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Gastrointestinal helminths infection in laboratory mice and rats from a breeding and maintenance facility

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Abstract

Laboratory animals play a critical role in biomedical research, and parasitic infections may compromise both animal welfare and the reliability of experimental outcomes.This study aimed to determine the prevalence of gastrointestinal helminths in Syrian mice (*Mus musculus*) and rats (*Rattus norvegicus*) maintained at a laboratory animal breeding and maintenance facility. Fecal samples were collected from 20 Syrian mice and 8 rats housed at the Faculty of Veterinary Medicine, Amol. Samples were examined microscopically for the presence of helminth eggs and larvae. All examined animals (100%) were infected with at least one gastrointestinal helminth species. The most frequently identified parasites in Syrian mice were *Aspiculuris tetraptera*, *Syphacia obvelata*, and *Hymenolepis nana*. In rats, *H. nana* was the most common, followed by *A. tetraptera*, *S. obvelata*, and *Syphacia muris*. The high prevalence of helminth infections highlights the need for routine parasitological screening in laboratory animal facilities. Implementing strict hygiene practices, regular monitoring, and preventive treatment protocols is recommended to safeguard both personnel health and research validity.

Introduction

Laboratory rodents, particularly Syrian mice (*Mus musculus*) and rats (*Rattus* spp.), are indispensable models in biomedical research. Maintaining their health is essential for animal welfare and for the validity and reproducibility of experimental findings. Gastrointestinal helminths are commonly encountered in conventionally housed colonies; although many infections are subclinical, they can modulate immune responses, alter gastrointestinal physiology and hematological parameters, and thereby confound experimental outcomes (Flynn, 1973; Pinto *et al*., 1994; Perec and Okulewicz, 2006; Akhtardanesh *et al*., 2010; Gaherwal *et al*., 2012; Kalani *et al*., 2012; Taylor *et al*., 2013; Dehghani *et al*., 2021). Previous surveys in Iran and elsewhere have repeatedly identified *Aspiculuris tetraptera*, *Syphacia* spp., and *Hymenolepis* spp. as dominant helminths of laboratory mice and rats.

Despite advances in commercial breeding, husbandry, and veterinary care, helminth infections persist in some facilities because of incomplete eradication, introduction via incoming animals, contamination of feed or bedding, ingress of wild hosts, or mechanical transfer by personnel (Valanzano, 2004). The life cycles of many common helminths (direct transmission), shared housing or bedding, and communal feeding facilitate rapid spread within colonies, increasing risks both for experimental bias and for zoonotic transmission to animal-care staff and researchers (Perec and Okulewicz, 2006; Gaherwal *et al.,* 2012; Thompson, 2015). The present study therefore, aimed to determine the prevalence and species composition of gastrointestinal helminths in Syrian mice and rats maintained at the breeding and maintenance facility of the Faculty of Veterinary Medicine, Amol, to inform monitoring and control strategies tailored to this facility.

Materials and Methods

Animals and sampling

The study was conducted on 28 laboratory rodents comprising 20 Syrian mice (*Mus musculus*) and 8 rats (*Rattus norvegicus*), all maintained at the breeding and maintenance facility of the Faculty of Veterinary Medicine, Amol. Fresh fecal samples were collected directly from each animal between April and June 2024. All procedures were carried out in accordance with institutional animal care guidelines.

Parasitological examination

Collected fecal samples were processed using the direct smear technique and the flotation method with a saturated saline solution. Slides were examined microscopically at 10× and 40× magnification to detect and identify helminth eggs. Identification was based on morphological criteria and standard parasitological references (Perec-Matysiak *et al*., 2006; Taylor *et al.,* 2013; Eslami *et al*., 2021).

Data analysis

The prevalence of helminth infections was calculated as the percentage of animals infected with each parasite species. Descriptive statistics were used to summarize findings, and comparisons were made between mice and rats regarding the frequency of infection.

Results

A total of 28 rodents (20 Syrian mice and 8 rats) were examined between April and June 2024. Parasitological analysis revealed that 100% (28/28) of the animals were infected with at least one gastrointestinal helminth species.

In Syrian mice, *A. tetraptera* was the most prevalent parasite, followed by *Syphacia obvelata* and *Hymenolepis nana*. In rats, *H. nana* was predominant, with *A. tetraptera*, *S. obvelata*, and *Syphacia muris* detected at lower frequencies.

Table 1 summarizes the distribution of helminth species identified in both host groups. Multiple infections were common in both mice and rats.

Table 1. Prevalence of gastrointestinal helminths in Syrian mice and rats.

Main helminths detected (in order of frequency)	Infection rate (%)	No. examined	Host species
Aspiculuris tetraptera, Syphacia obvelata, Hymenolepis nana	100	20	Syrian mice (*Mus musculus*)
Hymenolepis nana, Aspiculuris tetraptera, Syphacia obvelata, Syphacia muris	100	8	Rats (*Rattus norvegicus*)

Microscopic examination confirmed the presence of characteristic eggs for *A. tetraptera*, *S.*

obvelata, *H. nana*, and *S. muris*. Representative photomicrographs are provided (Figs. 1–4).

