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Zoonotic Potential of Parasites Found in Rattus spp. (Family: Muridae) Feces from a Residence in the Metropolitan Region of Belém-PA/Brazil

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Case Report

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Abstract

Rodents can serve as reservoirs of a variety of zoonotic parasites, and their proximity to humans in domestic environments, especially in metropolitan areas, is a constant public health concern. This study reports the parasitological findings from a fecal sample collected inside a residence in the metropolitan region of Belém, Pará, Brazil. The sample was submitted to the LHEA/UFRA laboratory, where it was analyzed using two techniques - the Direct Method and the Willis-Mollay Method – to detect parasite cysts, oocysts, eggs, and larvae. Among the protozoans found, y cysts of *Entamoeba* spp. and *Giardia intestinalis*, as well as *Cystoisospora* sp. oocysts were identified. Regarding helminths, eggs of *Moliniformes* sp., *Gongylonema* sp. were identified, along with eggs and larvae of *Angiostrongylus* sp. were observed using both techniques. The presence of multiple gastrointestinal parasites in a single sample collected from *Rattus* spp. in a domestic metropolitan environment not only demonstrates the behavioral proximity these animals to humans, given that the droppings were found on a bed, but also highlights concerns regarding the occurrence and epidemiological surveillance of these zoonotic parasitoses in urban areas where outbreaks of other rat-borne diseases occur, serving as a screening measure.

Introduction

Rodents are synanthropic mammals belonging to the Order Rodentia. Species such as *Rattus rattus* and *Rattus norvegicus* are subjects of constant public health attention and concern, as they frequently act as reservoirs and/or direct transmitters of various pathogens. This risk is further aggravated by their proximity to both rural and urban dwellings, which raises serious concerns for epidemiological surveillance (Lima et al., 2021; Davoodi et al., 2025).

Rodent-borne diseases represent a significant alert for health authorities, particularly because sick animals generally do not exhibit obvious signs of infection. This fact, combined with their adaptability to urban environments and cohabitation with humans, creates the ideal scenario for the transmission of zoonotic parasites. Pathogens such as *Angiostrongylus cantonensis*, *Hymenolepis diminuta*, and *Giardia* spp. or *Cryptosporidium* spp., have already been reported in human infections (Lima et al., 2009; Garedaghi & Khaki, 2014).

Direct or indirect human exposure of people to rodent droppings, through contaminated water or food, can lead to severe and often underreported illnesses, especially in metropolitan areas where these animals can establish themselves more easily due to the abundant available food. This present study therefore focused on identifying the parasites found in an opportunistic fecal sample of *Rattus* spp. discovered in the bed of a resident of the metropolitan region of Belém, state of Pará, Brazil. This report emphasizes the risks of zoonotic transmission and implications of the parasites found, thereby contributing to the public health knowledge. Furthermore, the resident is the guardian of several companion animals (dogs and cats), which are frequently contaminated with *Entamoeba* and *Giardia* cysts, warranting frequent laboratory evaluation.

Case Presentation

The feces, approximately 0.7g, were found under the sheets in a bed left behind by a rodent that fled immediately upon being spotted, in a residential house in the metropolitan region of Belém, state of Pará, Northern Brazil. They were collected using a universal fecal collection container and transported on the same day to the Laboratory of Histology and Animal Embryology of the Federal Rural University of the Amazon (LHEA/UFRA).

In the laboratory, the feces were processed using the Direct Method (DM) with 0.9% NaCl physiological solution and the Willis-Mollay Method (WM) to search for cysts, eggs, and larvae (Ribeiro et al., 2015). After processing, the specimens were observed under a Leica ES2 stereomicroscope, with photographs taken using a Leica DM2500 light microscope coupled to a DFC310 FX camera and the Leica Application Suite Software V4.4 image capture and processing system. The morphological identification of the findings was based on the works of Vitta et al. (2011), Archer et al. (2017), and Adhikari, Ghimire, and Ghimire (2025).

The stool sample analysis was positive for cysts and eggs with both methods, and found parasites from the classes Protozoa, Nematoda, and Archiacanthocephala (Fig. 2). Among the protozoa identified were cysts of *Entamoeba* spp. (Fig. 2A), *Giardia intestinalis* (Fig. 2B), and oocysts of *Cystoisospora* sp. (Fig. 2C), mainly in the WM method. Regarding helminths, eggs of *Moniliformes* sp. were observed. (Fig. 2D), *Gongylonema* sp. (Fig. 2E), as well as *Angiostrongylus* sp. eggs at different stages of formation (2F-H) and L1 larvae of *Angiostrongylus* sp. (2I).

Discussion

The study results reinforce the presence of coinfections in synanthropic rodents, similar to findings reported in Pernambuco by Lima et al. (2021). These authors reported *Moniliformis* sp. in two of eight *Rattus rattus* specimens and *Angiostrongylus cantonensis* in eight of the 80 *Rattus norvegicus* captured, and in both, cysts of *Entamoeba* sp. (4/8 and 2/80 respectively). Notably, all of these previously mentioned parasites, along with others of known zoonotic potential, were observed within a single stool sample.

