


Report of rare case of intense parasitism by 34 specimens of *Diectophyme renale* in a dog

Relato de caso raro de parasitismo intenso por 34 exemplares de *Diectophyme renale* em um cão

Pâmela Caye^{1*} ; Eduardo Santiago Ventura de Aguiar²; Joseana de Lima Andrades¹; Katiellen Ribeiro das Neves¹; Mariana Cristina Hoepfner Rondelli²; Fabrício de Vargas Arigony Braga²; Fabiane Borelli Grecco³; Júlia Ferrugem Kaiser⁴; Josaine Cristina da Silva Rappeti²

¹Hospital de Clínicas Veterinárias, Faculdade de Veterinária, Universidade Federal de Pelotas – UFPel, Pelotas, RS, Brasil

²Departamento de Clínicas Veterinárias, Faculdade de Veterinária, Universidade Federal de Pelotas – UFPel, Pelotas, RS, Brasil

³Departamento de Patologia Animal, Faculdade de Veterinária, Universidade Federal de Pelotas – UFPel, Pelotas, RS, Brasil

⁴Diagnóstico por Imagem - Stella Rausch, Pelotas, RS, Brasil

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Abstract

Diectophymosis is caused by *Diectophyme renale*, a nematode that usually affects the right kidney of carnivores. The aim of this study was to report on a case of a dog with progressive weight loss and swollen abdomen that was diagnosed as presenting diectophymosis. The patient underwent surgical treatment through which 34 nematodes were found, of which 18 were female and 16 were male, with a maximum length of 74 centimeters. The parasites were free in the abdominal cavity and inside the right kidney, and had caused peritonitis, free fluid, severe adhesions between the abdominal organs and renal perforation. Parasitic diseases with a high number of specimens of this species are uncommon in dogs. The disease progresses with an inflammatory reaction and consequent formation of adhesions and granulomatous tissue. This surrounds the eggs that were eliminated in the abdominal cavity by the free parasites. This disease occurs frequently in the city of Pelotas, Rio Grande do Sul, Brazil, where the patient of this report was living. To the best of authors' knowledge, this is the case with the largest number of specimens of *D. renale* removed from a single dog *in vivo*.

Keywords: Diectophymosis, helminth, kidney.

Resumo

A diectofimose é causada por *Diectophyme renale*, um nematódeo que geralmente afeta o rim direito de carnívoros. Este trabalho objetivou relatar o caso de um cão, com perda de peso progressiva e abaulamento abdominal, diagnosticado com diectofimose. O paciente foi submetido a tratamento cirúrgico, o que permitiu o achado de 34 nematódeos, sendo 18 fêmeas e 16 machos, com tamanho máximo de 74 centímetros. Os parasitos encontravam-se livres na cavidade abdominal e no interior do rim direito, causando peritonite, formação de líquido livre, intensas aderências entre os órgãos abdominais e uma perfuração renal. Parasitoses com alto número de exemplares dessa espécie são incomuns em cães. Cursam com reação inflamatória, com consequente formação de aderências e tecido granulomatoso, envolvendo os ovos eliminados na cavidade abdominal pelos parasitos livres. A doença é frequente na cidade de Pelotas, Rio Grande do Sul, Brasil, área de origem da paciente afetada. De acordo com a pesquisa realizada, acredita-se que esse é o caso com o maior número de exemplares de *D. renale* removidos de um cão *in vivo*.

Palavras-chave: Diectofimose, helmintos, rim.

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*Corresponding author: Pâmela Caye. E-mail: pamiscaye@gmail.com



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Dioctophyme renale (Goeze, 1782) is a nematode that causes dioctophymosis, a parasitic disease of chronic nature. This parasitosis develops through an indirect biological cycle and affects wild animals, domestic animals and humans. Infection occurs through ingestion of infective larvae that are present in the intermediate host (*Lumbriculus variegatus*) or in paratenic hosts (fishes and frogs) (Mace & Anderson, 1975). The right kidney is the organ mostly affected by this disease, which leads to destruction of the renal parenchyma, with consequent loss of organ function (Measures, 2001; Pedrassani & Nascimento, 2015).

