

THE PREVALENCE OF GIARDIOSIS IN ANIMALS AND HUMANS IN IASI COUNTY WITH THE ESTABLISHMENT OF ZONOTIC RISK

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Abstract

The study on the prevalence of *Giardia sp.* in bovines was performed by analysing the cases recorded at Dancu Research Station, the results showing that this is a protozoan, commonly found in bovine farms, being one of the main causes of diarrhoea in calves. The source of contamination with *Giardia sp.* is represented by drinking water, breast milk and environment. In the period 2017-2020, the cases of giardiasis diagnosed in pets at the Faculty of Veterinary Medicine were analysed; a coinfection was found in dogs in a proportion of 64% with yeast cells, 22% with *Cryptosporidium sp.*, 6% with *Isospora sp.* and only in 3% of cases *Giardia sp.* has been reported as the only pathogen involved in the clinical picture. The study on the prevalence of *Giardia sp.* in humans during 2017-2020 was performed using data provided by the Praxis Laboratory. The conclusions demonstrate the presence of a high rate of giardiasis in pets (dogs, cats), in farm animals (bovine), and in humans, each representing a source of contamination of the environment and of the other categories. The results showed for both humans and animals that drinking water can be a major source of infection with *Giardia sp.*, requiring the much more frequent and rigorous control of drinking water.

Keywords: giardiasis, opportunistic parasite, coinfection

Introduction

Giardia intestinalis, also called *Giardia lamblia* and *Giardia duodenalis*, is one of the most common intestinal parasites in the world, occurring in both industrialised and developing countries, with approximately 2.8 million new cases reported annually. Giardiasis is a widespread protozoon worldwide, with the parasitic reservoir consisting of a large number of healthy carriers. It is a parasitosis found in humans and animals, although the genotype adapted to each species is quite distinct. The clinical features of acute giardiasis in humans are similar to cryptosporidiosis and include severe diarrhoea, abdominal cramps, nausea, and weight loss. These symptoms may persist for several weeks or progress to a chronic disease. The infection can be asymptomatic or subclinical. Giardiasis in cattle, goats and sheep can cause malabsorption of nutrients, which may lead to weight loss. Microscopic examination of stool samples remains the basis of diagnosis for these parasites, although molecular methods and immunological tests can effectively replace microscopic approaches.

In 2017, 19,437 cases of confirmed giardiasis were reported in the EU/EEA. The EU/EEA notification rate was 5.5 cases per 100,000 inhabitants. The highest number of confirmed cases was reported in the United Kingdom, followed by Germany. These two countries accounted for 44% of all confirmed cases of giardiasis in the EU/EEA. Most of reported cases of giardiasis (60.1%) had been taken from the domestic market, except for three Northern countries (Iceland, Norway and Sweden), where 71% -83% of cases were associated with travel. Although the EU/EEA notification rate was stable over the period 2013-2017, the annual number of cases constantly increased. Giardiasis is the most commonly reported of the five parasitic diseases with possible contamination in food and water under mandatory EU surveillance. Giardiasis surveillance covers the entire population of most EU/EEA countries. However, a review in 19 Eastern European countries

showed discrepancies between the notification rates provided in the study and the rates officially reported in TESSy, suggesting under-reporting in all Eastern Europe. A quarter of EU Member States do not have surveillance systems for giardiasis and do not report cases. Giardiasis is common in dogs and cats in Europe and the United States, affecting animals of all ages, with a higher prevalence in young animals from weaning to 2 years of age. According to several epidemiological studies, it can be found in about 10% of faecal examinations in carnivores which have diarrhoea and are taken to the vet for examination. Epidemiological studies performed on the dogs used for breeding indicate that the parasite is present in almost 100% of cases, and that the prevalence of infection in dogs is up to 50%. These figures are identical or slightly higher than in helminth infections, making *G. duodenalis* one of the most common intestinal parasites in domestic carnivores. Giardiasis is particularly relevant in cattle, where infections associated with severe symptoms are commonly seen in young animals. Among the sources of zoonotic infection, cows are considered a major contributor, because the species and genotypes found in humans have also been isolated from cattle. In general, the infectious stages of *Giardia sp.* are excreted in the faeces of infected hosts and are able to infect susceptible hosts after ingestion. Humans can get the infection directly from contact with infected people (anthroponotic transmission), or animals (zoonotic transmission), or indirectly from contaminated food or water sources.

