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A survey on intestinal parasites of golden hamster (*Mesocricetus auratus*) in the northeast of Iran

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Abstract The aims of this study were to provide baseline knowledge about gastrointestinal parasites in golden hamster (*Mesocricetus auratus*) that inhabit the Mashhad area, and to analyze possible independent variable from October 2011–August 2012. To determine the prevalence of intestinal parasites in golden hamster, faecal samples were tested specifically for nematode eggs, protozoan oocysts and sporocysts utilizing a combined sedimentation–flotation technique. In addition, all fecal samples were examined to detect oocysts of *Cryptosporidium* spp. using modified Ziehl–Neelsen staining. Of 100 golden hamsters, 52 % were females and 48 % males. Of all examined fecal samples of golden hamsters, 44 % (95 % CI: 34.3–53.7 %) were found to harbor at least one parasite species. The following parasites were detected (with their respective prevalence): undetermined Trichurata (42 %, 95 % CI: 29.5–48.5 %), *Syphacia* spp. (4.3 %, 95 % CI: 1–7.3 %). *Cryptosporidium* and protozoan oocysts were not found in these animals. There was no significant difference ($p > 0.05$) between age, sex, litter, breeding place, breeding style and anthelminthic treatment with individual helminth infection in faecal examination. This is the first record of the gastrointestinal parasites of golden hamster in Iran. Considering that hamster and other rodents are pets in many homes, the likelihood of cross-infections, particularly involving children and mainly due to unhygienic habits, should be determined.

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Introduction

Because of the role golden hamster play in the evaluation of several biological parameters in scientific research and in light of the program established to control the sanitary conditions of owners animal houses, we have developed procedures to provide a reliable survey of the gastrointestinal parasites occurring in these animal. The model we targeted are commonly maintained but not often evaluated, considering the few data on the parasites they may harbor. The present approach is related to gastrointestinal parasites collected in golden hamsters from houses and pet shop in Mashhad city.

Hamsters are used mainly in assays related to experimental infections (León-Cabrera et al. 2010; Paciello et al. 2010; Toral-Bastida et al. 2011; Wold and Toth 2010), pathology (Songserm et al. 2009), host–parasite relationships (Wonkchalee et al. 2012), immune responses (Requena et al. 2000), immunodiagnoses (Nonaka et al. 1996), and drug therapies (Tritten et al. 2011; Xiao et al. 2011). In addition, pet shop hamsters were investigated as a comparative outside group, because little attention has been given to the possibility of acquiring parasitic infections from rodents obtained from commercial sources. Further, the general population probably is unaware of any threat of parasites infection from pet rodents. Results obtained thus far add new data to the previous major studies of helminths that parasitize laboratory animals (Pinto et al. 2001; Gonçalves et al. 1998). This report is important because parasites may act as variables, usually unsuspected, in experiments. The present

study was therefore, designed with the objectives of estimating the prevalence of gastrointestinal parasites infection and to assess the associated independent variable in Mashhad, northeast of Iran.

Materials and methods

Study area

This study was conducted in Mashhad County, the capital of Razavi Khorasan Province, which located in the northeastern part of Iran. It has an area about 27,480 km^2 and a population of approximately 2,500,000 and is located at 36.20° north latitude and 59.35° east longitudes, in the valley of the Kashaf River near Afghanistan on the east and Turkmenistan by the north, between the two mountain ranges of Binalood and Hezar-masjed. The city only sees about 250 mm of precipitation per year, some of which occasionally falls in the form of snow. Annual precipitation falling usually occurs between the months of December and May.

Study animals and their management

From October 2011–August 2012, fecal sample of 100 golden hamsters (*Mesocricetus auratus*) (48 males, 52 females) from different localities of Mashhad area were examined for parasite infections at the Faculty of Veterinary Medicine of the Ferdowsi university of Mashhad, Iran. The age, sex, litter, breeding place, breeding style and anthelminthic treatment for each of hamsters were recorded.

Rectal faecal samples from golden hamsters were tested specifically for nematode eggs, protozoan oocysts and sporocysts utilizing a combined sedimentation–flotation technique (sedimentation in water followed by centrifugal flotation in zinc sulphate solution; specific gravity 1.3 g/mL). In addition, all fecal samples were examined to detect oocysts of *Cryptosporidium* spp. using modified Ziehl–Neelsen staining. A thin smear was made of the pellet obtained from the sucrose flotation technique and stained by the modified Ziehl–Neelsen method. After staining, the smear was examined at 1,000× magnification for detection of *Cryptosporidium* spp. oocysts (Garcia et al. 1983).

Data analysis

Association of independent variables (age, sex, litter, breeding place, breeding style and anthelminthic treatment) and prevalence of intestinal parasites infection was evaluated using χ^2 test (Remington and Schork 1970). All statistical analyses were performed by SPSS version 16 and p value less than 0.05 was considered as significant.

