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PREVALENCE OF A ZOONOTIC PARASITE, *Dioctophyma renale* (GOEZE, 1782), AMONG MALE CANINES IN A WILD RIVERSIDE AREA OF LA PLATA RIVER, PROVINCE OF BUENOS AIRES, REPUBLIC OF ARGENTINA

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ABSTRACT

Dioctophymosis is an helminthiasis with an indirect life cycle caused by *Dioctophyma renale*. It may affect both humans and other mammals. The purpose of this study was to determine the prevalence of the parasite in male canines of different ages, living in a wild riverside area of La Plata River with favourable characteristics for the development of eggs, intermediate or paratenic hosts and completionof the life cycle of *D. renale*. 171 animals were surveyed and samples were collected through urethral catheterization. The samples were processed by means of centrifugation at a relative centrifugal force of 700 g and microscopic observation of sediments. 42.1% of canines exhibited patent Dioctophymosis in their kidneys. Male canines between the ages of 2 and 5 showed the highest frequency of positive results. Several epidemiological risk factors are discussed that, when associated, might favour the high prevalence of this parasite in the area. The need for equipment for the indirect diagnosis of the disease in canines and other animals prone to infection is clearly demonstrated.

KEY WORDS: Prevalence; *Dioctophyma renale;* zoonosis.

RESUMEN

Prevalencia de un parásito zoonótico, *Dioctophyma renale* (Goeze, 1782), en caninos machos de una zona rivereña al Río de La Plata, Provincia de Buenos Aires, República de Argentina.

La Dioctofimosis es una helmintiasis de ciclo de vida indirecto causada por *Dioctophyma renale*. Puede afectar a los seres humanos y diferentes mamíferos. El propósito de este estudio fue determinar la prevalencia del parásito en caninos machos de diferentes edades, que viven en una zona rivereña al Río de la Plata con características favorables para el desarrollo de los huevos, los huéspedes intermediarios o paraténicos y para el ciclo vida de *D. renale*. Fueron encuestados 171 animales, se recogieron muestras por medio de sondaje uretral. Las muestras se procesaron por centrifugación

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a una fuerza centrífuga relativa de 700 g y se observaron los sedimentos microscópicamente. El 42,1% de los caninos exhibió Dioctofimosis patente en sus riñones. Los caninos de sexo masculino con edades comprendidas entre 2 y 5 años presentaron la mayor frecuencia de resultados positivos. Se discuten varios factores de riesgo epidemiológico que asociados, podrían condicionar la elevada prevalencia de parasitosis en la zona. Se hace evidente la necesidad de equipos para el diagnóstico indirecto de la enfermedad en los caninos y otros animales propensos a infectarse.

PALABRAS CLAVE: Prevalencia; *Dioctophyma renale;* zoonosis.

INTRODUCTION

Dioctophymosis is an helminthiasis with an indirect life cycle caused by *Dioctophyma renale* (Goeze 1782), a nematode known as "giant kidney worm". Different wild and domestic mammals may be definitive hosts, hosting one or several worms, which, through proteolytic and lipolytic enzymes, gradually destroy the kidney tissue leaving only the organ capsule containing the worm (10). However, they can also be found in ectopic locations (1), such as the scrotum, breasts, thoracic cavity, abdominal cavity and bladder. They are blood red, with sexual dimorphism. Female worms can be over 100 cm long and male worms 35 cm, although their size may vary according to the affected species (17). Male worms have a bell-shaped bursa copulatrix that does not present rays and has one spicule. The oral opening is surrounded by buds in the anterior extremity of both sexes (5). Other mammals that can act as definitive hosts of the parasite include: canines, mink, wolves, foxes, jackals, coatis, otters, skunks, ferrets, weasels, rats, raccoons, wolverines, pumas, cats, seals, pigs and horses (17, 25, 34). They produce contaminated urine, releasing eggs that need an aquatic environment to develop. Different authors describe *Lumbriculus variegatus*, (2, 15, 26) a freshwater oligochaete annelid, as an intermediate host that may infect definitive and paratenic hosts by hosting the L3 of *D. renale*. However, this invertebrate has not been described in the Southern hemisphere (6, 7). In nature, the chance of acquiring the infection becomes higher with the presence of transport or paratenic hosts, such as frogs, eels and freshwater fish (16, 22, 24), in which the L3 remains without evolving, encapsulated in muscles, the stomach wall and the mesentery. Riverside areas are therefore important for transmission (32).

The definitive host is contaminated with third-stage infective larvae through water containing annelids or through raw or undercooked paratenic hosts. After a prepatent period of more than 138 days (16), the definitive host starts contaminating the environment with eggs. Humans can also be definitive hosts, and Dioctophymosis is a zoonotic disease, but in the case of humans, locations outside the kidney are frequent (33, 35). Several locations have been found, with nonspecific symptomatology. These include retroperitoneal tumours (31, 33), kidney and perirenal cysts (12, 14), subcutaneous nodules (3, 35); expulsion through the urethra has also been reported (4), and a case of bilateral and lethal kidney Dioctophymosis (19).

In Argentina, this disease is frequently found in canines but most cases are clinical cases, findings from surgical manoeuvres or autopsies (26, 27, 30), all found in Buenos Aires and neighbouring areas (28). Near the city of La Plata, in a wild riverside area of La Plata River, the disease was diagnosed after some discoveries of eggs in urine (5) and by ultrasonography (1).

