



## Case Report

# Heartworm in a southern tiger cat (*Leopardus guttulus*) in Santa Catarina, Brazil

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## Abstract

Heartworm disease, caused by *Dirofilaria immitis*, is a vector-borne illness primarily affecting dogs but also documented in domestic and wild felines. In Brazil, a previous case was reported in a southern tiger cat (*Leopardus guttulus*) in São Paulo. This report describes the first documented case of heartworm disease in a *Leopardus guttulus* in Santa Catarina, Brazil. An adult female southern tiger cat was found on a city road in Joinville and presented with hypothermia, apathy, respiratory distress, and weakness. Despite supportive treatment, the animal did not recover and ultimately succumbed to its injuries. Necropsy revealed hemoperitoneum and hypovolemic shock due to trauma, with bite-associated wounds. Additionally, seven adult nematodes identified as *D. immitis* were found in the right ventricle, pulmonary artery, and femoral artery. Histopathological examination confirmed intravascular microfilariae, pulmonary vascular hypertrophy, hepatic congestion, and cardiac fibrosis, findings consistent with heartworm disease and congestive heart failure. This case underscores the need for further studies on heartworm disease in wild felines and potential zoonotic risk in endemic regions.

**Keywords:** heart, *Dirofilaria immitis*, wild cat, microfilaria, necropsy.

## Introduction

Heartworm disease is a vector-borne illness transmitted by blood-sucking mosquitoes, which act as vectors by passing microfilaria during their blood meal (3). *Dirofilaria immitis* causes this disease and primarily affects dogs, its preferred host. However, it also occurs in domestic cats, accounting for 5% to 10% of the cases seen in dogs (5). Additionally, there are documented cases in wild felines, including lions (10), leopards (6), ocelots (9), and tigers (1). In Brazil, a case of dirofilariasis was reported in a southern tiger cat (*Leopardus guttulus*, previously named as *Leopardus tigrinus*) in the state of São Paulo (4).

The southern tiger cat (*Leopardus guttulus*) is the smallest feline species in Brazil, widely distributed across the country. It is classified as vulnerable worldwide by the International Union for Conservation of Nature (IUCN) and is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (8). This species has solitary and nocturnal habits, making it relatively rare to observe in the wild. Occasionally, kittens are captured and kept as pets, similar to domestic cats (*Felis catus*) (1). This report presents the gross and histopathological findings of the first documented case of heartworm disease in a southern tiger cat (*Leopardus guttulus*) in Santa Catarina, Brazil.

## Case description

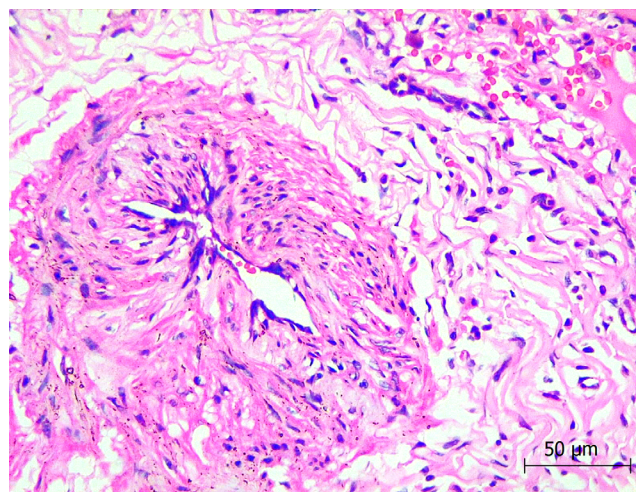
An adult female southern tiger cat (*Leopardus guttulus*) was brought to a veterinary clinic in Joinville, Santa Catarina, Brazil, by the Environmental Military Police for emergency care. The animal was found on a city road and exhibited hypothermia, apathy, respiratory distress, lethargy, and weakness. Despite the initiation of supportive treatment, the feline did not survive and was subsequently sent for necropsy at the Laboratório de Patologia Veterinária of the Universidade Federal de Santa Catarina (LABOPAVE-UFSC).