The erratic cycle of *D. renale* may facilitate the finding of parasites in other anatomic regions. Case reports describe the finding of the nematode free in the abdominal cavity (Paras et al., 2018; Butti et al., 2020), left kidney (Perera et al., 2017b), mammary gland (Paras et al., 2018), prostate (Butti et al., 2020) and abdominal musculature (Caye et al., 2018)

The clinical signs presented by animals affected by this parasitic disease are variable, and clinical signs include apathy, progressive weight loss, hematuria (Radman et al., 2017), ascites and abdominal pain (Measures, 2001). However, clinical signs are often unapparent (Mesquita et al., 2014; Pedrassani et al., 2017). Drugs are ineffective for controlling the disease, and it can only be treated surgically, through nephrectomy of the parasitized kidney or direct removal of the parasite (Pedrassani & Nascimento, 2015). The aim of this study was to describe a case of a dog with high parasitic load of helminths of the species *D. renale*.

A five-year-old female dog of the Bull Terrier breed was attended at the Veterinary Hospital of the Federal University of Pelotas, because it presented a swollen abdomen that had been evolving for 20 days and progressive weight loss. The patient was dehydrated, with pale-pink mucosae, and was tachypneic and tachycardic. From abdominal ultrasonography, a diagnosis of renal dioctophymosis with dissemination in the abdominal cavity was made. In addition, the patient presented peritonitis, edematous mesentery and a moderate quantity of free fluid.

Laboratory analyses revealed anemia (Hb 8.8 g.dL⁻¹; Hct 26.5%), hypoalbuminemia (2.29 g.dL⁻¹), hematuria, leukocyturia and presence of *D. renale* eggs in the urine. The serum biochemical tests showed that the levels of creatinine (1.0 mg.dL⁻¹) and urea (43.23 mg.dL⁻¹) were within the normal range for dogs. After evaluation and stabilization, the patient was sent for the surgical procedure of exploratory laparotomy and right nephrotomy for the treatment of the disease.

Several specimens of free *D. renale* were removed from the abdominal cavity and from inside the right kidney, which presented perforation of its capsule, thus enabling translocation of the parasites. Parasites were found in the upper right abdominal quadrant, in the right lateral and hypochondriac regions, in the kidney and liver and in body fluids containing blood, in moderate quantity. The omentum was reactive, with proliferative areas adhering to the liver, stomach, small and large intestines, pancreas, spleen, urinary bladder and internal abdominal wall.

In total, 34 parasite specimens were removed, among which 27 were free in the abdominal cavity and seven were inside the right kidney (Figure 1). The parasites were identified according to their sizes, coloration, anterior extremity with hexagonal mouth without lips and posterior extremity with a copulatory bursa in the males and



Figure 1. Thirty-four nematodes of the species *Dioctophyme renale* removed from a single dog. (A) Females (seven) found inside the right kidney; (B) Females (11) removed from the abdominal cavity; (C) Males (16) removed from the abdominal cavity.

an obtuse tail in the females (Pedrassani & Nascimento, 2015; Butti et al., 2018). All of them presented normal coloration and presence of intense motility. There were 11 females and 16 males in the abdominal cavity (Figure 2), and all the seven parasites in the right kidney were female. While the free-living females in the abdominal cavity had a mean length of 56.45 cm (range from 15 to 74 cm), those females in the kidney had a mean length of 42.57 cm (range from 39 to 45 cm). The males had a mean length of 24.93 cm, with a range from 21 to 30 cm.