Material and method

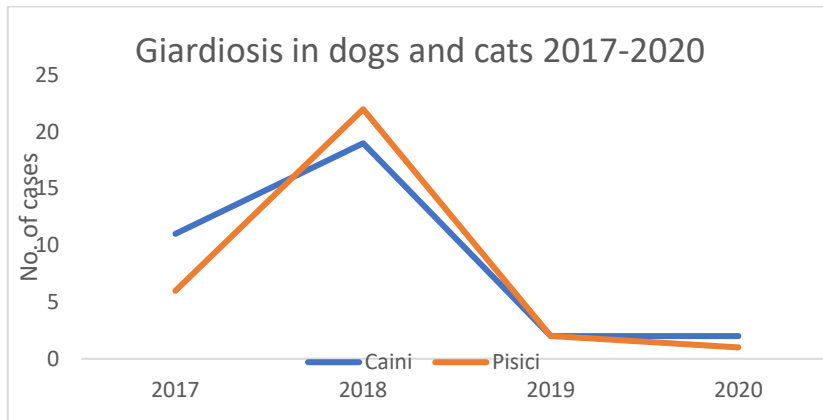
For the diagnosis of giardiasis, we used a direct microscopic examination with Lügol solution, the method of enrichment with saturated sugar solution, and quick test for the detection of Giardia Kit Antigen. The protozoan *Giardia duodenalis* can occur in two forms: trophozoite (vegetative form) and cyst. The vegetative form is found exceptionally only in watery stools, in the acute stage of the disease, especially in young women. The trophozoite is pear-shaped, 15 µm long/6-10 µm wide. It has a body with bilateral symmetry with 2 nuclei, 4 pairs of blepharoplasts and 4 pairs of flagella, an adhesive disc and an axostyle. The cyst is oval and is 9-13 µm long/6µm wide. It has a thin, double outer membrane, 4 nuclei, and a bundle of flagella. The nuclei have a variable arrangement, often grouped at one end of the cell. In the axis of the cyst, we can see S-shaped flagellated remains, with sinuous disposition. In the native preparation made in Lugol solution, the cysts are obvious, brown-coloured.

The samples were analysed in the Paraclinical Laboratory of Parasitology, within the Faculty of Veterinary Medicine, and they were obtained from cattle, dogs and cats. Faecal samples were collected from the patients who came to the clinic for a diagnosis, with an expressed clinical picture, and we could work on fresh samples. The data analysis was performed for the period 2017-2020. We collected samples from cattle from the Research and Development Centre for cattle breeding in Dancu; they were identified with a unique code, and kept in vacuum bags, and we processed them in stages. In order to establish the prevalence of the protozoan *Giardia sp.*, the samples were collected only from animals with a digestive clinical picture - soft stool to profuse diarrhoea. The samples were collected only from calves with diarrheal syndrome, because adults can be asymptomatic carriers, in which case no treatment is recommended. The samples were collected over a period of 3 months.

In addition, we did an analysis of the prevalence of giardiasis in humans, the data being provided by Praxis Medical Test Laboratory in Iași, for the period 2017-2020.

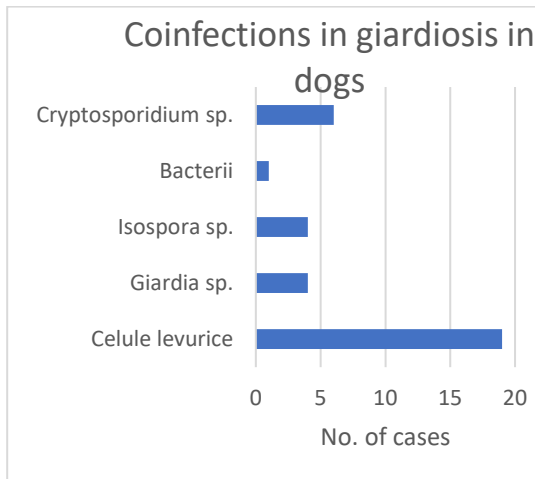
Results and discussions

The results obtained in the Paraclinical Laboratory of Parasitology within the Faculty of Veterinary Medicine

