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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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* sp., as well as *Cystoisospora* sp. oocysts, were identified. Regarding helminths, eggs of *Moniliformis* sp. and *Gongylonema* sp. were identified, along with eggs and larvae of *Angiostrongylus* sp., which 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 of 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 parasitic diseases in urban areas where outbreaks of other rat-borne diseases occur, serving as a screening measure.
KEYWORDS: Droppings; Helminths; Rodents; Parasites.

POTENCIAL ZOONÓTICO DE PARASITOS ENCONTRADOS EM FEZES DE *Rattus* spp. (FAMÍLIA: MURIDAE) DE UMA RESIDÊNCIA NA REGIÃO METROPOLITANA DE BELÉM-PA/BRASIL

RESUMO: Roedores podem atuar como reservatórios de diversos parasitos zoonóticos, e sua proximidade com humanos em ambientes domésticos, especialmente em áreas metropolitanas, constitui uma preocupação constante para a saúde pública. Este estudo relata os achados parasitológicos de uma amostra fecal coletada no interior de uma residência na região metropolitana de Belém, Pará, Brasil. A amostra foi encaminhada ao laboratório LHEA/UFRA, onde foi analisada por meio de duas técnicas, o Método Direto e o Método de Willis-Mollay, para a detecção de cistos, oocistos, ovos e larvas de

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parasitos. Entre os protozoários, foram identificados cistos de *Entamoeba* spp. e *Giardia* sp., bem como oocistos de *Cystoisospora* sp. Quanto aos helmintos, foram identificados ovos de *Moniliformis* sp. e de *Gongylonema* sp., além de ovos e larvas de *Angiostrongylus* sp., observados em ambas as técnicas. A presença de múltiplos parasitos gastrointestinais em uma única amostra coletada de *Rattus* spp. em ambiente doméstico metropolitano, não apenas demonstra a proximidade comportamental desses animais em relação aos humanos, visto que as fezes foram encontradas sobre uma cama, mas também ressalta preocupações quanto à ocorrência e à vigilância epidemiológica dessas parasitoses zoonóticas em áreas urbanas onde ocorrem surtos de outras doenças transmitidas por ratos, servindo como uma medida de triagem.
PALAVRAS-CHAVE: Fezes; Helmintos; Parasitos Zoonóticos; Roedores.

POTENCIAL ZOONÓTICO DE PARÁSITOS HALLADOS EN HECES DE *Rattus* spp. (FAMILIA: MURIDAE) PROCEDENTES DE UNA VIVIENDA EN LA REGIÓN METROPOLITANA DE BELÉM (PARÁ, BRASIL)

RESUMEN: Los roedores pueden actuar como reservorios de diversos parásitos zoonóticos y su cercanía a los seres humanos en entornos domésticos, especialmente en áreas metropolitanas, constituye una preocupación constante para la salud pública. Este estudio presenta los hallazgos parasitológicos obtenidos a partir de una muestra fecal recolectada en el interior de una vivienda de la región metropolitana de Belém, Pará (Brasil). La muestra fue remitida al laboratorio LHEA/UFRA, donde se analizó mediante dos técnicas, el método directo y el método de Willis-Mollay, para detectar quistes, ooquistes, huevos y larvas de parásitos. Entre los protozoos hallados, se identificaron quistes de *Entamoeba* spp. y *Giardia* sp., así como ooquistes de *Cystoisospora* sp. En cuanto a los helmintos, se identificaron huevos de *Moniliformis* sp. y *Gongylonema* sp., y se observaron huevos y larvas de *Angiostrongylus* sp. mediante ambas técnicas. La presencia de múltiples parásitos gastrointestinales en una única muestra recolectada de *Rattus* spp. en un entorno doméstico metropolitano no solo demuestra la proximidad conductual de estos animales hacia los humanos, dado que los excrementos se encontraron sobre una cama, sino que también pone de relieve la preocupación por la aparición y la vigilancia epidemiológica de estas parasitosis zoonóticas en zonas urbanas donde se producen brotes de otras enfermedades transmitidas por ratas, sirviendo así como medida de cribado.
PALABRAS CLAVE: Excrementos; Helmintos; Parásitos Zoonóticos; Roedores.

1. 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 rural and urban dwellings, raising serious concerns for epidemiological surveillance (Lima *et al*., 2021; Davoodi *et al*., 2025).

