest prevalence of helminths was recorded in rats with prevalence of 41.07% (23 of 56) followed by mice 30% (42 of 140). The highest prevalence of nematode was found in mice (28.57%) followed by rats (7.14%). There was a significant difference ($P<0.05$) in prevalence of gastrointestinal parasites among the three species of laboratory animals.

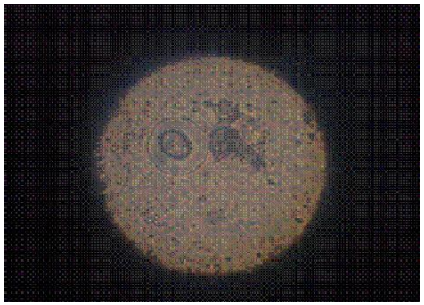
The most prevalent nematode parasites in mice were *Aspiculuris tetraptera*, *Syphacia obvelata* and mixed infection (*A. tetraptera* and *S. obvelata*) with prevalence of 21.43, 1.43 and 5.72% respectively (Table1, Figure 1a and b). On the other hand, the highest prevalence of cestode was found in rats (33.93%) followed by mice (1.43%). The most prevalent cestode in rats was *Hymenolepis diminata* (26.78%) followed by *Hymenolepis nana* (7.14%). The only cestode identified in mice was *H. nana*. *Eimeria caviae* were detected from all guinea pigs examined (prevalence of 100%); however, there was not any cestode or nematode identified from this group of laboratory animals. On the contrary, mice and rats were free of *E. caviae* (Table 1 and Figure 1c). Highest prevalence of helminths (21.43%) was found at 10 weeks of age in mice followed by that of 6, 8 and 4 week old mice with prevalence of 3.57, 2.86 and 2.14%, respectively. There was a statistically significant difference in prevalence of helminthes among the different age groups of mice ($P<0.05$) (Table 2). Of the total rats examined, 41.07% were found infected with helminth parasites and a higher prevalence was found in females (23.21%) than males (17.86%). No helminth parasite was detected in all age groups of guinea pigs. However, *E. caviae* was detected in all of 16 week old

Table 1. Prevalence of gastrointestinal parasites among different species of laboratory animals.

Laboratory animals	No. examined	No. positive	Number of positive animals and prevalence (%) of gastrointestin					
			Nematodes					Cestodes
			S. obvelata **n (%)**	***A. tetraptera*** **n (%)**	**Both n (%)**	**Sub-total n (%)**	***H. nana*** **n (%)**	***H. diminuta*** **n (%)**
Swiss albino	140	40	2(1.43)	30(21.43)	8(5.71)	40(28.57)	2(1.43)	0(0)
Wistar	56	23	4(7.14)	0(0)	0(0)	4(7.14)	4(7.14)	15(26.78)
Cavia porcellus	14	14	0(00)	0(0)	0(0)	0(0.0)	0(0)	0(0)
Total	210	79	6(2.86)	30(14.28)	8(3.81)	44(20.95)	6(2.86)	15(7.14)



(a) *A. tetraptera* (b) *S. obvelata*



(c) *H. nana*

Figure 1. Different types of eggs of helminths in laboratory animals.(a) *A. tetraptera*, (b) *S. obvelata* (c) *H. nana*

Table 2. Prevalence of gastrointestinal parasites among different age groups in laboratory animals.

Age group (weeks)	Species of laboratory animals								
	Swiss albino			Wistar			Cavia porcellus		
	Male n (%)	Female n(%)	Sub-total n(%)	Male n(%)	Female n(%)	Sub-total n(%)	Male n(%)	Female n(%)	Sub-total n(%)
4 wks	1(0.71%)	2(1.43%)	3(2.14%)	-	-	-	-	-	-
6 wks	2(1.43%)	3(2.14%)	5(3.57%)	-	-	-	-	-	-
8 wks	4(2.86%)	-	4(2.86%)	-	-	-	-	-	-
10 wks	17(12.14%)	13(9.28%)	30(21.43%)	10(17.86%)	13(23.21%)	23(41.07%)	-	-	-
16 wks	-	-	-	-	-	-	7(50%)	7(50%)	14(100%)

guinea pigs (prevalence of 100%) with an equal level of infection (50%) in male and female groups (Table 2).

