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CASE PRESENTATION

First report of *Diectophyma renale* (Nematoda, Diectophymatidae) in Colombia

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Diectophymosis is a zoonotic parasitic disease caused by *Diectophyma renale* (Goeze, 1782). It is distributed worldwide and it affects a large number of wild and domestic mammals.

Here we report the first confirmed case of canine diectophymosis in Colombia. The animal was found dead in the streets of the municipality of Yondó, Antioquia, and its dead body was taken to the *Instituto Universitario de la Paz* (UNIPAZ) to carry out a necropsy.

A parasite worm was found in the right kidney and sent for identification to the *Laboratorio de Parasitología* of the *Universidad de Santander* (UDES). The specimen was identified as a male of *D. renale* upon observing the typical oval and transversely elongated bell-shaped bursa copulatrix with a spicule and no rays. Another important factor to confirm the diagnosis was the anatomical location in the kidney. This is the first time *D. renale* is reported in a stray dog in Colombia.

Key words: Diectophymatoidea; Enoplida infections; case studies; Colombia.

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Primer reporte de *Diectophyma renale* (Nematoda, Diectophymatidae) en Colombia

La diectofimosis es una enfermedad parasitaria zoonótica causada por *Diectophyma renale* (Goeze, 1782), de amplia distribución mundial, que afecta a un gran número de mamíferos silvestres y domésticos. Se reporta el primer caso de diectofimosis canina en Colombia. El animal fue encontrado muerto en las calles del municipio de Yondó, Antioquia. Su cadáver fue llevado al Instituto Universitario de la Paz (UNIPAZ) donde se practicó la necropsia.

En el riñón derecho se encontró un parásito, el cual fue enviado al Laboratorio de Parasitología de la Universidad de Santander para su identificación. El espécimen se identificó como un macho de *D. renale* por la típica bursa copulatrix oval y alargada transversalmente en forma de campana, sin rayos y con una espícula. Otro factor importante para confirmar el diagnóstico fue la ubicación anatómica en el riñón. Se reporta por primera vez la presencia de *D. renale* en un perro mestizo callejero en Colombia.

Palabras clave: Diectophymatoidea; infecciones por Enoplida; estudios de casos; Colombia.

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The nematode *Diectophyma renale* (Goeze, 1782) belongs to the order Enoplida, family Diectophymatidae (1); it can measure up to 100 cm long and 1.2 cm in diameter (2,3). It is commonly called giant kidney worm and is one of the largest nematodes which parasitizes vertebrates.

This nematode has been reported to infect domestic carnivorous and wild animals such as dogs, foxes, minks, coyotes, ferrets, otters, cats, pigs, horses, cattle, and even humans (4-7). The parasitism it causes has spread throughout many parts of the

world, with the possible exception of Africa and the Australian continent. In America, it has been reported in Argentina, Brazil, Canada, the United States, Paraguay and Uruguay (8).

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Author's contributions:

All authors contributed to the identification of the parasite, the discussion, the literature review and the drafting of the manuscript.

In the literature review we carried out for diotrophymosis in Colombia, we found only one study in a Neotropical otter population (*Lontra longicaudis*) that reports eggs with characteristics similar to *D. renale*, but no adult parasites were reported (9).

Dioctophyma renale is commonly described in dogs. Brazil and Argentina are the countries with the largest number of reported cases in mammals (5,10). In Brazil, cases have been reported in several states, including Rio Grande do Sul (3,11-20). Similarly, the canine diotrophymosis has been reported in various regions of Argentina (10,21-26) and Uruguay (27,28).

The life cycle of *D. renale* is indirect and it may involve different types of hosts until the parasite reaches maturity. The dog is defined as the definitive host (11,29). The aquatic annelid *Lumbriculus variegatus* is the specific intermediary host and fish from freshwater and *Chaunus ictericus* (Bufonidae) are considered paratenic hosts (13,29,30). The not-segmented egg is ingested by the intermediary host, hatches on the inside and the larva moves to reach the third stage that infects the definitive host or the paratenic host. The definitive hosts are infected by ingesting the intermediary host or the paratenic host. The third stage larva penetrates the wall of the stomach or duodenum, and then it migrates through the liver and peritoneal cavity until it reaches the kidney, predominantly the right one, but some parasites stay in the peritoneal cavity (8,31-33). However, the parasite has also been found in the left kidney, the abdominal cavity, the thoracic cavity, the ureters, the bladder and the subcutaneous tissue of dogs and other definitive hosts (11,13,34-36).