Rodent-borne diseases are a major concern for health authorities, especially because sick animals often show do obvious signs of infection. This, combined with their adaptability to urban environments and cohabitation with humans, creates an ideal scenario for transmitting 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 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 abundant available food. This study therefore focused on identifying parasites 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 public health knowledge. Furthermore, the resident is the guardian of several companion animals (dogs and cats), which are frequently contaminated with *Entamoeba* sp. and *Giardia* sp. cysts, warranting frequent laboratory evaluation.

2. MATERIAL AND METHODS

The feces, approximately 0.7g, were found under the sheets in a bed left behind by a rodent that fled immediately when 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, feces were processed using the Direct Method (DM) with 0.9% NaCl physiological solution and the Willis-Mollay Method (WM) to detect 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 published works (Vitta *et al*., 2011; Archer *et al*., 2017; Adhikari, Ghimire; Ghimire, 2025).

3. RESULTS

Stool sample analysis was positive for cysts and eggs by both methods and identified parasites from the classes Protozoa, Nematoda, and Archiacanthocephala (Figure 1). Identified protozoa included cysts of *Entamoeba* spp. (Figure 1A), *Giardia* sp. (Figure 1B), and oocysts of *Cystoisospora* sp. (Figure 1C), mainly in the WM method. Regarding helminths, the most frequent in the DM were eggs of *Moniliformis* sp. (Figure 1D), *Gongylonema* sp. (Figure 1E), as well as *Angiostrongylus* sp. eggs at different stages of formation (1F-H) and L1 larvae of *Angiostrongylus* sp. (1I).

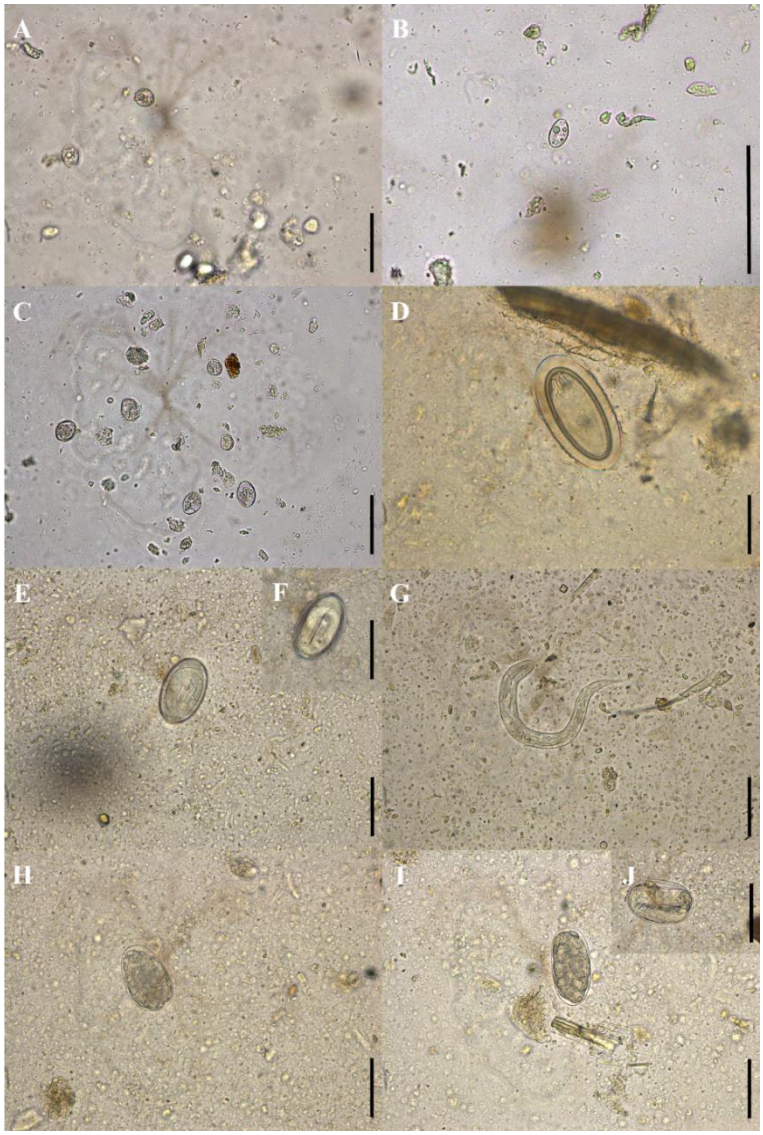


Figure 1. Photomicrographs of parasitic structures detected in fecal samples. (A) cyst of *Entamoeba* spp. Scale bar: 50 µm; (B) cyst of *Giardia* sp. Scale bar: 100 µm; (C) oocyst of *Cystoisospora* sp. Scale bar: 50 µm; (D) egg of *Moniliformis* sp. Scale bar: 50 µm; (E-F) egg of *Gongylonema* sp. Scale bar: 50 µm; (G) first-stage larva (L1) of *Angiostrongylus* sp. Scale bar: 50 µm; (H-J) eggs of *Angiostrongylus* sp. at different stages of embryonic development. Scale bar: 50 µm.