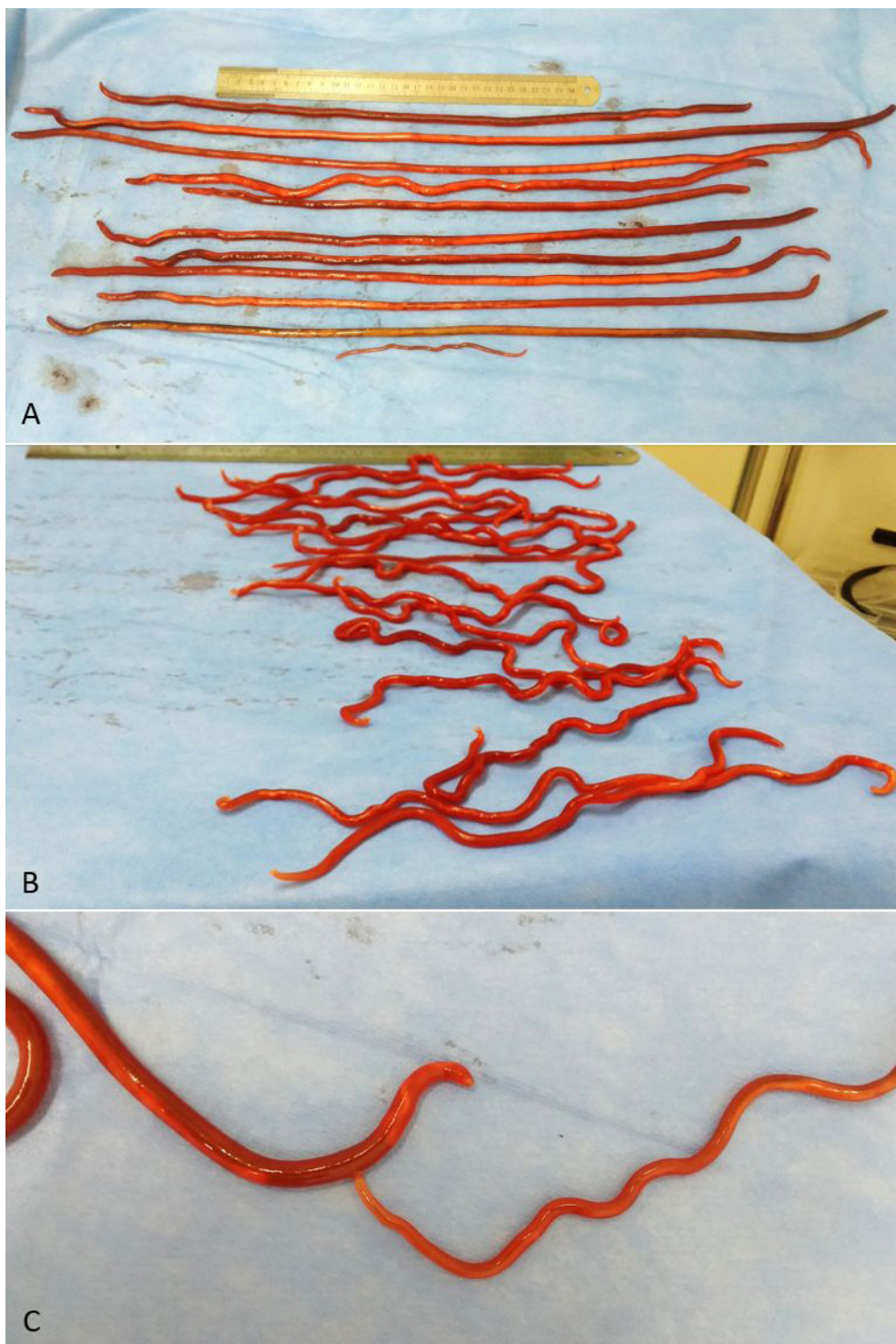


Figure 2. Free parasites removed from the abdominal cavity of a dog. (A) Females; (B) Males; (C) Copulation between two parasites, with the male united with the female by means of the copulatory bursa. The length of the ruler is 30 cm. The parasites presented motility, shown by the curvature of their bodies.

Samples were collected from the surface of each parasite using a sterile swab. These samples were sent for bacterial culturing in blood agar and MacConkey agar, and there was no growth of microbes in either of these. Histopathological analysis on fragments from the omentum revealed the presence of intense inflammatory infiltrate of lymphocytes, plasmacytes and macrophages. Very many eggs of *D. renale*, of rugose and bioperculate appearance, were found in the middle of the inflammatory connective tissue (Figure 3).

There have been reports of similar cases of multiparasitism caused by *D. renale*. In reports on dogs examined through necropsy, Monteiro et al. (2002) found 34 parasites (28 in the abdominal cavity and six in the right kidney) and Sadighian & Amini (1967) found 27 adult worms (14 in the right kidney, 10 in the peritoneal cavity and three in the peritoneum). Perera et al. (2017b) reported an *in vivo* finding of 23 parasites in the abdominal cavity in a single dog, which survived after removal of the nematodes.

The measurements of the 27 parasites described by Sadighian & Amini (1967) ranged from 29 to 75 cm among the females and from 21 to 33 cm among the males. Those sizes were similar to what was found in the present report, which shows that the high parasite load did not interfere with the development of the specimens encountered. In another report in the literature, it is stated that females can reach a length of 100 cm and males, 45 cm (Pedrassani & Nascimento, 2015).

