

# *Giardia* spp.: Determination of the frequency of infection in dogs and cats from the District of Évora, Portugal (2007-2008)

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## Abstract

*Giardia* is a ubiquitous parasite; a protozoan with the ability to infect most species of vertebrates, including domestic animals and humans. In spite of being the most common enteric parasite in developing countries, there are still many doubts regarding its zoonotic potential, making it a public health issue particularly important for immunocompromised populations. This study is an approach to estimate the frequency of infection of *Giardia* spp. in cats and dogs from the District of Évora. During the course of this study, stool samples were collected from 131 dogs and 21 cats. From November 2007 through July 2008, veterinary hospitals and shelters provided these samples. In total, 82 dogs and 19 cats belonged to clients of the veterinary hospitals, while 49 dogs and 2 cats were shelter animals. The stool samples were collected during 3 consecutive days. The method used to detect the presence of *Giardia* was the Modified Faust. The animals considered positive had at least 1 sub-sample positive. Of the 152 samples tested, 34 of 131 dogs (26.0%) and 2 of 21 cats (9.5%) tested positive for *Giardia* spp. The parasite was not detected in any of the cats belonging to clients of the veterinary hospitals although both shelter cats showed positive results. As for dogs, 30 shelter animals were infected (61.2%), compared to 4 from the veterinary hospitals (4.9%). This study shows a much higher frequency of infection in shelter animals compared to

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animals from veterinary hospitals. Overcrowding, stress, non-existent proper de-worming protocol, and less than ideal hygiene practices are all factors that contribute to an animal population more susceptible to parasites such as *Giardia* spp. These factors are common in animal shelters. Due to the zoonotic potential of this parasite, people who adopt animals from shelters should be warned that such animals represent a higher risk in terms of infection with *Giardia* spp.

### Keywords

*Giardia*, health, immunocompromised host, zoonoses, frequency

### **GIARDIA SPP: DETERMINAÇÃO DA FREQUÊNCIA DE INFECÇÃO EM CÃES E GATOS NO DISTRITO DE ÉVORA, PORTUGAL (2007 - 2008)**

### Resumo

*Giardia* é um protozoário ubíquo com a capacidade de infectar a maioria das espécies vertebradas. Apesar de ser o parasita entérico mais comum em países em desenvolvimento, há ainda muitas dúvidas em relação ao seu potencial zoonótico, representando um tema de saúde pública particularmente importante para as populações imunodeprimidas. Este estudo é uma tentativa de estimar a frequência de infecção com *Giardia* spp. em gatos e cães do Distrito de Évora. Desde Novembro de 2007 até Julho de 2008, amostras de matéria fecal foram recolhidas de 131 cães e 21 gatos provenientes de hospitais veterinários e canis de refúgio. No total, 82 cães e 19 gatos pertenciam a clientes de hospitais veterinários, enquanto 49 cães e 2 gatos pertenciam a refúgios. O método utilizado para detectar a presença de *Giardia* spp. foi o de Faust Modificado. Os animais considerados positivos tiveram, no mínimo, 1 de 3 sub-amostras positivas. Das amostras testadas, 26,0% dos cães e 9,5% dos gatos foram positivos para *Giardia* spp. O parasita não foi detectado em nenhum dos gatos pertencentes aos clientes dos hospitais veterinários, enquanto ambos os gatos de refúgios mostraram resultados positivos. No caso dos cães, 61,2% dos animais de refúgios estavam infectados, em contraste com 4,9% dos animais de hospitais veterinários. Nota-se, pois, uma frequência de infecção bastante superior em animais de refúgios quando comparados com animais provenientes de hospitais veterinários. A sobrepopulação, o stress, a inexistência de protocolos de desparasitação adequados e as práticas higiénicas insuficientes são factores que contribuem para uma população animal mais susceptível a parasitas como *Giardia* spp. Estes factores estão frequentemente presentes nos refúgios de animais. Devido ao potencial zoonótico deste parasita, as pessoas que adoptam animais de refúgios devem ser informadas de que estes animais representam um risco mais elevado no que diz respeito a infecção com *Giardia* spp.

## Palavras chave

*Giardia*, saúde, hospedeiro imunocomprometido, zoonoses, frequência

## **GIARDIA SPP.: DETERMINACIÓN DE LA FRECUENCIA DE LA INFECCIÓN EN PERROS Y GATOS DEL DISTRITO DE ÉVORA, PORTUGAL (2007 - 2008)**

### Resumen

*Giardia* es un protozoo ubicuo con la habilidad de infectar la mayoría de las especies vertebradas. A pesar de ser el parásito entérico más común en países en desarrollo, existen aún muchas dudas respecto a su potencial zoonótico, representando un tema de salud pública particularmente importante para las poblaciones inmunocomprometidas. Este estudio es una aproximación al intento de estimar la frecuencia de infección de *Giardia spp.* en gatos y perros del Distrito de Evora. Desde noviembre de 2007 hasta julio de 2008, muestras de materia fecal fueron recolectadas de 131 perros y 21 gatos, proporcionadas por los hospitales veterinarios y refugios animales. En total, 82 perros y 19 gatos pertenecían a clientes de hospitales veterinarios, mientras que 49 perros y 2 gatos pertenecían a refugios.