4. 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; in both, cysts of *Entamoeba* sp. were found (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* occurs 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 these animals may play in the infection cycle, which helps explain disease recurrence in exposed populations.

One important 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 Silva *et al*. (2014) discuss. This ultimately relates to exposure of people and domestic animals to rodent feces in the home environment as part of the *Entamoeba* sp. cycle.

E. moshkovskii has also been linked to 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 sp. is one of the protozoan genera best known for its association with zoonotic disease and its ability to infect various mammalian species. Its presence is linked to cases of acute diarrhea in humans, particularly affecting children. Water or food can facilitate transmission, but it can also occur through direct contact with infected animals, as discussed by Davoodi *et al*. (2025). Furthermore, Qin *et al*. (2026) emphasize that it is a recurrent parasitosis in wild rodents, which harbor a variety of species and genotypes. Importantly, the identification of *Entamoeba* spp. and *Giardia* sp. 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 detected using the WM method. Morelli *et al*. (2025) emphasize that they are common in dogs and cats, with the species *C. canis*/*C. ohioensis* and *C. felis*/*C. rivolta* being the most frequently reported. However, exposure to rodent feces and predation on rodents can maintain domestic cycles. Furthermore, infection in humans by *C. belli* is common in immunosuppressed individuals, as Mohanty *et al*. (2022) note.

Eggs and L1 larvae of *Angiostrongylus cantonensis* are well established in 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 become accidental hosts when they ingest infective larvae through contaminated food or water. 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. The occurrence of *Moniliformis* sp. is equally concerning, as Mathison *et al.* (2016) have recorded zoonotic cases in Australia, Iran, Nigeria, the United States, Zimbabwe, and Saudi Arabia. Zoonotic infections by acanthocephalans may end up being underreported or only discovered during necropsies, as reported by Barnish and Misch (1987) in New Guinea.

Gongylonema sp. has also been documented in other studies, such as Garedahi and Khaki (2014) in populations of Rattus rattus and Rattus norvegicus in Iran, alongside *Hymenolepis diminuta*/*Hymenolepis 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 to the higher prevalence rates found. This suggests that locations with a high humidity index favor a higher incidence of these

infections; consequently, they also pose a high zoonotic risk for populations exposed to these animals.

Only leptospirosis and bubonic plague are currently subject to mandatory notification in Brazil through the Notifiable Diseases Information System of the Department of Informatics of the Unified Health System (SINAN-DATASUS). Moreira *et al.* (2013) highlighted this limitation and suggested tracking zoonotic infections in regions experiencing increases in these reported diseases to strengthen epidemiological surveillance. Furthermore, infections in domestic dogs and cats with Entamoeba spp. and *Cystoisospora* spp. are often neglected and poorly documented.

5. 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 droppings found on the bed, but also the potential risk of transmitting parasitic zoonoses in urban areas. This finding highlights the importance of epidemiological surveillance, sanitary monitoring, and adopting rodent population control measures, given the possible silent and underreported circulation of zoonotic agents that can affect public health.

REFERÊNCIAS

ARCHER, E. C. *et al.* Endo-parasites of public-health importance recovered from rodents in the Durban metropolitan area, South Africa. **Southern African Journal of Infectious Diseases**, 2017.

ADHIKARI, R. B.; GHIMIRE, D.; GHIMIRE, T. R. Investigation of the occurrence of zoonotic intestinal parasites along the Karmanasa River Bank in Lalitpur, Nepal. **Veterinary Medicine and Science**, v. 11, n. 1, e70164, 2025.

BARNISH, G.; MISCH, K. A. Unusual cases of parasitic infections in Papua New Guinea. **The American Journal of Tropical Medicine and Hygiene**, v. 37, n. 3, p. 585-587, 1987.

CALDEIRA, R. L. *et al.* First record of mollusks naturally infected with *Angiostrongylus cantonensis* (Chen, 1935) (Nematoda: Metastrongyloidea) in Brazil. **Memórias do Instituto Oswaldo Cruz**, v. 102, n. 7, p. 887-889, 2007.