The patient that was followed up in the present report had undergone a cesarean procedure, together with ovariohysterectomy, five months before receiving the diagnosis of diroctophymosis, performed by another professional. There were no reports of any macroscopic alterations seen during those procedures. Therefore, it can be suggested that the disease developed over that five-month period, since the prepatent period of *D. renale* in dogs is estimated to be 135 days (Mace & Anderson, 1975).

This dog was living in the rural zone of the municipality of Pelotas, in the south of the state of Rio Grande do Sul, Brazil. There have been several cases of animals parasitized by *D. renale* in the Pelotas region (Rappeti et al., 2017). Eggs of this parasite were found in soil samples from the urban region of the city (Perera et al., 2017a), and

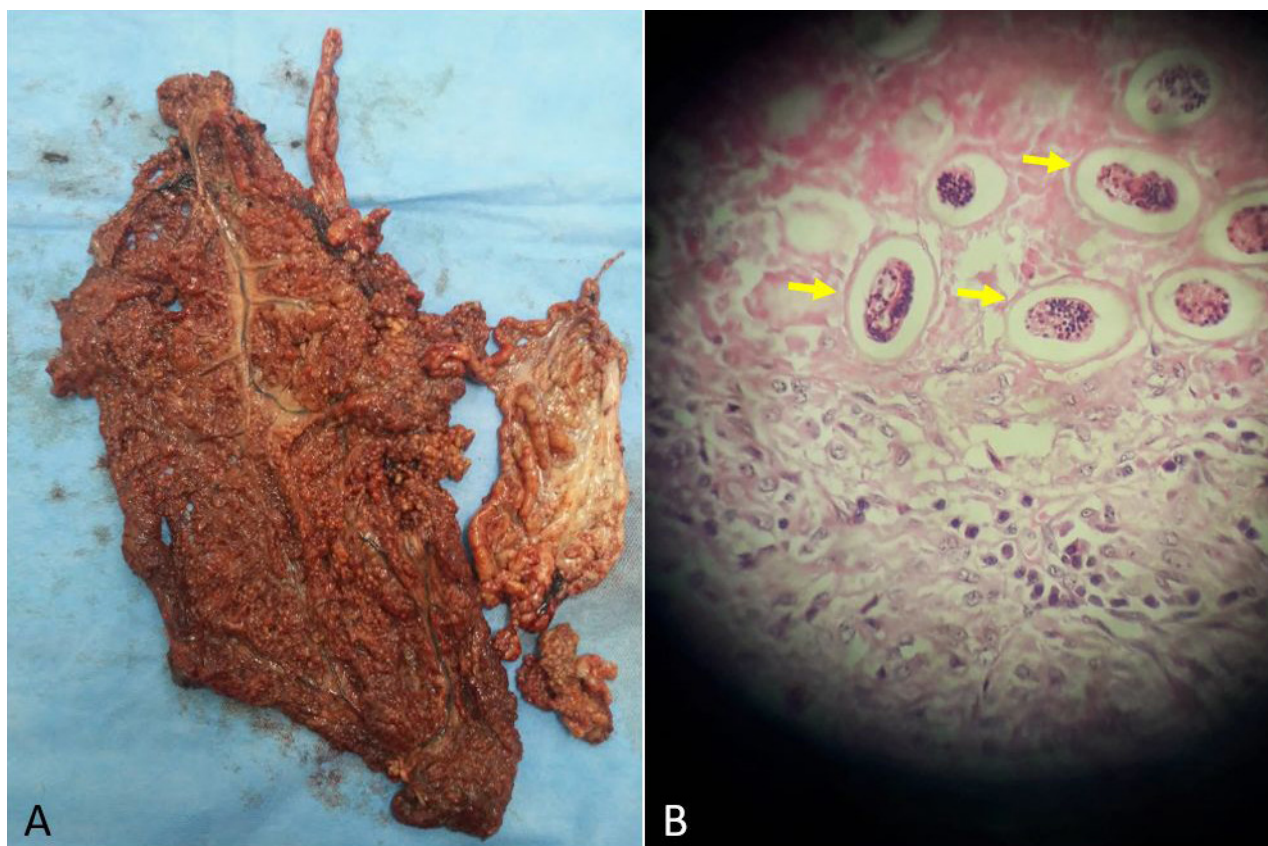


Figure 3. Omentum of a dog with diroctophymosis caused by 34 specimens of *Diroctophyme renale*. (A) Macroscopic appearance, with intense proliferative reaction and alteration of the tissue coloration and consistency; (B) Microscopic appearance, with intense inflammatory infiltrate consisting of lymphocytes, plasmacytes and macrophages (H&E; 10x). Arrows: Eggs of *Diroctophyme renale* surrounded by connective tissue.

third-stage larvae were found in 50% (n = 60) of the specimens of the turtle D'Orbigny's slider (*Trachemys dorsalis*) that were evaluated (Mascarenhas & Müller, 2015). These surveys show that dioctophymosis is present and disseminated in Pelotas, thus favoring infection with large numbers of worms.