Normally the infection in dogs is subclinical (11,34), but the affected animals can present compressive atrophy of the parenchyma, dilation of the renal pelvis, and ureteral obstruction. The most striking lesion is the progressive destruction of the renal parenchyma, which, in the most severe cases, can reach a stage where only a thin capsule contains the parasite and hemorrhagic exudate (37,38).

The clinical presentation of diotrophymosis can be initially asymptomatic because the non-infected kidney is usually capable of assuming the functions of the infected one. Individuals typically present symptoms including renal colic, hematuria, and pyuria. If the parasite migrates to the ureter and the urethra, it blocks the flow of urine, which can lead to death by uremia and anuria.

The ectopic locations of the parasite in the liver, stomach, groin region, and mammary gland differentiate the clinical presentation, as well as the number of parasites in the definitive host (13,16-18).

The importance of these parasites for public health resides in their zoonotic potential demonstrated by the report of several human clinical cases (8,39-43).

Dioctrophymosis is a zoonotic disease in which humans can be the definitive host, although the location of the parasite in the kidney is not the most frequent feature, as the peritoneum and the skin are the most frequent locations in humans (38-42). Risk factors for human infection include a high prevalence of infected canines, a high level of surface contamination, the use of rivers as a means of transportation, recreation and food fishing (fish, frogs, and eels) (10).

Here we report the first case of *D. renale* in Colombia detected in the necropsy of a dog found in the municipality of Yondó, Antioquia, located near the Magdalena river where the dog possibly consumed food contaminated with the parasite. Our report describes the lesions found in the dog and discusses how it could have been infected with this important nematode not previously reported in the country.

Case presentation

In August, 2015, the body of a dead dog found in the streets of the municipality of Yondó (Antioquia) was taken to the Instituto Universitario de la Paz to carry out a necropsy. The dog was a male mongrel about 8 years old and its weight was 10 kg. A parasite was found in its right kidney and was sent to the *Laboratorio de Parasitología* of the *Universidad of Santander* (UDES) for identification.

Materials and methods

A complete post-mortem examination was performed for teaching purposes, giving special attention to the thoracic and abdominal cavities. The parasite was preserved in alcohol and sent to the *Laboratorio de Parasitología* at the *Universidad de Santander* (UDES) in Bucaramanga.

To identify the parasite, the morphological characteristics of the external genital structures of the genus, as well as the size and color of the nematode and its anatomical location, were taken into consideration (44,45). A definitive taxonomic key for the identification of this species is the presence in males of a bell-shaped copulatory bursa with no rays and a spicule measuring 0.5 to 0.6 cm long (46).

Discussion

The macroscopic features observed at the necropsy, such as the location of the parasite in the kidney and its red color, led to the identification of *D. renale* in almost a definitive way because of its large size, which makes this procedure an important diagnosis method. The final identification of the parasite as a male of *D. renale* was based on its morphological characteristics, mainly the typical bell-shaped bursa copulatrix with no rays and a protruding spicule of 0.5 to 0.6 cm in length (3,30,35,47,48), which are characteristic of this species (figure 1). The nematode measured 17 cm in length and 3 mm in diameter (figure 2). During the necropsy, no significant macroscopic lesions were observed.

In the literature review we carried out on diectophymosis in Colombia, we found only one study in a Neotropical otter population (*L. longicaudis*). Only eggs with characteristics similar to *D. renale* were reported, so there was no certainty about the presence of adult parasites or about eggs effectively corresponding to the parasite (9).

The dead body of the dog did not present significant lesions, and it did not show signs that it had been hit by a car either. The parenchyma of the right kidney was completely destroyed and only the organ capsule was left (figure 3).