DAVOODI, T. *et al. Giardia duodenalis* in rodents: a global systematic review and meta-analysis. **Veterinary Medicine and Science**, v. 11, n. 5, e70546, 2025.

FERREIRA, L. A. *et al.* Pesquisa de estruturas parasitárias em moedas e cédulas circulantes em coletivos na região metropolitana de Belém-PA/Brasil. **Brazilian Journal of Development**, v. 6, n. 11, p. 84601-84609, 2020.

GAREDAGHI, Y.; KHAKI, A. A. Prevalence of gastrointestinal and blood parasites of rodents in Tabriz, Iran, with emphasis on parasitic zoonoses. **Crescent Journal of Medical and Biological Sciences**, v. 1, n. 1, p. 9-12, 2014.

LAU, Y. L. *et al.* Molecular detection of *Entamoeba histolytica* and *Entamoeba dispar* infection among wild rats in Kuala Lumpur, Malaysia. **Tropical Biomedicine**, v. 31, n. 4, p. 721-727, 2014.

LIMA, A. *et al.* Alicata disease: neuroinfestation by *Angiostrongylus cantonensis* in Recife, Pernambuco, Brazil. **Arquivos de Neuro-Psiquiatria**, v. 67, n. 4, p. 1093-1096, 2009.

LIMA, V. F. S. *et al.* Occurrence of zoonotic gastrointestinal parasites of rodents and the risk of human infection in different biomes of Brazil. **Brazilian Journal of Veterinary Medicine**, v. 43, e113820, 2021.

MATHISON, B. A. *et al. Macracanthorhynchus ingens* infection in an 18-month-old child in Florida: a case report and review of acanthocephaliasis in humans. **Clinical Infectious Diseases**, v. 63, n. 10, p. 1357-1359, 2016.

MOHANTY, S. *et al.* Intractable diarrhoea due to co-infection with *Cystoisospora belli* and *Trichuris trichiura* unraveling a severely compromised host immune status. **Annals of Parasitology**, v. 68, n. 2, p. 399-403, 2022.

MORASSUTTI, A. L. *et al.* Eosinophilic meningitis caused by *Angiostrongylus cantonensis*: an emergent disease in Brazil. **Memórias do Instituto Oswaldo Cruz**, v. 109, n. 4, p. 399-407, 2014.

MORELLI, S. *et al.* Occurrence of *Cystoisospora* spp. and other intestinal parasites in dogs and cats with diarrhea. **Veterinary Parasitology**, v. 338, e110546, 2025.

MOREIRA, V. L. *et al.* Endemic angiostrongyliasis in the Brazilian Amazon: natural parasitism of *Angiostrongylus cantonensis* in *Rattus rattus* and *Rattus norvegicus*, and sympatric giant African land snails, *Achatina fulica*. **Acta Tropica**, v. 125, n. 1, p. 90-97, 2013.

OLIVEIRA, A. P. *et al. Angiostrongylus cantonensis* infection in mollusks in the municipality of São Gonçalo, a metropolitan area of Rio de Janeiro, Brazil: role of the invasive species *Achatina fulica* in parasite transmission dynamics. **Memórias do Instituto Oswaldo Cruz**, v. 110, n. 6, p. 739-744, 2015.

QIN, Y. *et al.* Prevalence of *Giardia* in nine species of wild rodents in Guangxi, Hunan, and Yunnan Provinces, China. **Foodborne Pathogens and Disease**, v. 23, n. 2, p. 89-95, 2026.

RIBEIRO, V. M. F. *et al.* Acompanhamento da carga parasitária intestinal e do manejo sanitário de um criatório de pacas. **Ciência Animal Brasileira**, v. 16, n. 4, p. 608-614, 2015.

SHIMOKAWA, C. *et al. Entamoeba moshkovskii* is associated with diarrhea in infants and causes diarrhea and colitis in mice. **Journal of Infectious Diseases**, v. 206, n. 5, p. 744-751, 2012.

SILVA, M. T. N. *et al.* Prevalence of *Entamoeba histolytica/Entamoeba dispar* in the city of Campina Grande, in Northeastern Brazil. **Revista do Instituto de Medicina Tropical de São Paulo**, v. 56, n. 5, p. 451-454, 2014.

VITTA, A.; POLSEELA, R.; NATeeWORANART, S.; TATTIYAPONG, M. Survey of *Angiostrongylus cantonensis* in rats and giant African land snails in Phitsanulok province, Thailand. **Asian Pacific Journal of Tropical Medicine**, v. 4, n. 8, p. 597-599, 2011.

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