The genus *Entamoeba* can be found in both animals and humans. Its cysts are resilient across various environmental conditions and can contaminate water and food, surfaces and objects such as banknotes, as reported by Ferreira et al. (2020). Although not associated with recurrent complications, studies by Lau et al. (2014) have *E. histolytica*, *E. dispar*, and *E. moshkovskii* in wild rats using microscopic and molecular analyses. This underscores the reservoir role that these animals may play in the infection cycle, which helps explain recurrence of the disease in exposed populations.

One important to consideration is that the standard diagnosis of amebiasis relies on morphology. Because the morphologies of s *E. histolytica* and *E. dispar* are similar, they are referred to as the *E. histolytica*/*E. dispar* complex. The former is associated with symptomatic cases, whereas the latter is

considered asymptomatic, as discussed by Silva et al. (2014). This ultimately goes back to the issue of the exposure of people and domestic animals to rodent feces in the home environment as part of the *Entamoeba* sp. cycle.

It is also worth noting that the species *E. moshkovskii* has been linked to cases of acute diarrhea in children and colitis in mice, according to Shimokawa et al. (2012). This species also shares a morphology similar to the *E. histolytica*/*E. dispar* complex, yet it is less recognized among health professionals.

Giardia intestinalis (also known as *G. lamblia* or *G. duodenalis*) is the cause of the best-known zoonotic protozoan diseases that is capable of infecting various species of mammals. Its occurrence is associated with acute diarrhea in humans, particularly affecting children. Transmission is facilitated by water or food, but also occurs through direct contact with infected animals, as discussed by Davoodi et al. (2025). Furthermore, Qin et al. (2025) emphasize that it is a recurrent parasitosis in wild rodents, which harbor a variety of species and genotypes. An important point is that the identification of *Entamoeba* spp. and *Giardia* spp. was based on morphological characteristics observed via light microscopy. Although this approach is widely used in coproparasitological studies, future studies should incorporate molecular tools for confirmation.

The coccidium *Cystoisospora* sp. was was detected using the WM method. Morelli et al. (2025) emphasize that they are common in dogs and cats, with the species *C. ystoisospora canis*/*C. ystoisospora ohioensis* and *Cystoisospora felis*/*Cystoisospora rivolta* being the most frequently reported. However, the exposure of these animals to rodent feces their predation of rodents can ensure the maintenance of domestic cycles. Furthermore, infection in humans by *C. belli* is common in immunosuppressed individuals, as pointed out by Mohanty et al. (2022).

The presence of eggs and L1 larvae of *Angiostrongylus cantonensis* is well established within the genus *Rattus*, as these rodents are natural definitive hosts. They utilize mollusks as intermediate hosts, with *Achatina fulica* being the most common species associated with zoonotic transmission, as corroborated by Caldeira et al. (2007) and Oliveira et al. (2015). Consequently, humans end up being accidental hosts when they ingest the infective larvae through contaminated food or water and. This can lead to eosinophilic meningoencephalitis as the most severe clinical outcome, a complication already reported in several countries, including Brazil, according to Lima et al. (2009), Vitta et al. (2011) and Morassutti et al. (2014).

In the Northern region, Moreira et al. (2013) found this parasitosis in *Rattus rattus* and *Rattus norvegicus* in neighborhoods in the metropolitan region, and also described for the first time the natural infection of *Achatina fulica* by *A. cantonensis* in Pará. This work reinforces the proximity of the transmission cycle in densely populated areas and raises concerns about zoonotic transmission. It is worth noting that the occurrence of *Moniliformes* sp. is equally concerning, as zoonotic cases have already been recorded in Australia, Iran, Nigeria, the United States, Zimbabwe, and Saudi Arabia, according to Mathison et al.

(2016). Zoonotic infections by acanthocephalans may end up being underreported or only discovered during necropsies, as reported by Barnish & Misch (1987) in New Guinea.

Gongylonema sp. has also been documented in other studies, such as that of Garedahi & Khaki (2014) in populations of *Rattus rattus* and *Rattus norvegicus* in Iran, alongside s *H. diminuta*/*H. nana* and *Trichuris* spp. Those authors emphasize that the diversity of helminths found may be linked with the humidity levels in East Azerbaijan, thereby connecting climatic factors issue to the higher prevalence rates found. This suggests that locations with a high humidity index are favorable for a higher incidence of these infections, consequently, a high zoonotic risk for populations exposed to these animals.

It should be noted that, the only rodent-borne diseases that are currently subject to mandatory and compulsory notification in Brazil by the Notifiable Diseases Information System of the Department of Informatics of the Unified Health System (SINAN-DATASUS) are Leptospirosis and Bubonic Plague. This limitation was highlighted by Moreira et al. (2013) who also suggests tracking zoonotic infections in regions experiencing increase in these reported diseases as means of strengthening epidemiological surveillance. Furthermore, that the occurrence of infections in domestic dogs and cats by *Entamoeba* spp. and *Cystoisospora* spp. is often neglected and poorly documented,

Conclusion

The presence of different gastrointestinal parasites in a single sample of Rattus spp. feces, collected in a domestic environment in the metropolitan region, underscores not only the increasing proximity and exposure of these rodents in residences, as shown by the droppings found on the bed, but also reinforces the potential risk of transmission of parasitic zoonoses in urban areas. This finding highlights the importance of epidemiological surveillance, sanitary monitoring, and the adoption of rodent population control measures, in light of the possible silent and underreported circulation of zoonotic agents capable of impacting public health.

