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RESEARCH NOTE / NOTA CIENTÍFICA

FIRST RECORD OF *CAPILLARIA BOEHMI* (SYN. *EUCOLEUS BOEHMI*) (SUPPERER, 1953) IN A DOMESTIC DOG IN SOUTHERN BRAZIL

PRIMER REPORTE DE *CAPILLARIA BOEHMI* (SYN. *EUCOLEUS BOEHMI*) (SUPPERER, 1953) EN CANINOS DOMÉSTICOS EN EL SUR DE BRASIL

PRIMEIRO RELATO DE *CAPILLARIA BOEHMI* (SYN. *EUCOLEUS BOEHMI*) (SUPPERER 1953) EM CANINO DOMÉSTICO NO SUL DO BRASIL

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ABSTRACT

Capillaria boehmi (syn. *Eucoleus boehmi*) (Supperer, 1953) is a nematode of the Trichuridae family that infects the upper respiratory tract of definitive hosts, primarily wild and domestic canids. Transmission occurs through the ingestion of embryonated eggs, eliminated in the feces or nasal secretions of infected animals, or through the ingestion of earthworms, which are considered intermediate/paratenic hosts of the parasite. Therefore, the aim of this study was to report the first case of *C. boehmi* in a domestic dog in southern Brazil. The fecal sample analyzed was collected from an adult male mixed-breed dog. The animal had recurrent episodes of sneezing and had been previously diagnosed and treated, unsuccessfully, as

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an allergic condition. In the coproparasitological examination, using the flotation technique in a hypersaturated solution, eggs of *C. boehmi* were observed. The instituted treatment was milbemycin oxime (2 mg/kg). This report highlights the importance of including *C. boehmi* in the differential diagnosis of dogs with chronic respiratory signs, especially when other common causes, such as bacterial, viral, or allergic infections, have been ruled out.

Keywords: *Capillaria boehmi* – diagnosis – dog – treatment

RESUMEN

Capillaria boehmi (sin. *Eucoleus boehmi*) (Supperer, 1953) es un nematodo de la familia Trichuridae que infecta las vías respiratorias superiores de los huéspedes definitivos, principalmente cánidos salvajes y domésticos. La transmisión ocurre a través de la ingestión de huevos embrionados, eliminados en las heces o secreciones nasales de animales infectados, o también, a partir de la ingestión de lombrices, consideradas como hospedadores intermediarios/paraténicos del parásito. Por lo tanto, el objetivo de este trabajo fue reportar el primer diagnóstico de *C. boehmi* en un perro doméstico en el sur de Brasil. La muestra fecal analizada fue recolectada de un perro, macho, adulto, sin raza definida. El animal presentaba episodios recurrentes de estornudos y había sido diagnosticado y tratado anteriormente, sin éxito, como un proceso alérgico. En el examen coproparasitológico, mediante la técnica de flotación en solución hipersaturada, se observaron huevos de *Capillaria boehmi*, y el tratamiento instituido fue milbemicina oxima (2 mg/kg). Este relato evidencia la importancia de incluir a *C. boehmi* en el diagnóstico diferencial de perros con signos respiratorios crónicos, especialmente cuando otras causas comunes, como infecciones bacterianas, virales o alérgicas, han sido descartadas.

Palabras clave: *Capillaria boehmi* – diagnóstico – perro – tratamiento

RESUMO

Capillaria boehmi (syn. *Eucoleus boehmi*) (Supperer, 1953), é um nematódeo da família *Trichuridae*, que infecta as vias respiratórias superiores dos hospedeiros definitivos, principalmente canídeos selvagens e domésticos. A transmissão ocorre através da ingestão de ovos embrionados, eliminados nas fezes ou secreções nasais de animais infectados, ou ainda, a partir da ingestão de minhocas, consideradas como hospedeiros intermediários/paratênicos do parasito. Portanto, o objetivo deste trabalho, foi relatar o primeiro diagnóstico de *C. boehmi*, em um cão doméstico no sul do Brasil. A amostra fecal analisada foi coletada de um cão, macho, adulto, sem raça definida. O animal apresentava episódios recorrentes de espirros e havia sido diagnosticado e tratado anteriormente, sem sucesso, como um processo alérgico. No exame coproparasitológico, através da técnica de flutuação em solução hipersaturada, foram observados ovos de *C. boehmi*, e o tratamento instituído foi milbemicina oxima (2 mg/kg). Este relato evidencia a importância de incluir *C. boehmi* no diagnóstico diferencial de cães com sinais respiratórios crônicos, especialmente quando outras causas comuns, como infecções bacterianas, virais ou alérgicas, foram descartadas.