On gross examination, lesions consistent with hypovolemic shock were observed, including pale mucous membranes, hemoperitoneum, and marked pallor of the internal organs. A focally extensive hematoma was present in the subcutaneous tissue of the right costal region, while the perineal region exhibited focal perforations in the skin and muscle, measuring between 1 and 3 millimeters, associated with hemorrhage (lesions consistent with an animal bite). The liver exhibited pronounced hepatomegaly with an evident lobular pattern and a nutmeg-like aspect on cut section. Lungs were non-collapsed, elastic, and reddish. Furthermore, the heart showed a moderate increase in volume and in the right ventricle. Seven cylindrical, smooth, and thin parasitic specimens, averaging 20 cm in length and 3 mm in thickness, were found in the right ventricle (Figure 1) and pulmonary trunk artery, consistent with adult nematodes of *Dirofilaria* sp. Additionally, one parasite with similar characteristics was identified in the femoral artery. No significant gross lesions were noted in other organs.

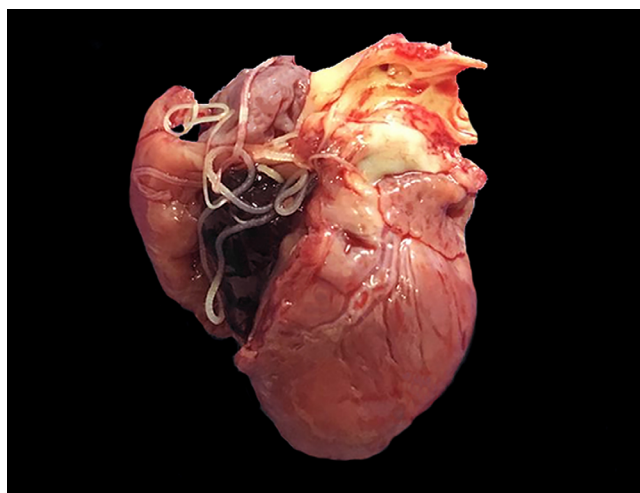
The nematodes collected during necropsy were sent for identification at the Laboratório de Doenças Parasitárias (LaDo-Pa) at UFSC. Tissue samples, including the lung, heart, liver, spleen, kidneys, lymph nodes, small and large intestines, brain, spinal cord, urinary bladder, gallbladder, skeletal muscle, and

skin, were collected, fixed in 10% formaldehyde, and routinely processed for histopathological examination at LABOPAVE.

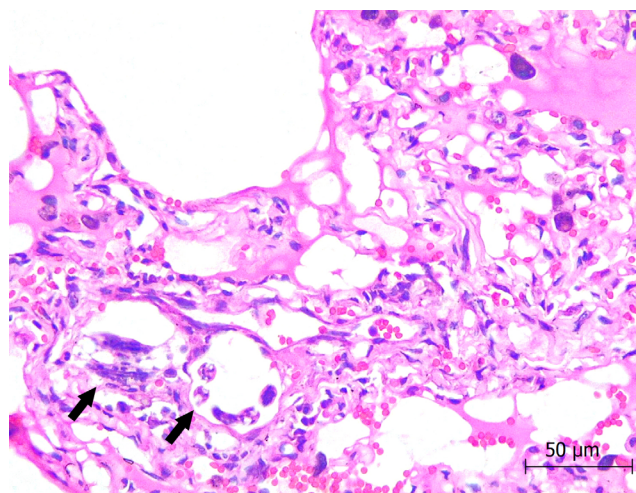
Histologically, in the lungs, multiple foci of proliferation of smooth muscle cells in the tunica media of arteries, sometimes with decreased arteriolar lumen. Perivascular fibrosis (Figure 2) and a moderate inflammatory infiltrate, composed of eosinophils, macrophages, lymphocytes, and plasma cells, were also observed. In several foci, intravascular structures were observed in longitudinal sections measuring  $30\text{--}40 \times 5\text{--}10 \mu\text{m}$  and in transverse sections measuring  $5\text{--}10 \mu\text{m}$  in diameter. These structures had a smooth, multilaminar cuticle and prominent musculature, findings consistent with intravascular microfilariae (Figure 3). Additionally, moderate interalveolar fibrosis was present, along with hemosiderosis, multifocal hemorrhage, diffuse congestion, and moderate multifocal alveolar edema.