In the report by Monteiro et al. (2002), renal perforation was also found, which allowed passage of parasites. It can be suggested that the high parasite load inside the kidney may have led to dispersal of parasites out from the kidney to the abdominal cavity, given the limited physical space inside the kidney capsule. In addition, there is the possibility that the free worms in the abdominal cavity had perforated the kidney, given that there is a migratory tendency towards this organ (Hallberg, 1953; Mace & Anderson, 1975). Likewise, considering the anatomical characteristics of the host, migration of the parasites to the right kidney explains the finding that all specimens were observed to be in the right lateral region of the abdomen.

The absence of bacterial growth in the cultures that were performed demonstrated that the parasitosis was not accompanied by bacteria infection. Aseptic peritonitis occurred through mechanical factors, due to the high parasite load and the presence of eggs that had not been eliminated and were causing inflammation and irritation to the tissue (Anderson, 2000). Moreover, chemical factors are also involved, given that the parasites eliminate lipolytic and proteolytic esophageal enzymes, thus causing tissue lysis (Pedrassani & Nascimento, 2015). The tissue lesions explain the formation of connective tissue and the inflammatory reaction surrounding the eggs, as described by Measures & Anderson (1985).

We believe that this report presents the largest number of specimens of *D. renale* that have so far been removed from a single dog *in vivo* (34 specimens). We were unable to find any similar report in the current literature available through the main databases. It was noted that the high parasite load did not impede full development of the parasites, which had reached sexual maturity with elimination of eggs. This led to consequent peritonitis, abdominal inflammatory reaction and tissue destruction.

The patient was still in a clinical stable condition at the time of writing this report, 148 days after the surgical treatment. The creatinine levels remained stable on days 11, 14 and 36 post-surgery, with values of 1.4 mg.dL⁻¹, 1.3 mg.dL⁻¹ and 1.2 mg.dL⁻¹. The urea concentrations progressively decreased (86.65 mg.dL⁻¹, 71.93 mg.dL⁻¹ and 64.53 mg.dL⁻¹) over these timepoints. Currently, the creatinine concentration is 1.9 mg.dL⁻¹ and urea 97.0 mg.dL⁻¹. The patient continues to be clinically monitored.

References

- Anderson RC. *Nematode parasites of vertebrates – Their development and transmission*. 2nd ed. New York: CAB International; 2000. <http://dx.doi.org/10.1079/9780851994215.0000>.
- Butti MJ, Gamboa MI, Terminiello J, Radman NE. Dioctofimosis en un canino de 3 meses de edad: reporte de caso. *Rev Arg Parasitol* 2018; 7: 33-36.
- Butti MJ, Gamboa MI, Terminiello J, Urbiztondo M, Polizzi C, Acosta C, et al. Dioctofimosis renal, abdominal e intraprostática en un canino. *Rev Arg Parasitol* 2020; 9(1): 27-30.
- Caye P, Milech V, Lima CS, Braga FVA, Cleff MB, Rappeti JCS, et al. Intramuscular *Dioctophyme renale* surgically removed from dog – rare case report. *Sch J Agric Vet Sci* 2018; 5(5): 266-269.
- Hallberg CW. *Dioctophyma renale* (Goeze, 1782) a study of the migration routes to the kidneys of mammals and resultant pathology. *Trans Am Microsc Soc* 1953; 72(4): 351-363. <http://dx.doi.org/10.2307/3223483>.
- Mace TF, Anderson RC. Development of the giant kidney worm, *Dioctophyma renale* (Goeze, 1782) (Nematoda: dioctophymatoidea). *Can J Zool* 1975; 53(11): 1552-1568. <http://dx.doi.org/10.1139/z75-190>. PMID:127653.
- Mascarenhas CS, Müller G. Third-stage larvae of the enoplid nematode *Dioctophyme renale* (Goeze, 1782) in the freshwater turtle *Trachemys dorsalis* from Southern Brazil. *J Helminthol* 2015; 89(5): 630-635. <http://dx.doi.org/10.1017/S0022149X14000364>. PMID:24830883.
- Measures L, Anderson RC. Centrarchid fish as paratenic hosts of the giant kidney worm, *Dioctophyma renale* (Goeze, 1782), in Ontario, Canada. *J Wildl Dis* 1985; 21(1): 11-19. <http://dx.doi.org/10.7589/0090-3558-21.1.11>. PMID:3157009.
- Measures LN. Dioctophymatosis. In: Samuel WM, Pybus MJ, Kocan AA. *Parasitic diseases of wild mammals*. 2nd ed. Ames: Iowa State University Press; 2001. p. 357-364. <http://dx.doi.org/10.1002/9780470377000.ch13>.
- Mesquita LR, Rahal SC, Faria LG, Takahira RK, Rocha NS, Mamprim MJ, et al. Pre- and post-operative evaluations of eight dogs following right nephrectomy due to *Dioctophyma renale*. *Vet Q* 2014; 34(3): 167-171. <http://dx.doi.org/10.1080/01652176.2014.924166>. PMID:24832362.