In the Northeast region of the country, *D. renale* was found in canines in the city of Resistencia, Province of Chaco (8, 9) and in the Province of Formosa (23).

The purpose of our research was to determine the prevalence of Dioctophymosis in male canines living in a riverside area of La Plata River, in the District of Ensenada, Province of Buenos Aires, Argentina.

MATERIALS AND METHODS

Area of study: the sampling was made in the ´El Molino´ neighbourhood, District of Ensenada, Province of Buenos Aires, located approximately 34° S latitude and 57° W longitude. This neighbourhood has particular hydrographic characteristics that contribute to the spread of *D. renale,* and belongs to the Marginal Forest of Punta Lara; the southernmost gallery forest in the world (11) (Figure 1).

Animals: urine samples of 171 male canines (male because their urethra facilitated the procedure) between 5 months old and 15 years old were collected. The animals were spontaneously taken by their owners; they were vaccinated and all provided several samples for diagnosis. This was performed within the framework of educational meetings about sanitation during the period between 2003 and 2009 (32).

Sample collection: samples were collected through urethral catheterization, using disposable catheters of various sizes according to the age of each animal. Samples were placed in labelled centrifuge tubes and were centrifuged at a relative centrifugal force of 700 g (13) for a period of 5 minutes. Sediments were analysed between slides and coverslips using a microscope at 10x objective. Three preparations per sample were observed. Samples were processed at the end of each consultation.

Data Collection: epidemiological data were gathered using specially designed forms, where information concerning the owner's and the animal's backgrounds was included, for example, their age and their eating and mobility habits, among others. For a more careful analysis, animals were grouped into 6 categories according to their age. As a descriptive summary, a statistical analysis of the data was performed using the Epidat 3.1 program (Method: Stratified Contingency Tables).

RESULTS

From the total number of male canines participating in this survey, 72 tested positive for *D. renale* eggs (Figure 2), and this represented a percentage of 42.1% (Table 1).

Table 1. Eggs of *Dioctophyma renale* found in canine urine samples. Distributed according to age.

Age	Category	Pos.	Neg.	Tot.	% Pos.
< 1 year.	1	4	24	28	14.3
1 to 2 y.	2	11	22	33	33.3
2.1 to 3 y.	3	18	16	34	52.9
3.1 to 4 y.	4	8	7	15	53.3
4.1 to 5 y.	5	5	4	9	55.5
> 5 y.	6	26	26	52	50
	Total	72	99	171	42.1

The homogeneity test between levels stratified by age provided a Chi-square value of 14.2 for 5 gl. and a very significant random value of 0.014. The linear trend test was also very significant.

Figure 1. Photograph of the study area.

Figure 2. Egg of *Dioctophyma renale* obtained from the urinary sediment of a male canine.

DISCUSSION

Most scientific communications in Argentina provided information only about discoveries of *D. renale,* (8, 23, 26, 27, 28). Recent studies (5), however, have revealed some preliminary population results.

This study is a descriptive study where patent kidney parasitosis was found in 42.1% of cases. There is a possibility that more animals were infected with the disease but in a subpatent form as a consequence, for example, of the presence of young nematodes, only males, or the location of the parasite outside the kidney.

For sample gathering, only male canines were chosen and grouped into 6 categories (C) according to age. From C1 to C5, increasing infection percentages were observed. This might be due to higher exposure to infectious forms of the parasite. Absence of immunity was also found.

Category C1, involving animals under the age of one, revealed a prevalence of 14.3%, emphasizing a wide difference compared to C2. In general, owners of young pets take more care of them, as a result avoiding exposure to infectious forms. Additionally, the low prevalence observed in C1 may imply that *D. renale* is not vertically transmitted, as occurs with other nematodes, such as, *Toxocara canis.* The high prevalence found from C2 to C5 would indicate, among other factors, that the animals move freely, drink water from ditches and feed on the potential paratenic hosts of this parasitosis (fish, frogs and eels). On the other hand, the low prevalence observed in C6, involving animals over the age of 5, might be due to aging or death of nematodes from probable previous infections. The change in mobility habits owing to an increasingly sedentary lifestyle in old animals decreases the chances of reinfections.

The area of analysis presented certain characteristics that favour the development of eggs, intermediate and paratenic hosts and the completion of *D. renale* life cycle. These included: a surface highly contaminated with eggs (20, 21, 29), flooding (3, 16), the presence of various families of annelids (6), and the eating habits of surveyed canines (16, 22). Because of all these factors, the prevalence of Dioctophymosis found in this study is not considered accidental.

Other studies state that this parasitosis is not very frequent in humans, considered to be accidental hosts of the parasite (14). However, according to Le Bailly et al. (18), parasitosis has been found in archaeological material dating from 3384 to 3370 BC.

In the context of this zoonosis, several factors in this location pose a risk to the health of the inhabitants: high prevalence of infected canines, high level of surface contamination, use of the river as a means of transport, recreation and fishing for food (fish, frogs and eels).

Various authors reported findings of *D. renale* in humans in different locations (2, 3, 4, 8, 12, 14, 33, 35). This would justify undertaking studies to analyse the presence of the parasitosis in humans living in the area through indirect methods.

Some other analysis would also be necessary in order to confirm the presence of *L. variegatus* or other probable intermediate hosts in the area.

Without any doubt, additional study of this parasitosis in female canines through imaging and/or serological methods, would result in estimates of prevalence different to those found in this study. It would therefore be appropriate to extend this investigation.

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