In the necropsy, a male specimen of *D. renale* was found in the right kidney of the animal. This anatomical location of the specimen coincided with the majority of reports of this parasite (3,11,12,27,37,49-51) and is related to the anatomical position of this organ in front of the duodenum, where *D. renale* frequently leaves the intestine during its migratory route (52). The location of the parasite in the left kidney is less frequent, as it occurs when it crosses the stomach in the greater curvature or develops a cyst around the liver associated with its migration through the lower curvature of the stomach (11).

In a retrospective study of 16 cases of *D. renale* infection in dogs, all diagnoses were based on necropsy findings (11). In most of the cases, the parasitic infection by *D. renale* in these animals was found during the necropsy. Clinical diagnosis is difficult given that signs and symptoms have no specificity and many individuals are asymptomatic (11,34,37,38,53).

In some cases, canine diectophymosis can be diagnosed by parasitological examination of the urine (34,35), or during an exploratory laparotomy

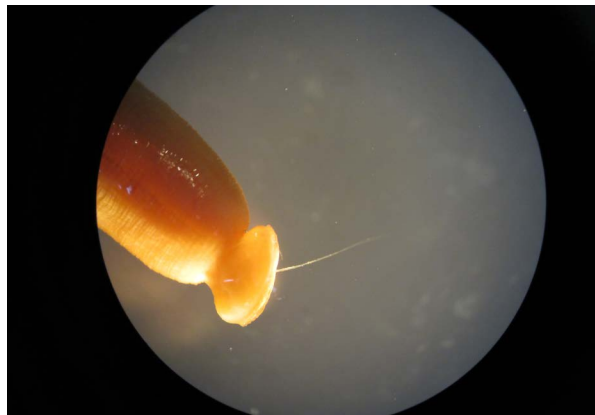


Figure 1. The large bell-shaped copulatrix bursa with a spicule that protrudes and no rays, characteristic of *Diectophyma renale*



Figure 2. The parasite measured 17 cm in length and 3 mm in diameter; a reddish coloration was observed.



Figure 3. Parenchyma of the right kidney completely destroyed by the parasite after eating the insides of the kidney leaving only the renal capsule of the organ

of the abdominal cavity (38). In addition, in cases where there is a loss of renal parenchyma with concomitant hypertrophy of the non-parasitized kidney, the diagnosis can be done by performing an ultrasound (Oliveira LL, Attallah FA, Santos CL,

Wakofs TN, Rodrigues MC, Santos AE. O uso da ultrassonografia para o diagnóstico de *Diocotophyma renale* em cão—relato de caso. In: Annals V Conferência Sul-americana de Medicina Veterinária. Rio de Janeiro, Brazil, 2005) or a radiograph (54).

In the case we report, only one adult parasite was found in the dog's right kidney. However, an unusual case of canine diocotophymosis was reported in Brazil, in which 28 worms of both sexes were found in the abdominal cavity of a 2-year-old male canine, and a single parasite in the right kidney (3). This may be the case with the largest number of specimens of *D. renale* in dogs ever reported.

The dog in our report was found in the streets of the municipality of Yondó (Antioquia), with access to the Magdalena River. It is very likely that this dog spent all its life living on the streets, feeding of garbage and discarded food. Taking into account these risk factors, it may have ingested the intermediate host or the paratenic host of *D. renale*. This is consistent with other reports by different authors in which canine diocotophymosis was found predominantly in stray dogs (11,13,34) and it may suggest that stray dogs are more susceptible to the infection, but the definitive condition is associated with the type of food that such dogs eat, unlike purebred dogs or domestic pets that normally remain indoors and are fed with a healthy and balanced diet (11,13). In a report from southern Brazil, a stray dog was fed with fish and its viscera, which was considered the main source for the infection (3).

This first case of *D. renale* in a stray dog in Colombia indicates that the parasite may complete its biological cycle in the local conditions of the place where it was found and that, therefore, it could be circulating in this region. Thus, it is necessary to carry out epidemiological studies in the area to determine risk factors for the transmission of the infection and to investigate whether there are more cases of the disease in dogs and even in humans, bearing in mind that it is a zoonosis.

The present case report proves for the first time the presence of the nematode *D. renale* in a canine in Colombia, which may indicate that in similar environments it would be possible to find the intermediate or paratenic host of this giant kidney worm.

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Conflicts of interest

None to declare

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