Original Article

Intestinal Helminths in Laboratory Mice and Rats in Four Research Centers, Tehran, Iran

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Introduction: There is not much data on parasitic infections of laboratory animals that are kept in conventional conditions in Iran. The present study was designed to investigate intestinal helminths infections in laboratory colonies of rats and mice. **Methods:** Droppings from 110 mice and 110 rats (each animal one dropping) belonging to experimental and breeding groups in four animal houses were collected. Experimental groups were being used in biomedical researches and breeding groups were not under any experiment. The droppings were preserved in formaldehyde 10% individually and examined by microscopy with 10x magnification. **Results:** Out of 220 droppings examined, 96 (43.6%) harbored helminths eggs; 53 (48.1%) belonged to mice and 43 (39.09%) to rats. Four helminthes species including, *Syphacia obvelata*, *Syphasia muris*, *Hymenolepis nana,* and *Hetrakis spumosa* were identified in the both animals, while *Aspicularis tetraptera* was merely seen in mice. *H. nana* was the most frequent helminth infection in mice and rats and infection with *H. spumosa* and *A. tetraptera,* showed the lowest rates in droppings of mice and rats, respectively. Mixed infections with ≥ two species was observed in 21 (9.5%) of 220 droppings, 14 (12.7%) belonged to mice and 7 (6.3%) to rats. **Conclusion:** The present results emphasizes more careful monitoring in laboratory animal houses, such as improving the cleaning and ventilating systems as well as adopting therapeutic measures, when required. *J Med Microbiol Infec Dis, 2014, 2 (4): 130-132.*

Keywords: Laboratory mice, Rat, Helminth, Iran.

INTRODUCTION

Mice and rats are the most common laboratory animals used in research centers worldwide [1]. Animal houses that supply mice and rats for experimental researches should have facilities to produce and maintain specific pathogen-free animals under controlled sanitary conditions. However, 95% of laboratory animals are kept in conventional situations that can expose them to various infectious agents including helminth parasites [2, 3]. Moreover, the behavior of the rats and mice supports the quick transmission of pathogens among the colony members in cages. The ease of transmission and direct life cycle along with the resistance of helminths eggs to environmental conditions have led to high prevalence of these parasites in cages environment [4]. From the perspective of safety regulations that should be considered in experimental researches, these pathogens, mainly the zoonotic ones can be regarded harmful for technicians and researchers [5]. According to the literatures, *Syphacia obvelata*, *Syphasia muris*, *Hymenolepis nana* and *Aspicularis tetraptera* are known as the most prevalent helminths in laboratory animals, of which, only A. *tetraptera* is not considered zoonotic [6]. Parasitized laboratory animals are not suitable for experiments as their infection may have a negative influence on results. Although most of these infections are subclinical, they are able to affect the animal physiology, leading to changes in immunological and biochemical parameters [7]. In mice during the tissue and luminal phase of *H. nana* development, Th1-type and Th2 responses are elicited, respectively, with variation of cytokines production during parasite development [8]. The aim of the current survey was to evaluate the present status of helminthic infections in laboratory mice and rats in order to find some measures to control them.

MATERIAL AND METHODS

Droppings from 110 mice and 110 rats belonging to the experimental and breeding groups in four animal houses were collected. Experimental groups were being used in biomedical researches and breeding groups were not under any experiment. The droppings were preserved in formaldehyde 10% individually and examined by microscopy with 10x magnification.

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Helminth eggs found in droppings were identified based on morphological and morphometric characters described by others [9].

