http://dx.doi.org/10.21708/avb.2022.16.3.10519

Infection by *Aelurostrongylus abstrusus* in a wild *Leopardus wiedii* (Carnivora: Felidae): case report

Infecção por Aelurostrongylus abstrusus *em* Leopardus wiedii *(Carnivora: Felidae) de vida livre: Relato de caso*

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ABSTRACT: *Aelurostrongylus abstrusus,* popularly known as "feline pulmonary worm", it is a nematode that affects the respiratory system of felines causing aelurostrongylosis. This parasite can be found in the host's bronchi and pulmonary arteries. The clinical signs presented vary according to the animal's immune response and severity of the infection, the host might present apathy, dyspnea, syncope, wheezing, sneezing, among others. This report aims to describe a case of aelurostrostrilylosis in a feline of wildlife threatened of extinction. The animal, *Leopardus wiedii* (Schinz, 1821), popularly known as Margay, was found in an urban perimeter in the municipality of Anchieta, state of Santa Catarina (SC) in Brazil and attended at the Veterinary Clinic CLINIVET, of the University of the West of Santa Catarina - UNOESC, campus of São Miguel do Oeste (SC). In the initial clinical evaluation, the patient presented with deambulatory difficulties, biological samples were collected for further investigation. In the coproparasitological exam, parasitism was diagnosed by *A. abstrusus*, however the animal did not present any clinical signs related to the respiratory system. The results of this report indicate that the species *L. wiedii*, diagnosed with subclinical infection, can act as a wild reservoir for *A. abstrusus*, serving as a source of infection for other species of wild felids and also for domestic ones. This highlights the importance of effective public policies for the conservation, management and study of diseases that affect wild cats, especially species that need more urgent attention, that is, those threatened of extinction.

KEYWORDS: aelurostrongylose; feline pulmonary parasite; free living feline; Margay.

RESUMO: *Aelurostrongylus abstrusus,* popularmente conhecido como "verme pulmonar felino", é um nematoide que acomete o sistema respiratório dos felinos causando aelurostrongilose. Este parasita pode ser encontrado nos brônquios e artérias pulmonares do hospedeiro. Os sinais clínicos apresentados variam de acordo com a resposta imune do animal e gravidade da infecção, podendo o hospedeiro apresentar apatia, dispneia, síncope, sibilos, espirros, entre outros. Este relato tem como objetivo descrever um caso de aelurostrongilose em um felino silvestres ameaçado de extinção. O animal, *Leopardus wiedii* (Schinz, 1821), popularmente conhecido como gato maracajá, foi encontrado no perímetro urbano do município de Anchieta, estado de Santa Catarina (SC), Brasil e atendido na Clínica Veterinária CLINIVET, da Universidade do Oeste de Santa Catarina - UNOESC, campus de São Miguel do Oeste (SC). Na avaliação clínica inicial o paciente apresentava dificuldade de locomoção, foram coletadas amostras biológicas para posterior investigação. No exame coproparasitológico foi diagnosticado parasitismo por *A. abstrusus*, porém o animal não apresentou nenhum sinal clínico relacionado ao sistema respiratório. Os resultados deste relato indicam que a espécie *L. wiedii*, diagnosticada com infecção subclínica, pode atuar como reservatório silvestre para *A. abstrusus*, servindo como fonte de infecção para outras espécies de felinos silvestres e também para os domésticos. Isso destaca a importância de políticas públicas efetivas para a conservação, manejo e estudo das doenças que acometem os felinos selvagens, principalmente as espécies que necessitam de atenção mais urgente, ou seja, aquelas ameaçadas de extinção.

PALAVRAS-CHAVE: aelurostrongilose; parasita pulmonar felino; felino de vida livre; gato maracajá.

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Received: 05/08/2021. Accepted: 06/25/2021

INTRODUCTION

The Margay, *Leopardus wiedii* (Schinz, 1821) is a small-sized wild felid species (2-5 kg), which has a protruding snout, with large eyes and paws (OLIVEIRA; CASSARO, 2005; ROCHA et al., 2005). The Margay is naturally present in a variety of habitats throughout the neotropical region (ACHAVAL; CLARA; OLMOS, 2007). Despite this, the species is considered to be "almost threatened" of extinction in the Red List for the Conservation of Nature and Natural Resources (IUCN) (OLIVEIRA et al., 2015; IUCN 2020) and "vulnerable" (VU) nationwide (MMA, 2014). This species is an important ecological component of ecosystems, as it acts as a regulator of prey populations (VALENZUELA-GALVAN et al., 2013, SEIBERT et al., 2015). However, it is threatened with extinction, mainly due to the fragmentation of its habitats, hunting and being run over (MOREIRA et al., 2001; TORTATO et al., 2013). Parasitism can also act on the structure of the animal community, affecting its abundance, acting similarly to a predator in nature, as a biotic force capable of affecting the biodiversity of communities (KUSMA et al., 2015).