El método usado para detectar la presencia de *Giardia* fue el de Faust modificado. Los animales considerados positivos tuvieron al menos 1 de 3 submuestras positivas. De las muestras probadas, 26,0% de los perros y 9,5% de los gatos fueron positivos para *Giardia spp.* El parásito no fue detectado en ninguno de los gatos pertenecientes a los clientes de los hospitales veterinarios y los gatos de refugios mostraron resultados positivos. De los perros, 61,2% de los animales de refugios estaban infectados, comparados con el 4,9% de los hospitales veterinarios. Se muestra una frecuencia mucho mayor de infección en animales de refugio comparados con animales de hospitales veterinarios. La sobrepoblación, el estrés, la inexistencia de protocolo de desparasitación adecuados y las prácticas higiénicas no ideales son factores que contribuyen a una población de animales mas susceptibles a los parásitos como *Giardia spp.* Estos son comunes en los refugios animales. Debido al potencial zoonótico de este parásito, las personas que adoptan animales de refugios deben ser avisadas que tales animales representan un riesgo mayor en términos de infección con *Giardia spp.*

## Palabras clave

*Giardia*, Salud, Huésped Inmunocomprometido, Zoonosis, Frecuencia.

## Introduction

*Giardia* is the most common enteric protozoan parasite of domestic animals; it infects a wide range of vertebrates, including cats, dogs, livestock and humans (Monis and Thompson, 2003; Thompson, 2000). Of particular interest to a veterinary audience is the growing knowledge that the zoonotic potential of this well-known parasite definitely deserves further expansion. Its occurrence is significant from both clinical and public health perspectives and yet, until very recently, confusion over taxonomy and host range of *Giardia* prevented a clear understanding of the epidemiology of infections (Thompson et ál., 2008). Recent advances in Molecular Epidemiology have brought light into a previously obscure field, thus allowing some cycles of transmission to be determined.

*Giardia* has been known for more than 300 years; Antony van Leeuwenhoek discovered it in 1681 while examining his own diarrheal stools under the microscope (Dobell, 1932). Although humans seem to have been suffering the consequences of this parasitic infection for thousands of years, we had to wait another 200 years after its first observation until it was properly described (as *Cercomonas intestinalis*) by Vilem Dusan Lambl in 1859. In 1915, the parasite was named to commemorate the work of Professor A. Giard and Dr Lambl. British microbiologist Brian J. Ford, recreating van Leeuwenhoek's observations, demonstrated the clarity with which one could view *Giardia* through a primitive microscope. Today, *Giardia* is one of the most studied organisms, not only because of its ubiquity as a parasite, but also because of its importance in evolutionary biology and molecular genetics (Thompson, 2004).

*Giardia duodenalis* (*G. duodenalis*), also known as *G. intestinalis* or *G. lamblia*, has a global distribution, causing an estimated  $2.8 \times 10^8$  cases per annum (Lane and Lloyd, 2002), and is one of the most common intestinal parasites found in humans in developing countries. About 200 million people in Africa, Asia and Latin America have symptomatic giardiasis, with some 500 000 new cases reported every year (WHO, 1997). This protozoan is a common cause of disease, particularly among those with weak or compromised immune systems, (such as children, elders, pregnant women, and HIV patients) and young livestock (Robertson et ál., 2000). Chronic infections contribute to poor growth and other nutritional disorders in children (Thompson and Monis, 2004). In young livestock,

*Giardia* infections may have a large impact on production (Olson et ál., 2004). While cats and dogs rarely show clinical signs of infection, they may still carry strains of *Giardia* that are potentially infective to humans, therefore treatment should be advocated whether or not they present the symptoms of clinical illness (Barr et ál., 1994; Kirkpatrick, 1985; Thompson, 1991). The recent development of vaccines against *Giardia* that seem to reduce cyst shedding might provide a viable method for reducing carrier rates in pets and subsequent environmental contamination (Robertson et ál., 2000).

The prevalence of *Giardia* seems to have increased over the past few decades, making giardiasis a re-emerging infectious disease (Thompson, 2000). These changes could be real or could be artificial due to the type of surveys conducted, the animals surveyed and the diagnostic tests used (Hopkins et ál., 1997).