RESULTS

Out of 220 droppings examined, 96 (43.6%) showed to harbor helminth eggs; 53 (48.1%) belonged to mice and 43 (39.09%) to rats (Table 1). Four helminthes species including, *S. obvelata*, *S. muris*, *H. nana*, and *Hetrakis spumosa* were identified in the both animals, while *A. tetraptera* was merely seen in mice (Figure 1). *H. nana* was the most frequent helminth infection in mice and rats and *H. spumosa* and *A. tetraptera*, showed the lowest rates in the mice and rat, respectively. Mixed infections with ≥ two species was observed in 21 (9.5%) of 220 droppings, 14 (12.7%) belonged to mice and 7 (6.3%) to rats. *H. nana* and *S. obvelata* coinfection showed the highest rate in mice and *H. nana* and *S. muris* showed the highest rate in rats (Table 2). In conclusion no significant differences were seen for the experimental and breeding groups of the current survey.

DISCUSSION

The helminths *S. obvelata*, *S. muris*, *H. nana* and *A. tetraptera* are known as the most prevalent helminths in laboratory animals, of which, only *A. tetraptera* has not been reported as a zoonotic parasite [6]. In this study four species of helminthes including, *S. obvelata*, *S. muris*, *H. nana* and *H. spumosa* were detected in both laboratory rodents, while *A. tetraptera* was merely seen in mice, which reflect its high susceptibility to this helminth [1, 10]. The infection rate of *H. nana* in mice was much higher than that observed in rats.