In domestic and wild cats, *Aelurostrongylus abstrusus* is the main etiological agent capable of causing respiratory infection of parasitic origin (SCOTT, 1973; ELSHEIKHA et al., 2016). The affection of the respiratory system by nematodes has received special attention from students and researchers in recent years due to the increase in the number of cases registered worldwide (RIGÃO et al., 2019). The problem, which was considered endemic only in European countries and in North America, managed to cross borders and spread, thus affecting cats worldwide (RIGÃO et al., 2019). Undesirable interactions between domestic animals and wild life animals are more common nowadays due to anthropogenic actions that are causing forest degradation, environmental losses, increase in pollution and urban expansion (ICMBIO, 2008). The proximity of these animals could facilitate the transmission of infectious agents, and, among them, the *A. obstrusus.*

A. abstrusus, the causative source of feline aelurostrongylosis, can reach 10 mm in length, and has a heteroxene epidemiological cycle. Adult females of the parasite, hosting the definitive host (DH), deposit their fertile eggs in the alveolar ducts, where the eggs hatch, giving rise to first stage larvae (L1). These migrate from the lower to the upper respiratory system, are swallowed, reach the gastrointestinal system and are excreted together with feces (NORSWORTHY et al., 2009).

In the environment, the L1 penetrate the intermediate host (IH), which are terrestrial mollusks, and develop in them until they reach the L3 stage (third stage larva) (SCOFIELD, et al., 2005). L3 can be ingested together with IH by rodents, birds, amphibians and reptiles, which can act as a parathenic host (PH) (SCOFIELD et al., 2005). In the PH, the larva does not complete its biological cycle but remains as L3 (SCOFIELD et al., 2005). Felines become infected by consuming PH with L3 and, less frequently, by ingesting IH (RIGÃO et al., 2019). In the gastrointestinal system of DH, the larvae penetrate the intestinal mucosa, reaching the lymphatic and blood circulation and proceed to their place of predilection for parasitism, which are alveolar ducts and terminal bronchioles (TAYLOR et al., 2007).

The clinical signs presented can vary among apathy, dyspnea, easy tiredness, discomfort, sneezing and wheezing, in addition to possible interstitial bronchopneumonia (ELSHEIKHA et al., 2016). The symptoms presented by the host will depend on the intensity of the infection and its immune response to the parasitic agent (TAYLOR et al., 2007; ELESBÃO, 2014). The parasitism in immunocompetent felines is usually subclinical and self-limiting. However, according to Taylor et al. (2007), in some cases intense infection can occur and could be fatal.

According to Barrs et al. (1999), the diagnosis can be made through evaluation of tracheal lavage, pulmonary radiographic, histopathological analysis (WILLARD et al., 1988), in addition to the coproparasitological exam. The last mentioned has greater specificity, as it allows the direct visualization of larvae from fecal samples (EHLERS et al., 2013; ELESBÃO, 2014). Baerman's technique (BAERMANN et al., 1917) is the method of choice when there is suspicion of a lung disease of parasitic etiology (PEREIRA et al., 2017). The sample should be fresh, preferably. Or, collected in the last 24 hours, as long as it has been kept refrigerated (2 to 8 ° C) (FERREIRA DA SILVA et al., 2005). However, the larvae are not constantly excreted, which favors a false-negative result (FERREIRA DA SILVA et al., 2005) and, consequently, reduces the sensitivity of the diagnosis.

This report aims to describe a case of aelurostrongylosis in a wild feline of the species *Leopardus wiedii*, popularly known as Margay.

CASE REPORT

An adult male of Margay (*Leopardus wiedii*), weighing 2.1 kg (Figure 1), was found in the urban perimeter of the municipality of Anchieta (SC) and taken by environmental police

Figure 1. *Leopardus wiedii* (Schinz, 1821). Adult male specimen with positive diagnosis for *Aelurostrongylus abstrusus*, performed through parasitological examination of feces.

officers from the 2nd Platoon of the 2nd Company. from the 2nd Battalion of the Environmental Military Police of the state of Santa Catarina to the CLINIVET Veterinary Clinic of the University of the West of Santa Catarina - UNOESC, campus of São Miguel do Oeste (SC). Chemical restraint was performed with tiletamine and zolazepan (10mg / kg) and subsequent evaluation and a full clinical examination was performed. Physical examination revealed pale mucous membranes, body temperature of 36.7 ° C and dehydration of 10%. The orthopedic examination revealed crackling and difficulty to execute movements in the hip region of the left pelvic limb, showing on the radiograph, left hip dysplasia, in addition to decreased bone density. As therapeutic protocol, fluid therapy was performed for rehydration, administration of anti-inflammatory (meloxicam, 0.1mg / kg) for three days and analgesic (dipyrone 25mg / kg and tramadol 2mg / kg) for three initial days, followed by tramadol (2mg / kg) for another 10 days, both administered orally with food. Calcium supplementation was also included in the diet. In addition to drug therapy, rest in an enclosure place with reduced size and height was indicated to decrease the animal's mobility.