*Giardia's* simple lifecycle and environmentally resistant cysts provide ample opportunities for the parasite to be transmitted directly from one infected individual to another, or indirectly through contamination of the environment or food. In this respect, water is one of the most noteworthy vehicles for its transmission to humans (Thompson, 2004). Although much is understood about the transmission of *Giardia* through water, the real public health meaning of infected non-human hosts as sources of water contamination remains unsolved, and it is common belief that humans themselves have been the source of the most significant water-borne *Giardia* outbreaks reported (Thompson, 2000).

To the best of the author's knowledge, in Portugal very little is known about the epidemiology of this parasite, particularly when it comes to pets. Most animal hospitals tend to treat general diarrhea with Metronidazol regardless of the cause, thus, no data is collected in situations where *Giardia* might be involved. The aim of this study was to determine the presence of *Giardia* spp. and its prevalence in cats and dogs from the District of Évora.

## Materials and methods

This study was undertaken in the District of Évora, located in the South of Portugal. This District has a temperate climate, with both Mediterranean and Continental characteristics. The summers tend to be hot and dry, with the winters

typically wet and cold. During the spring and autumn the temperatures are warm but big thermal amplitudes can be registered. The samples tested in this study were collected between the months of December 2007 and July 2008. Since *Giardia* protozoans thrive most readily with cooler temperatures and above-average moisture, this study encompasses the months in which the climate is most favorable to the survival of the *Giardia* protozoans in the environment.

Faecal samples of 131 dogs and 21 cats residing within the District of Évora were obtained. For that purpose, cooperation was requested from three veterinary hospitals, two animal shelters and several individual owners. There were no exclusion factors during sample collection. The animals were then divided into two main groups according to their origin: one including the animals with owners and the other one including the animals from the shelters (originally stray animals). By the end of the period established for the duration of this study, of all the tested animals, 82 dogs and 19 cats had owners, while 49 dogs and 2 cats were shelter animals. Every animal which tested positive was reported to the respective owner(s)/shelter.

The processing method used to detect *Giardia* using a simple optical microscope was the Faust Method (Faust et ál., 1938). This method was chosen since it is of simple execution, has been proven to be one of the best methods for *Giardia* microscopic detection (e.g. Chaves et ál., 1979), and does not require many specialized materials. It is also one of the flotation methods most utilized by veterinary clinics and hospitals equipped with in-house parasitology laboratories. The stool samples were collected during three consecutive days and the animals considered positive had at least 1 sub-sample positive (when at least one structure morphologically compatible with a *Giardia* cyst was observed). There were no exclusion factors during the sample collection.

## Results and discussion

Pet ownership has been associated with both emotional and physical health benefits. However, owning pets may also pose health risks, especially to immunocompromised patients, through zoonotic transmission of disease (Hemsworth and Pizer, 2006).

The *Giardia* test results point out a frequency of infection of nearly 25% in the sampled dogs: 30 out of 49 shelter dogs were infected (61.2%) while only 4 out of 82 owned dogs carried this protozoan (4.9%). Both shelter cats were *Giardia*-positive while none of the cats with owners showed the presence of the parasite. Unfortunately, the number of cats in this sample is far too small to extrapolate these results to the District's cat population. Still, these results point out a significant difference between groups, which means that adopting an animal from these shelters represents an increased risk for infection with *Giardia*. It might be wise to advise people who adopt these animals to get them tested or preventively treated before allowing them close contact with other animals or people.

The lack of previous studies in Portugal, and the fact that those undertaken in other countries have used molecular methods and immunofluorescence microscopy as the main tools for *Giardia* detection, make it difficult to compare the values determined by this study with any others.

Surveys of a variety of canine populations for the presence of *Giardia* reported a prevalence of approximately 10% in well cared for dogs, 36-50% in pups, and up to 100% in breeding establishments and kennels (Hahn *et ál.*, 1988; Kirkpatrick, 1988). These data, though not recent, are not dissimilar to the data determined by this study, although animals less than 2 years of age did not show the largest frequency of infection amount the age classes (17.1%).

Younger animals, and animals living in overcrowded and stressful environments such as animal shelters, because of their immune status, are reported to be more vulnerable to gastrointestinal problems when infected with *Giardia* (Baños *et ál.*, 2002). In this study, however, obvious clinical signs that might indicate the presence of *Giardia* in shelter animals were missing. While it is certainly true that most of these animals show a general health condition that is far from ideal, no obvious connection with the presence of parasites could be established. As for the age factor, this study supports the previous observations that younger animals tend to show clinical gastrointestinal signs more often than older ones, but many pups showed no clinical evidence of infection.

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