However, among breeds of laboratory animals the prevalence of gastrointestinal parasitic infection found by coproscopic examination were nematodes (*S*. *obvelata* and *A*. *tetraptera* which are pinworms of mice), cestodes (*H. nana* and *H*. *Diminuta*, these are the true tape worms of mice and rats), and coccidial oocyst (*E*. *caviae*). From 210 laboratory animals, the higher prevalence of nematodes from the three breeds were found in mice 32(15.20%), rats 4 (1.9%). The prevalence of cestodes were found higher in rats 18 (8.6%) than in mice 2 (1.0%). The prevalence of mixed infection by nematodes *S*. *obvelata* and *A*. *tetraptera* were found in mice 8 (3.8%). The prevalence of coccidial oocyst in guinea pigs was found 14 (6.7%). The significant difference found were X2 = 274.668, df =12 and P=0.001.

Among the total 210 laboratory animals, the prevalence of nematodes varies between the sexes of laboratory animals (males and females). The prevalence of nematodes in males were 8 (3.8%) and in females 28 (13.3%), prevalence of cestodes were 12 (5.7%) in males and 8 (3.8%) in females, and prevalence of coccidial oocyst were 7 (30.10%) in males and 7 (33.0%) in females, prevalence of mixed infection by nematodes *S*. *obvelata* and *A*. *tetraptera* were 4 (1.9%) in males and also 4 (1.9%) in females with a significant difference of X2=14.932 , df= 6, and P=0.021. But the prevalence of gastrointestinal parasites found between males and females of the total animals were 31 (14.8%) in males and 48 (22.9%) in females with a significant difference of X2= 1.561, df= 1 and P=0.21.

The prevalence of different species of parasites with their respective hosts (breeds of laboratory animals) were *S*. *obvelata* 2 (1.0%) in mice, 14 (1.9%) in rats and prevalence of *A*. *tetraptera* 30 (14.4%) in mice and the prevalence of mixed infection with *S*. *obvelata* and *A*. *tetraptera* were 8 (3.8%) in mice, the prevalence of *H*. *nana* were 2 (1.0%) in mice and 4 (1.9%) in rats, prevalence of *H*. *diminuta* were 14 (6.7%) in rats and the prevalence of coccidian (*E*. *caviae*) were 14 (6.7%) in guinea pigs with a significant difference of X2=274.668 , df=12 and P=0.001.

DISCUSSION

The prevalence of helminthiasis was higher in mice (28.57%) than rats (7.14%). This finding was not in agreement with other studies in Brazil, in which a high degree of parasitism (96 to 100%) was observed in mice (Hayunga, 1991). More recently, Tanideh et al. (2010) reported higher prevalence of helminthiasis (50 to 100%) in laboratory animals in Animal House of Shiraz University of Medical Sciences of Iran. Rafique et al. (2009) reported similar results that, the prevalence of all the helminths recovered from different structures of *H*. *nana* was observed in 60% of the sampled mice collected from kachiabadies in Pakistan. The prevalence of cestode was higher in rats (33.93%) than mice (1.40%), the most prevalent cestode being in Wistar was *H*. *diminata* (26.79%) followed by *H*. *nana* (7.10%). The cestode identified in Swiss albino was *H*. *nana* (1.40%) and no cestode and nematode were identified in guinea pigs. These findings are lower than the reports of Pinto et al. (1994) in mice, who detected *H*. *nana* with prevalence of 32%.

All *E*. *caviae* infections were detected from *C. porcellus* with prevalence of 100% and no infection with *E*. *caviae* was detected in Swiss albino and Wistar. Faecal examination might reveal oocyts, but these are passed only intermittently (Craig, 1998; Matsui et al., 1999). It was noted that, there was a significant difference between the prevalence of helminths in male and female laboratory animals which might be due to the fact that, lactation and pregnancy stress, causes depressed immunity which resulted in increased shedding of eggs through faeces (Clifford, 2009; Tanideh et al., 2010). The prevalence of helminth in S. albino was found highest in 10 weeks of age groups (21.43%) while the lowest was in the 4 weeks of age groups (2.14%). This finding is not in agreement with the fact that, immunity against

gastrointestinal infection decreases as age increases due to acquired immunity (Susan and Mays, 1998). However, this might be due to the fact that S. albino were reared in cages in which the faeces were piled up which could increase the chance of faecal-oral transmission of the eggs of helminths and oocysts.

The present study indicated that laboratory animals in the EHNRI were infested with helminthic parasites and Eimeria oocysts. Therefore, the EHNRI should be concerned to handle laboratory animals with care and personnel working with laboratory animals should aware the risk of parasitic zoonosis from these animals.

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