After initial clinical evaluation, a fecal sample was collected and sent for coproparasitological analysis. Initially, the Faust method (FAUST et al., 1939) was used, through which the presence of *A. abstrusus* first stage larvae was found. The diagnosis was confirmed by the Baerman's technique (BAERMANN et al., 1917), which is based on the positive hydro characteristic and thermotropism of the larvae to separate them from the fecal content, which allows them to be visualized easily. Under optical microscopy, morphology was consistent with first stage larvae, length of about 400 µm and tail with the presence of an S-shaped subterminal spine (Figure 2), was observed. The animal did not show clinical signs of respiratory disease, but a chest radiograph was requested to rule out pulmonary abnormalities, the exam did not present changes in the pulmonary pattern. A complete blood count was also performed, which did not reveal any indications consistent with the identified parasitism. As treatment for pulmonary parasitism, it was instituted a medication based on pyrantel pamoate 232.0mg and praziquantel 20.0mg (PETZI GATOS®), one tablet, taken orally in a single dose, and repeated after 15 days. The feline was held captive for two weeks and later referred to the Environmental Military Police for appropriate procedures. Collecting permits were provided by Sisbio/ Brasil (#69525-1).

Source: Erickson Júnior de Ré, laboratory of veterinarian parasitology of University of West Santa Catarina (UNOESC).

Figure 2. Morphological characteristics of *Angiostrongylus abstrusu* first stage larvae. Image recorded under optical microscopy 400X magnification. The larvae of *A. abstrusus* in the first stage can be identified by the presence of a subterminal subterranean spine in the S-shaped tail (TAYLOR et al., 2007).

RESULTS AND DISCUSSION

Few studies have reported the species *Aelurostrongylus abstrusus* in wild felines. Noronha et al. (2002) recorded *A. abstrusus* in a Jaguarundi (*Puma yagouaroundi*) and a Geoffroy's cat (*Leopardus geoffroyi*), Gressler et al. (2016) in a Pampas Cat (*L. colocolo*) in a Northern tiger cat (*L. tigrinus*) and Kusma et al. (2015) identified in an unprecedented way the presence of this parasite in free-living Margay (*L. wiedii*) in the Três Barras National Forest – SC.

It is believed that the contamination of wild felids is directly linked to the ingestion of contaminated prey (FERREIRA DA SILVA et al., 2005), such as rodents, which act as a parathenic host (DRYDEN, 1996). Or, also, the environmental contamination can come from feces of domestic cats that are parasitized and that live close to the natural habitat of the regional flora.

The feline presented in this report had a subclinical infection, however, it is important to note that the pathogenicity in wild felids is not yet fully known, although according to Kusma et al. (2015) there are reports on wild felids. However, because there is little data on pathogenicity in wild felids, it cannot be said that the process is the same as that which occurs in domestic felids. In these, according to Rigão et al. (2019), the majority of the cases of aelurostrongylosis are asymptomatic. And, when symptomatic, the disease may show some signs considered nonspecific, such as apathy, hyporexia, anorexia, prostration and weight loss (PEREIRA et al., 2017; RIGÃO et al., 2019). Due to the non-specific clinical signs, animals affected by *A. abstrusus* can be mistakenly diagnosed with any of the countless respiratory pathologies that can affect felids (HEADLEY, 2005).

In domestic cats, it is documented that, occasionally, the disease may cause some respiratory symptoms. On those cases, dyspnea, nasal discharge, bronchitis and even pneumonia may occur. Fever can also manifest itself, especially when there are secondary infections of bacterial origin (FERREIRA DA SILVA et al., 2005; PEREIRA et al., 2017; RIGÃO et al., 2019). In general, gastrointestinal and respiratory parasites in felids can cause anemia, weight loss and less ability to adapt to changes in the environment (ARANDA et al., 2013). According to Taylor et al. (2007), although the infection is more common

in a subclinical form, in cases of intense infections the pleural cavity is usually altered, with the presence of whitish fluid, and the animals can die.

It is important to emphasize that the animal with subclinical infection is relevant from an epidemiological point of view, as it may serve as a source of infection for other susceptible individuals. According to Taylor et al. (2007), the dissemination of the agent is facilitated by environmental contamination from the feces of infected animals and by the ease of access and possible intake of PH and IH by felids. Based on this information, it can be assumed that, in the natural environment, in which wild felids live, the spread of the infection is facilitated by the free movement of these animals, which favors the spread of parasitism in that population.

Thus, the results of this report indicate that the *L. wiedii*, diagnosed with subclinical respiratory infection, can act as a wild reservoir for *A. abstrusus*, acting as a source of infection and threatening other species of wild felids and also for domestic ones. This highlights the importance of more effective public policies for the conservation, management and study of diseases that affect and put wild cats at risk, especially species that need more urgent attention, that is, those threatened with extinction, as is the case of *L. wiedii*, which is in the category of '' vulnerable '' (VU) nationwide (MMA, 2014), in Paraná state according to Mikich and Bérnils (2004) is also found in a vulnerable state (VU), and also in the state of Rio Grande do Sul as a VU (FZB 2014). And by IUCN it is listed as a near threat (NT) (OLIVEIRA et al., 2015).

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