Palavras chave: cão – *Capillaria boehmi* – diagnóstico – tratamento

INTRODUCTION

Capillaria boehmi (syn. *Eucoleus boehmi*) (Supperer, 1953) is a nematodes belonging to the Trichuridae family that infect carnivores and small mammals, mainly wild and domestic canids. They can be found in the upper airways of the definitive host, especially in the nasal cavity and paranasal sinuses (Lalosević *et al.*, 2008; Germitsch *et al.*, 2020). Although the infection by *C. boehmi* is fairly rare, it can present a set of respiratory clinical signs that compromise the host's health, such as nasal secretion, sneezing (reverse or not), epistaxis, cough, nasal obstruction and impaired sense of smell (Clark *et al.*, 2013; Veronesi *et al.*, 2014; Germitsch *et al.*, 2020). Brain damage due to intracranial migrations of the parasite has also been described (Clark *et al.*, 2013).

The infection can be confounded with other breathing issues, which makes the differential diagnosis a challenge to the veterinary clinics. Reviews show that the infection

may appear in dogs of different races and ages, with the transmission generally occurring by the ingestion of embryonated eggs in the environment or earthworms that are considered intermediate/paratenic hosts of the parasite (Veronesi *et al.*, 2013).

Generally, the diagnosis is made by the identification of the eggs of the parasite in the nasal and fecal samples or by the molecular techniques, such as PCR (Di Cesare *et al.*, 2015; Germitsch *et al.*, 2020; Massetti *et al.*, 2024). The treatment is based on the administration of specific anthelmintics like fenbendazole or lactones macrocyclics, such as moxidectin and milbemycin, although the therapeutic choice depends on the severity of the infection and the animal's clinical response (Baan *et al.*, 2011; Alho *et al.*, 2016; Cervone *et al.*, 2017).

Therefore, the objective of this work is to report a diagnosis of *C. boehmi* in a domestic canine in the south of Brazil.

MATERIALS AND METHODS

A canine fecal sample was received at the Parasitic Diseases Laboratory of the Veterinary School of the Federal University of Pelotas, Brazil for coproparasitological examination. The sample came from an adult male mixed-breed dog. The material was submitted by a private veterinary clinic in Pelotas. The owners reported that the animal had recurrent episodes of sneezing and had previously been diagnosed and treated unsuccessfully as an allergic condition. In light of this, the attending veterinarian also requested a fecal parasitological test as an additional examination.

Ethic aspects: The team of authors indicate that they met all national and international ethical requirements.

RESULTS AND DISCUSSION

In the coproparasitological exam, behind the fluctuation technique in hipersaturated solution (Willis, 1921), eggs of *C. boehmi* had been observed (Figure 1). The eggs of *C. boehmi* have the size of 54-60x30-95 µm, with a multicellular embryo which doesn't fill the entire egg, they have a golden clear coloration and a delicated marked surface (Magi *et al.*, 2012). These morphological characteristics allow the differentiation of *C. boehmi* eggs of the other similar eggs, such as *C. aerophila* (Creplin, 1839) and *Trichuris vulpis* (Fröelich, 1789).

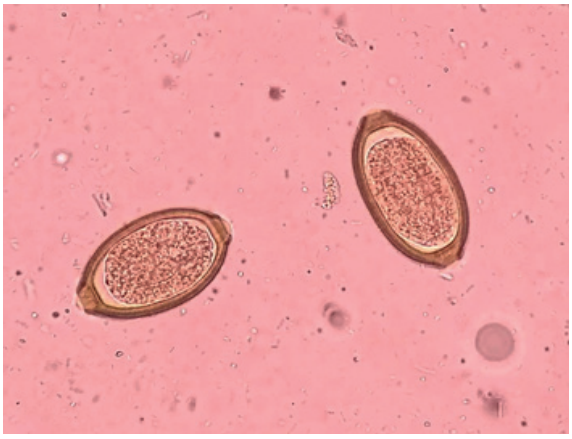

Figure 1. Eggs of *Capillaria boehmi* in coproparasitological exam of a dog, observed in optical microscopy, with a rise of 400x.