Monteiro SG, Sallis ESV, Stainki DR. Infecção natural por trinta e quatro helmintos da espécie *Dioctophyma renale* (Goeze, 1782) em um cão. *Rev FZVA* 2002; 9(1): 95-99.

Paras KL, Miller L, Verocai GG. Ectopic infection by *Dioctophyme renale* in a dog from Georgia, USA, and a review of cases of ectopic dioctophymosis in companion animals in the Americas. *Vet Parasitol Reg Stud Rep* 2018; 14: 111-116. <http://dx.doi.org/10.1016/j.vprsr.2018.09.008>. PMID:31014715.

Pedrassani D, Nascimento AA, André MR, Machado RZ. *Dioctophyme renale*: prevalence and risk factors of parasitism in dogs of São Cristóvão district, Três Barras county, Santa Catarina State, Brazil. *Rev Bras Parasitol Vet* 2017; 26(1): 39-46. <http://dx.doi.org/10.1590/s1984-29612017004>. PMID:28198911.

Pedrassani D, Nascimento AA. Verme gigante renal. *Rev Port Ciênc Vet* 2015; 110(593-594): 30-37.

Perera SC, Capella GA, Pinto NB, Rappeti JCS, Müller G, Azambuja RHM, et al. First isolation of *Dioctophyme renale* eggs from an urban environment and identification of those from animal urine. *Rev Bras Parasitol Vet* 2017a; 26(1): 89-91. <http://dx.doi.org/10.1590/s1984-29612016064>. PMID:27925059.

Perera SC, Rappeti JCS, Milech V, Braga FA, Cavalcanti GAO, Nakasu CC, et al. Eliminação de *Dioctophyme renale* pela urina em canino com dioctofimatose em rim esquerdo e cavidade abdominal – Primeiro relato no Rio Grande do Sul. *Arq Bras Med Vet Zootec* 2017b; 69(3): 618-622. <http://dx.doi.org/10.1590/1678-4162-9036>.

Radman NE, Gamboa MI, Butti MJ, Blanco M, Rube A, Terminiello J, et al. Occurrence of dioctophymatosis in canines within a riparian zone of the Río de la Plata watercourse, in Ensenada, Buenos Aires Province, Argentina. *Vet Parasitol Reg Stud Rep* 2017; 10: 43-50. <http://dx.doi.org/10.1016/j.vprsr.2017.07.007>. PMID:31014597.

Rappeti JCS, Mascarenhas CS, Perera SC, Müller G, Grecco FB, Silva LMC, et al. *Dioctophyme renale* (Nematoda: Enoplida) in domestic dogs and cats in the extreme south of Brazil. *Rev Bras Parasitol Vet* 2017; 26(1): 119-121. <http://dx.doi.org/10.1590/s1984-29612016072>. PMID:27925066.

Sadighian A, Amini F. *Dioctophyma renale* (Goeze, 1782) Stiles, 1901, in stray dogs and jackals in Shahsavari Area, Caspian Region. *Iran J Parasitol* 1967; 53(5): 961. <http://dx.doi.org/10.2307/3276817>. PMID:4228861.