Fig. 1. Egg of *Aspiculuris tetraptera* identified in fecal sample from Syrian mouse.

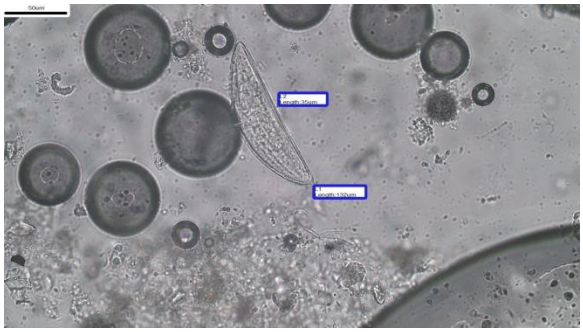

Fig. 2. Egg of *Syphacia obvelata*.

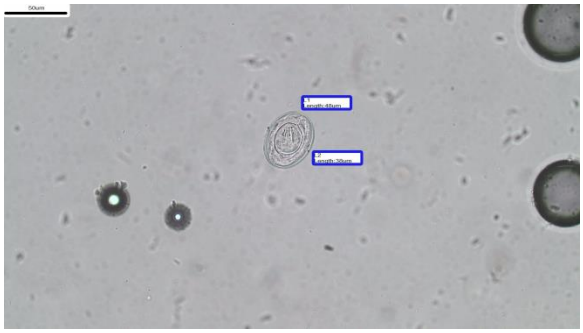

Fig. 3. Egg of *Hymenolepis nana*.

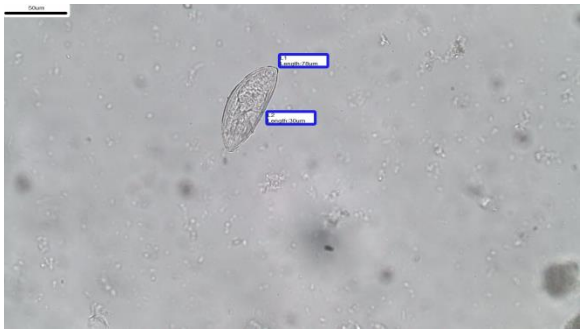

Fig. 4. Egg of *Syphacia muris*.

Discussion

The present study demonstrated a 100% prevalence of gastrointestinal helminth infections among Syrian mice and rats in the Amol laboratory animal facility. Such a high infection rate is consistent with reports from other conventional facilities, where helminth contamination is often widespread due to direct life cycles and rapid transmission through shared housing, bedding, or feed (Akhtardanesh *et al*., 2010; Gaherwal *et al*., 2012; Thompson, 2015).

Among Syrian mice, *A. tetraptera* and *S. obvelata* were the most common nematodes, while *H. nana* predominated in rats. These findings align with previous Iranian surveys that reported similar parasite profiles in rodent colonies (Akhtardanesh *et al*., 2010; Tanideh *et al*., 2010; Dehghani *et al*., 2021). The identification of *H. nana*is is important, as it is a zoonotic cestode capable of direct transmission to humans without an intermediate host (Gudissa *et al*., 2011; Valanzano, 2004). This highlights occupational risks for animal-care staff and researchers, underlining the need for routine surveillance and preventive measures.

Parasitic infections in laboratory rodents may remain subclinical, but they are known to modulate immune function, alter physiological responses, and interfere with experimental outcomes, particularly in studies involving immunology, oncology, or gastrointestinal physiology (Perec and Okulewicz, 2006; Kalani *et al*., 2012). Therefore, failure to control such infections may compromise both animal welfare and the reproducibility of scientific results.

Effective control requires a multifaceted approach: (i) regular parasitological screening, (ii) strict sanitation and cage management protocols, (iii) strategic use of anthelmintics or medicated diets, and (iv) prevention of contamination from wild rodents and personnel (Perec-Matysiak *et al*., 2006; Akanbi *et al*., 2022). Adopting these measures can substantially reduce infection risks and safeguard the validity of experimental research.

In conclusion, the high prevalence of helminths observed in this facility emphasizes the urgent need for comprehensive monitoring and control strategies. Further studies with larger sample

sizes and molecular confirmation of species may provide deeper insights into the epidemiology of these parasites in laboratory colonies in Iran.

This study revealed a universal prevalence of gastrointestinal helminths among Syrian mice and rats in a laboratory breeding and maintenance facility in Amol, Iran. The predominant parasites identified were *A. tetraptera* and *S. obvelata* in mice and *H. nana* in rats. The detection of *H. nana* is particularly concerning due to its zoonotic potential and its possible impact on both animal health and research outcomes.

Conflict of Interest

The authors declare that they have no conflict of interest.

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