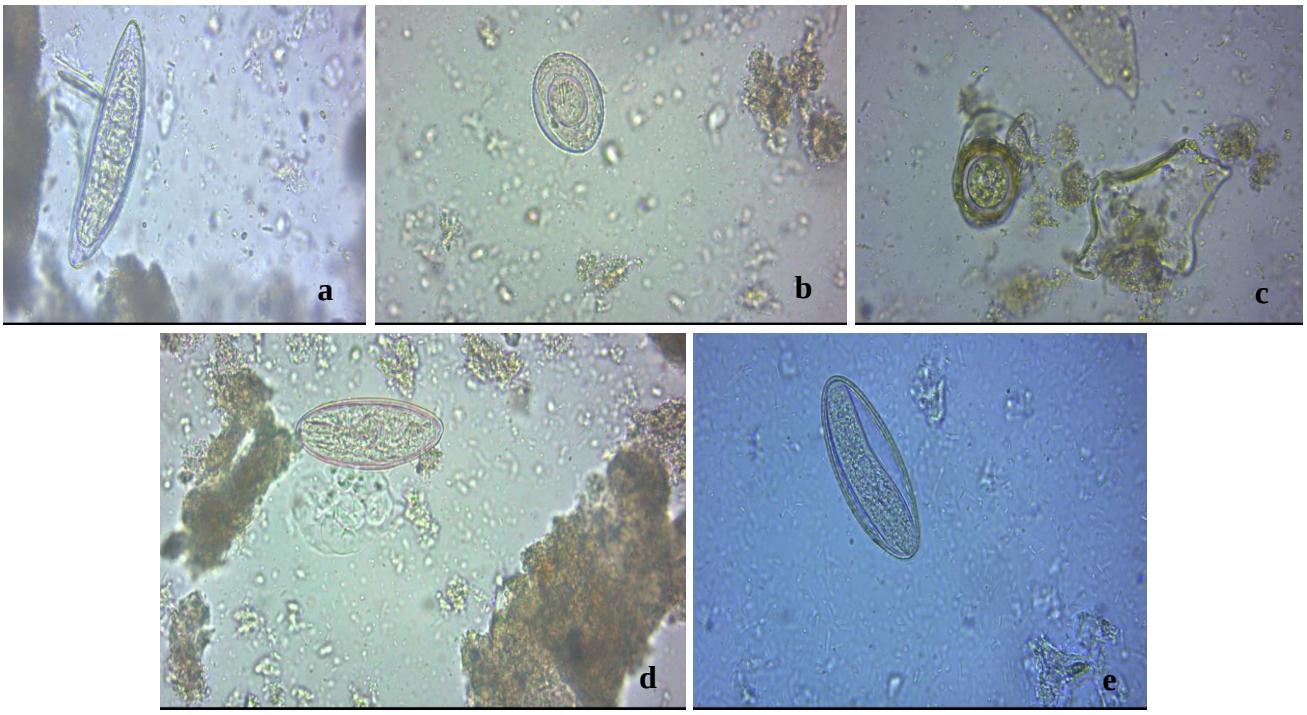


Fig. 1. The eggs recovered from the laboratory animals droppings. a) Egg of *S. obvelata* from mice; b) Egg of *H. nana* from rat; c) Egg of *H. spumosa* from rat; d) Eggs of *S. muris* from rat; e) Eggs of *A. tetraptera* from mice.

Table 1. Helminths detected from the total of 55 experimental and 55 breeding in each Mice and Rat.

Types of helminths	Types of animals			
	Mice		Rat	
	Experimental No (%)	Breeding No (%)	Experimental No (%)	Breeding No (%)
S.obvelata	5 (9.1)	3 (5.5)	2 (3.6)	4 (7.3)
S.muris	2 (3.6)	3 (5.5)	5 (9.1)	7 (12.7)
H.nana	10 (18.2)	11 (20)	6 (10.9)	11 (20)
H.spumosa	0 (0)	0 (0)	1 (1.8)	0 (0)
A.tetraptera	4 (7.3)	1 (1.8)	0 (0)	0 (0)

No (%): Number of infected (ratio of infected %)

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Table 2. Mixed infections detected from the total of 55 experimental and 55 breeding in each Mice and Rat.

Mixed Infections	Types of animals			
	Mice		Rat	
	Experimental No (%)	Breeding No (%)	Experimental No (%)	Breeding No (%)
S.muris, A.tetraptera	1 (1.8)	1 (1.8)	0 (0)	0 (0)
A.tetraptera, H.spumosa	1 (1.8)	1 (1.8)	0 (0)	0 (0)
H.nana, A.tetraptera	2 (3.6)	2 (3.6)	0 (0)	0 (0)
S.obvelata, H.nana	0 (0)	5 (9.1)	1 (1.8)	2 (3.6)
H.nana, S.muris	0 (0)	0 (0)	2 (3.6)	2 (3.6)
S.obvelata, S.muris, H.spumosa	0 (0)	1 (1.8)	0 (0)	0 (0)

No (%): Number of infected (ratio of infected %)

It is important to remark that this parasite does not need intermediate host and has characteristics of autoinfection that contribute to maintain the high prevalence of animal infection in the colonies [6]. In a similar study in the animal house of Shiraz University of medical sciences, mice were found infected with *H. nana* (50%), *A. tetraptera* (90%), *S. obvelata* (90%) and rats were infected with *S. muris and A. tetraptera* (83.3%) [6]. The sanitary conditions of 13 animal houses in nine public institutions in Minas Gerais, Brazil showed that animals from only one animal house were parasite free, whereas animals belonging to the other centers were infected; mice showed infection with *S. obvelata* (92.3%), *A. tetraptera* (23.1%), and *H. nana* (15.4%), and rat colonies harbored *S. muris* (46.2%) and *Trichosomoides crassicauda* (28.6%) [7]. Releasing of parasite antigens in infected laboratory animals, particularly those used for immunological experimental studies, can affect the results of the research [11]. *H. nana* changes its surface antigens during its differentiation and maturation and the infected mice produce various antibodies against this antigens [12]. For instance, infection of laboratory animals with cestodes can lead to their exclusion from the research programs due to their immunological stimulating effects of the helminths [13]. Crowded cages is known as the most important factor for circulating the parasites among laboratory animals kept in conventional animal houses. In conclusion the current study emphasizes more careful monitoring in laboratory animal houses. Adopting preventive measures, such as sterilization of cages, water bottles, and food as well as therapeutic measures, when required, can, to some extent, interrupt the helminthic infection transmission in animal houses.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest associated with this manuscript.

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