Declarations

Conflict of interests

No conflict of interest.

Author Contribution

L. A. F.: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. E. G. G.: Writing – review & editing, Writing – original draft, Supervision, Methodology.

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Figures

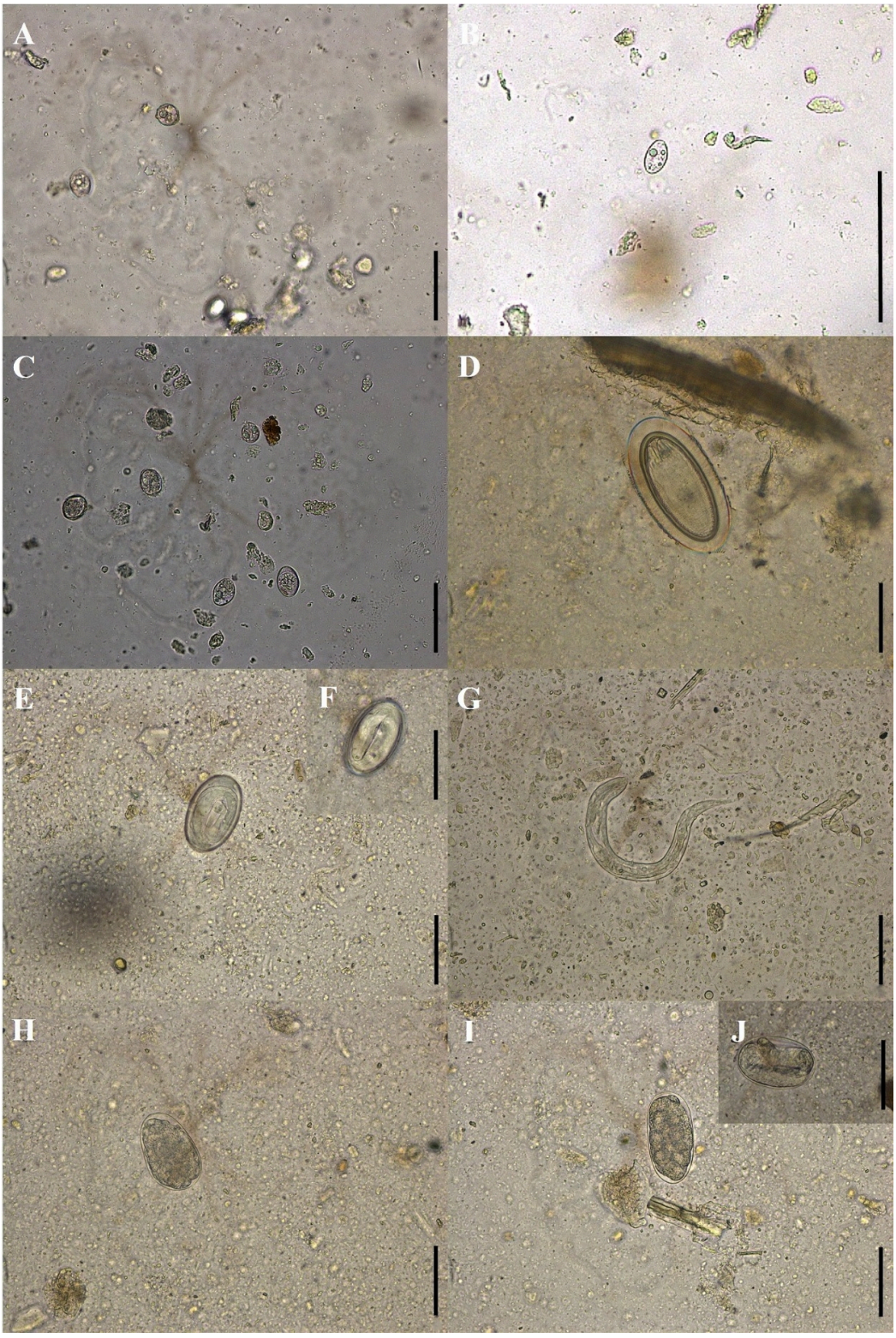


Figure 1

Figure 2. Photomicrographs of parasitic structures detected in fecal samples. (A) Cyst of *Entamoeba*spp.; (B) cyst of *Giardia intestinalis*; (C) oocyst of *Cystoisospora*sp.; (D) egg of *Moliniformes* sp.; (E-F) egg of *Gongylonema* sp.; (G) (F–H) eggs of *Angiostrongylus* sp. at different stages of embryonic development; and (I) first-stage larva (L1) of *Angiostrongylus* sp. Protozoan forms were mainly detected by the Willis-Mollay (WM) flotation method.