Result

Of all examined fecal samples of golden hamsters, 44 % (95 % CI: 34.3–53.7 %) were found to harbor at least one parasite species. The following parasites were detected (with their respective prevalence): undetermined Trichurata (42 %, 95 % CI: 29.5–48.5 %), *Syphacia* spp. (4.3 %, 95 % CI: 1–7.3 %). *Cryptosporidium* and protozoan oocysts were not found in these animals. There was no significant relationship ($p > 0.05$) between sex, age, litter, breeding place, breeding style and anthelminthic treatment with individual helminth infection in faecal examination (Table 1).

Discussion

To our knowledge this is the first report of intestinal parasite infection of golden hamster in Iran. The overall prevalence of intestinal parasites found in this study is 44 %, revealing high level of infection. Similar findings were also reported with intestinal helminths from china (84.3 %, Lv et al. 2009) where a very high prevalence value is reported.

The overall frequently of undetermined Trichurata (42 %) obtained here is comparable to those obtained in previous studies from china (18.3 %, Lv et al. 2009). Generally, the unusual finding of undetermined Trichurata in golden hamster, originally described on the basis of nematodes recovered from rat (Baker 2007), may be due to a possible contamination induced by the animal owners who may be in close contact with wild rodents. Furthermore, common house mice and even brown rats have been observed in the hamster breeding rooms.

Another very common parasite found in the evaluated golden hamsters was *Syphacia* spp. which shows that this helminth is the main intestinal helminth found in these animals, as indicated by previous studies in all other countries (Hasegawa et al. 2008; Lv et al. 2009). Its prevalence in the present study (4.3 %) was lower than the range of other recent studies of intestinal parasite in hamster from other region (Hasegawa et al. 2008; Lv et al. 2009). Moreover, because of the lack of morphometric data and of illustration of internal structures (except for eggs) that would facilitate reliable identification, the so-called *Syphacia obvelata* described in hamsters (Stone and Manwell 1996) may be, in fact, *S. mesocriceti*.

The role of pet rodent animals in the transmission of helminth infections to humans has been emphasized

Table 1 Independent variable association with occurrence of intestinal parasites in golden hamster

Risk factors		No. tested	No. positive (%)	*p* value
Age	1≥	61	25 (41)	0.57
	1–2	23	11 (47.8)	
Sex	Male	49	22 (44.9)	0.859
	Female	51	22 (43.1)	
Litter	Sawdust	83	37 (44.6)	0.797
	Newspaper	17	7 (41.2)	
Breeding place	Home—cage	29	13 (44.8)	0.420
	Home—aquarium	13	8 (61.5)	
	Shop—cage	19	6 (31.6)	
	Shop—aquarium	39	17 (43.6)	
Breeding style	Individual	24	9 (37.5)	0.462
	Group	76	35 (46.1)	
Anthelminthic treatment	Treated	13	6 (46.2)	0.867
	No treated	87	38 (43.7)	

strongly (Stone and Manwell 1996). Human *Hymenolepis nana* infections have been reported (Stone and Manwell 1996) and appear to be due to carelessness resulting from misunderstanding of the necessary prophylactic procedures for properly handling pet rodents. Nevertheless, cases of human infections by *Syphaciinae* nematodes are based only on personal communications, and there are no available data on these contaminations, which appear to be accidental. However, the generic diagnosis of *Syphacia* refers to these nematodes as parasites of rodents and man (Hasegawa et al. 2008; Olsen 1974).

The transfer of *Syphacia* spp. from pet or laboratory animals to humans probably is not rare, even as an accidental infection—the parasites likely are overlooked often because of their monoxenous life cycle and lack of alarming symptoms. This point of view is reinforced by the fact that pet shop animals are seldom maintained under acceptable sanitary conditions and, when purchased from wholesalers, are not checked (at least in Iran) for ecto- and endoparasites prior to their arrival in the pet shops.

The present findings provide reliable data on the intestinal parasites fauna of a very common pet animal. In addition, in light of the close contact (including caressing and even kissing) of children with hamsters, our findings serve as a warning regarding the procedures to be adopted in an attempt to avoid the eventual rodent-to-man and man-to-rodent transmission of these parasites.

Considering that hamster and other rodents are pets in many homes, the likelihood of cross-infections, particularly involving children and mainly due to unhygienic habits, is high. Regarding barriers to infection, we concluded that the practices of animal house, particularly of sterilizing bedding and chow, were more effective than those of institutional source. Even upon the development of increased parasitic burdens of the *Syphaciinae* nematodes, which are monoxenous (Anderson 1992), this practice prevented the installation of the cestode cycle, which is heteroxenous (Olsen 1974) and has a low potential of transmission.

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