The parasitized animals are generally asymptomatic or show mild breathing alterations, although, in cases of a high parasitic load, the clinical signs are usually more severe (Germitsch *et al.*, 2020). The prognosis is generally good, especially when the diagnosis was made early and the treatment is correctly applied. However, in chronic states, there could be sequelae like chronic rhinitis or anatomic alterations in nasal cavities, which can persist even though the elimination of the parasit (Alho *et al.*, 2016). A case of meningoencephalitis with neurological signals caused by the migration of *C.boehmi* had been related (Clark *et al.*, 2013), pointing to the necessity of early diagnosis and treatment.

Despite the low frequency, a crescent number of cases had been observed, mainly in the temperate regions of North America and Europe. Cases of domestics and wild canines with clinical breathing signs secondary to the infection by *C. boehmi* are related in Italy (Magi *et al.*, 2012; Cervone *et al.*, 2017; Traversa *et al.*, 2019), Portugal (Alho *et al.*, 2016), Serbia (Lalošević *et al.*, 2013), Bosnia e Herzegovina (Hodžić *et al.*, 2016a), Austria (Hodžić *et al.*, 2016b), Switzerland (Germitsch *et al.*, 2020), United States of America (Piperisova *et al.*, 2010; Baan *et al.*, 2011; Clark *et al.*, 2013), Argentina (Lavallén *et al.*, 2018), among others.

In Europe, the foxes are frequently infected by *C. boehmi*, consequently, hounds and dogs who live or have access to areas where foxes are present a greater risks of infection (Di Cesare *et al.*, 2015).

The epidemiology of the infection by *C. boehmi* is still not completely comprehended. It is believed that the cycle of life of the parasite involves intermediary hosts, such as earthworms, who eat the eliminated eggs in nasal

discharge and excreta of contaminated dogs. The dogs, in turn, acquire the infection by the oral fecal route or by the ingestion of the intermediary hosts (Anderson, 2000). The infection is more common in dogs that have access to an external environment, especially humid areas with the soil rich in organic matter (Guardone *et al.*, 2016).

In terms of therapy, currently there is no registered medication for the treatment of dog nasal capilariosis and the used therapies are based on off-label use of benzimidazoles (fenbendazole) and macrocyclic lactones (ivermectin, milbemycin, moxidectin) (Evinger *et al.*, 1985; King *et al.*, 1990; Conboy *et al.*, 2009; Germitsch et al., 2020). For the dog of this case report, the anthelmintic recommended was milbemycin oxime, in dose of 2mg/mg. And to evaluate the effectiveness of the treatment, a new coproparasitological examination was performed 15 days later, where no more *C. boehmi* eggs were observed, demonstrating the effectiveness of the treatment.

Studies performed using milbemycin to treat *C. boehmi* infection have shown promising results. Some studies have also reported the efficacy of milbemycin oxime in the treatment of *C. boehmi* (Conboy *et al.*, 2009; Di Cesare *et al.*, 2015; Cervone *et al.*, 2017). The use of spot-on formulation with moxidectin/imidacloprid has also been successfully reported by some authors (Veronesi *et al.*, 2014; Alho *et al.*, 2016).

The dog in this report had street access, through walks with its owners, and may have ingested *C. boehmi* eggs in an environment contaminated by excreta or nasal discharge from infected animals, or even by ingesting the intermediate host (earthworms). This finding reinforces the importance of considering the animals environment and lifestyle when investigating suspected cases.

Considering the potential cycle of the parasite and the probability of the fecal-oral transmission, sanitation measures such as environment feces removal and prevention of geophagic and coprophagic practices, appear to be a crucial procedure for controlling and preventing the disease (Baan *et al.*, 2011).

This case report shows the importance of inclusion of *C. boehmi* in the differential diagnosis in dogs with chronic breathing signals, especially when other common causes like bacterial infections, virus or allergy were discarded (Hodžić *et al.*, 2016b). The infection for *C. boehmi* can be underdiagnosed due to the lack of familiarity of the clinicals with the illness and the diagnostic difficulties.

Therefore, the conscientization about this parasitosis and the correct utilization of diagnosis methods are essential. The early identification, associated with an appropriate therapeutic approach, is crucial for the clinic resolution and the well-being of the animal. The in-depth comprehension of the biological cycle, the diagnosis methods and the available therapeutic options will allow better results for the control of this breathing parasitosis.

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Visualization: AF, LQN
Writing – original draft: AF, ACDR, RFO, WPO, JFS, MMA, TFBM, RLS, FRPB, LQN
Writing – review & editing: AF, ACDR, RFO, WPO, JFS, MMA, TFBM, RLS, FRPB, LQN

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