
PARASITIC GASTRITIS IN *Cuniculus paca*
(RODENTIA: CUNICULIDAE)

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ABSTRACT

Parasitism by genus *Physocephalus* sp. is reported in two naturally infected species of paca from the eastern Amazon region. Four animals were necropsied and during inspection of the digestive tract nodules were observed in the greater curvature of the stomach. Inside these nodules, parasites of the genus *Physocephalus* sp. were found, (seven males and seven females) with an average of three nematodes fixed and infiltrated into the submucosa of each lesion. Histopathological examination showed congestion and interstitial hemorrhage in the submucosal region, associated with the presence of mononuclear inflammatory infiltrate, as well as nematodes at the lesion site. Despite previous descriptions of this pathogen in rodents, we are not aware of any reports of lesions caused by this parasite. The lesions caused by the action of this pathogen in the stomach mucosa may affect the digestive process of *C. paca* and lead the animal to present diminished food intake and consequent inactivity and arrested growth and weight gain, compromising the health and welfare of wild species.

KEY WORDS: *Cuniculus paca*. Parasitic gastritis. *Physocephalus* sp. Nematode.

RESUMO

Gastrite parasitária em *Cuniculus paca* (Rodentia: Cuniculidade)

O parasitismo pelo gênero *Physocephalus* sp. é relatado em duas pacas naturalmente infectadas da região leste da Amazônia. Quatro animais foram necropsiados e durante a inspeção do trato

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digestivo, nódulos foram observados na curvatura maior do estômago. Nestes nódulos foram encontrados sete machos e sete fêmeas de parasitos do gênero *Physocephalus* sp, totalizando uma média de três nematóides fixos e infiltrados na submucosa de cada lesão. O exame histopatológico mostrou congestão e hemorragia intersticial na submucosa, associada com a presença de infiltrado inflamatório mononuclear. Os nematóides no local da lesão eram evidentes. Apesar de descrições anteriores deste patógeno em roedores, não houve qualquer relatório de lesões causadas por esta espécie de parasito. As lesões causadas pela ação do patógeno na mucosa do estômago podem afetar o processo digestivo de *C. paca* e levar o animal a apresentar diminuição da ingestão alimentar e inatividade e conseqüente interferência no crescimento e ganho de peso, comprometendo a saúde e o bem-estar de espécies selvagens.

DESCRITORES: *Cuniculus paca*. Gastrite parasitária. *Physocephalus* sp.

Cuniculus paca is a rodent species native to the Americas and distributed throughout the tropical regions, from southeastern Mexico to northeastern Argentina. This species has short and hard fur varying in color from brown to red, with white stripes and spots, and is characterized by having four toes on the front paws and five on the hind paws. It is a medium-sized animal, with adults weighing 6 to 12 kg, and is found in a wide range of forested habitats, including mangrove swamps, narrow gallery forests and dense highland jungle. These animals are also strongly associated with damp or flooded localities; they have a habit of taking refuge in rivers when pursued by predators (5).

Changes in wild animals' natural habitats are among mankind's actions in the environment, and these may be reflected in increased vulnerability of wild species. There is a great need to plan on the extractive use of small mammals (10, 16). Among the factors that may represent a risk to management and recovery programs for threatened species are parasites. These animals may act as reservoirs for parasitic species, and worldwide studies on biodiversity and on parasite fauna are mainly based on the importance of small mammals as agents for diseases and their influence on the health of ecosystems and natural and domestic environments (3). In terms of conservation biology, parasites may act to control host populations, thereby avoiding overpopulation, assisting in maintaining genetic variability and structuring vertebrate and invertebrate communities (20, 21). On the other hand, parasites are responsible for diminishing weight gain and causing mortality among *C. paca* during its first days of life. Thus, it is important to identify parasite species and find out about parasite biology in order to gain better understanding of the parasite-host relationship (11, 18).

Four male specimens of *C. paca* were caught using Tomahawk traps in the region of Araguaína, state of Tocantins, Brazil (7°12'49.99"S and 48°13'14.16"W) in December 2010. This was done in accordance with authorization received from the Brazilian Institute for the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis; IBAMA) (requirement Nr. 19.995-1). After capture, the animals were sacrificed by means of firstly applying 2.5% sodium thiopental intravenously until barbiturate

coma was achieved. Then, 19.1% potassium chloride was administered until cardiac arrest occurred, in accordance with the Brazilian Ethics Code for Laboratory Animal Experimentation formulated by the Animal Lovers' Educational Society and the Animal Protection Association.

Following these procedures, the animals were necropsied. Esophagus, stomach, small and large intestine were opened up, the material collected was sieved, and the content from each anatomical segment was fixed in Railliet and Henry's fluid and placed in duly identified individual flasks. When lesions were found at the stomach, they were excised and submitted to histopathological examination; tissue fragments containing nodules were removed for subsequent preparation of slides with hematoxylin-eosin staining (H.E).

Descriptive statistics were used (14) for determination of infection indicators, as follows: *Prevalence*: number of hosts infected by helminth species under study, divided by the number of examined hosts; *abundance*: number of helminth species in the study, divided by the total number of examined hosts; *average intensity*: number of helminth species in the study, divided by the number of hosts infected by the species under study; *variations of intensity*: minimum and maximum number of helminth species studied, observed in infected hosts.

In the present study, nodules were observed in the greater curvature of the stomach, in two animals (Figure 1ab). On average, seven males and seven females of the genus *Physocephalus* sp. were found (Figure 2), totaling an average of three nematodes fixed and infiltrated into the submucosa of each lesion. The histopathological examination showed congestion and interstitial hemorrhage in the submucosal region, in association with presence of mononuclear inflammatory infiltrate. The nematodes were evident at the lesion site (Figure 1cd).