**Figure 2.** Lung: artery with proliferation of the middle tunic and perivascular fibrosis in heartworm disease in a southern tiger cat (*Leopardus guttulus*). Lung, HE, obj. 40X.



**Figure 1.** Adult nematodes (total of seven) in right atrium and ventricle, morphologically compatible with *Dirofilaria immitis*, in a southern tiger cat (*Leopardus guttulus*).



**Figure 3.** Diffuse intra-alveolar edema and presence of intravascular *Dirofilaria immitis* microfilariae in longitudinal and transversal sections (arrow) in heartworm disease in a southern tiger cat (*Leopardus guttulus*). Lung, HE, obj. 40X.

The heart exhibited mild multifocal fibrosis and some cardiomyocytes with loss of transverse striations and increased cytoplasmic eosinophilia, indicative of hyaline degeneration. In the liver, centrilobular hepatocytes were occasionally pyknotic, accompanied by marked diffuse centrilobular congestion and mediozonal fat degeneration, corroborating the nutmeg appearance observed macroscopically. Additionally, multifocal cholestasis, fibrosis, and discrete multifocal duct proliferation in the periportal regions were noted.

Parasite identification was based on morphological and epidemiological characteristics. The specimens were long, white nematodes with a conical anterior end, a lipless oral cavity, and a straight posterior end in females; males, on the other hand, exhibited a rounded posterior end. Based on these features, the parasites were morphologically identified as *Dirofilaria immitis* (12).

## Discussion

The presence of hematomas in the thoracic region, along with hemoperitoneum and blood clots in the abdominal cavity, supports the diagnosis of hypovolemic shock secondary to trauma as the cause of death. Additionally, the identification of bite marks on the animal suggests a possible attack by another animal. Morphological identification of *D. immitis* by LaDoPa, as well as epidemiological, gross, and histopathological findings compatible with heartworm disease, were essential for the diagnosis of this condition. According to Taylor et al. (12), parasite size and predilection sites have diagnostic value for *D. immitis*. In living animals, diagnosis can be made by detecting microfilaria in blood samples, through serology, or via radiographic examination (7). Unfortunately, as the animal arrived dead, it was not possible to perform serological tests or blood smear.

Vascular microscopic lesions associated with heartworm disease include perivascular leukocyte infiltration, primarily with eosinophils, fibroplasia, and hypertrophy of the tunica media of blood vessels (7), as well as intravascular microfilariae (4). Grossly, heartworm disease is characterized by irregular intimal thickening of the pulmonary artery with villous projections into the lumen. Additionally, proliferative fibromuscular vascular lesions occur in small-caliber vessels of the lung, causing a decrease in vascular lumen and pulmonary hypertension (7). In this case, intravascular microfilaria was found in the lungs, associated with perivascular eosinophilic infiltrates, diffuse vascular congestion, and fibromuscular proliferation of pulmonary arteries, similar to lesions described by Filoni et al. (4).

The severity of the parasitic infection in the heart likely contributed to the chronic cardiac lesions observed in this animal. Additionally, the centrilobular hepatic congestion aligns with the cardiac findings, supporting the diagnosis of congestive heart failure. Although the animal was not observed alive, the severe pathological changes caused by

*Dirofilaria immitis* likely aggravated the clinical condition following the trauma. Given that the southern tiger cat is predominantly nocturnal (1), it is plausible that heartworm disease compromised its overall health, reducing its agility and making it more vulnerable to accidents or attacks.

Although heartworm disease is rare in humans, it is considered a zoonosis by the World Health Organization (WHO) (11). In Joinville, confirmed human cases of heartworm disease were caused by *Dirofilaria immitis* (2), indicating both parasite transmission and the presence of this species in the region, as corroborated by this case report.

Finally, the southern tiger cat remains a poorly studied species (1), and data on diseases affecting wild felines in South America are scarce. The prevalence and impact of heartworm disease in this species should be further investigated, particularly in relation to its potential effects on human health.

## Conflict of Interest

The authors declare no competing interests.

## Acknowledgments

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