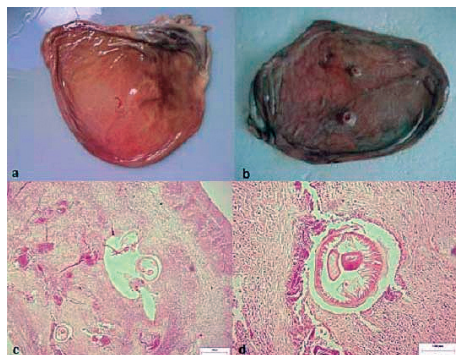


Figure 1. Gastric lesions caused by *Physocephalus* sp., parasitizing free-living pacas from the municipality of Araguaina, state of Tocantins, eastern Amazon region, Brazil (a and b). Two stomachs of animals containing nodules (c and d). Court of nodules in the stomach of animals showing the cross section of the helminth increase in smaller and larger respectively.

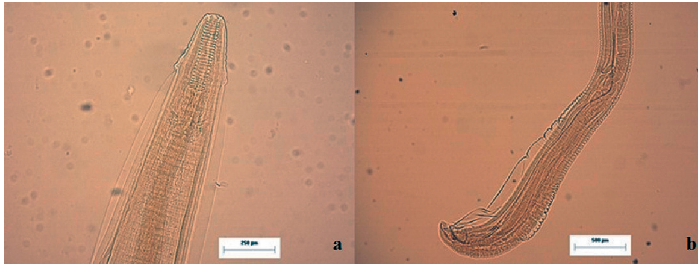


Figure 2. Morphological aspects of *Physocephalus* sp., male, parasitizing free-living pacas from the municipality of Araguaína, state of Tocantins, eastern Amazon region, Brazil. a) Anterior region. b) Posterior region.

The prevalence of the species found in this study was 50%, with abundance of 3.5, mean intensity of 7 and intensity range from 1 to 13. Table 1 presents the biometry on the males and females of *Physocephalus* sp. that were found in the stomachs of the naturally infected animals. These data are similar to what was found in other studies on this species (8).

Table 1. Biometric characteristics of male and female *Physocephalus* sp., parasitizing free-living pacas from the municipality of Araguaína, state of Tocantins, eastern Amazon region, Brazil.

Parameters (µm)	Sex (mean ± standard deviation)	
	Males	Females
Total length	17.8 ± 1.74	24.9 ± 3.05
Muscular esophagus	0.34 ± 0.03	0.43 ± 0.04
Glandular esophagus	2.78 ± 0.34	3.29 ± 0.17
Vestibule	0.26 ± 0.02	0.29 ± 0.01
Nerve ring	0.35 ± 0.02	0.38 ± 0.02
Papilla	0.19 ± 0.02	0.22 ± 0.01
Width	0.40 ± 0.02	0.42 ± 0.01
Smaller spicule	0.63 ± 0.05	-
Larger spicule	2.63 ± 0.13	-
Gubernaculum	0.06 ± 3.83	-
Cloaca/Posterior	0.12 ± 0.01	-
Vulva/Posterior	-	0.95 ± 0.11
Anus/Posterior	-	0.17 ± 7.66

Observation of parasites of the genus in agoutis and pacas from the state of Mato Grosso do Sul and the Amazon region were reported previously (8, 9). Nonetheless, despite the previous descriptions of this pathogen in rodents, there have not been any reports on the lesions. The pathogen is believed to be hematophagous because of blood that is seen in the gastric tube of nematodes, which is responsible for the reddish coloration that is observed macroscopically. It is of prime importance to emphasize that there are no reports of the presence of gastric lesions in the species

C. paca in the literature, such that the present study is the first such report. The lesions may affect the food digestion process, given that the nematodes may cause nausea and even vomiting as they migrate through the stomach mucosa, and they may lead the animal to stop feeding, with consequent delayed body growth (12). The species *Sceloporus serrifer*, which is a lizard found in Texas, has also been described as parasitized by species in the genus *Physocephalus* sp. The prevalence of infection was 29%, i.e. seven out of the 24 animals were infected. The parasites were seen to be encysted in the gastric region, thereby causing thickening of the submucosa, displacement of the external muscle layer, and focal destruction of the gastric glands. This agent caused granulomatous inflammation and fibrous wall cysts, which was reflected in the chronic nature of the host response. At the start of the infection, inflammatory cells and groups of lymphoid cells and macrophages were identified, while at the end of the reaction, fibroblasts predominated (6). The genus *Physocephalus* sp. has already been found in a wide variety of animals, including large birds (19), mammals as wild boar (7) dromedaries (2), rats (13), deer (17), bats (1) and armadillos (4), amphibians (15) and reptiles (lizards) (6). *Physocephalus* sp. has also been described as an etiological agent for parasitic gastritis in the host *Grus americana*, which has led to questioning about the possibility that large birds might participate in spreading this parasite (19).

The size of both male and female parasites reported here, was considerably large as shown in Table 1. Female (24.9 μm) were larger than males (17.8 μm). The spicules were unequal in the male, being the lowest 0.63 μm and the highest 2.63 μm . It was also verified the presence of a gubernaculum of 0.06 μm . In females the vulva was 0.95 μm at a distance from the rear end of the body and the anus was 0.17 μm . These biometric data suggest an impact caused by the action of the parasite in the host mucosa and impairment of health and welfare of the wild species.

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