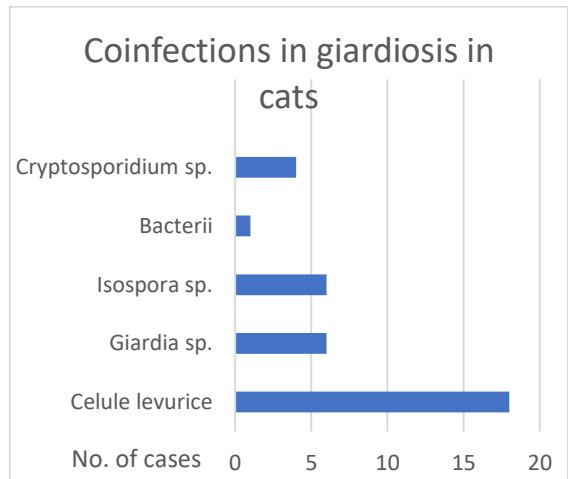


Graph 1. Giardiosis in dogs and cats 2017-2020

In the period 2017-2020, at the Faculty of Veterinary Medicine, 48 cases were recorded in pets, of which 25 cases in dogs and 23 cases in cats. In 2019, most cases of giardiosis were diagnosed, 15 in dogs and 8 in cats. Giardiosis is a protozoosis underdiagnosed in both veterinary medicine and human medicine, due to the sensitivity in making a correct diagnosis. The quick antigen detection test is expensive to use in every clinical case suspected of parasitosis, given the non-specific clinical picture. The diagnosed cases were due to the lack of a preliminary diagnosis, or due to the ineffectiveness of the treatment established subsequently. Many *Giardia sp.* infestations were treated without a definite diagnosis.



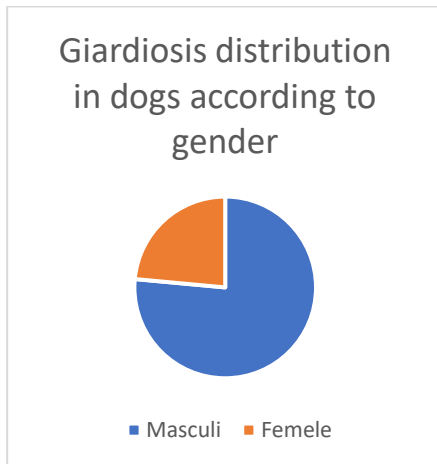
Graph 2 Coinfection in giardiosis in dogs



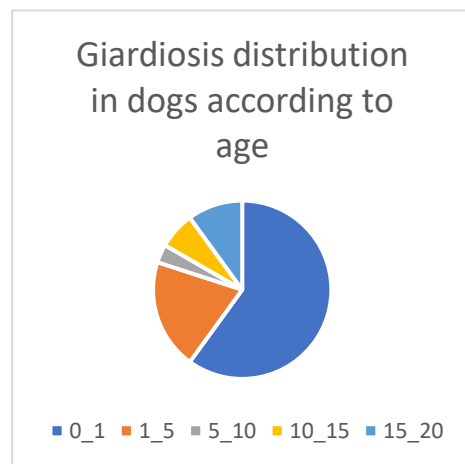
Graph 3 Coinfection in giardiosis in cats

In the cases diagnosed at the Faculty of Veterinary Medicine, a coinfection was found in dogs in a proportion of 65% with yeast cells, 22% with *Cryptosporidium sp.*, 8% with *Isospora sp.* and only in 5% of the cases *Giardia sp.* was reported as the only pathogen involved in the clinical picture (graph 2).

In cats, a coinfection was reported in a proportion of 62% with yeast cells, 32% in coinfection with *Cryptosporidium sp.*, 9% with *Isospora sp.* and 14% in **Giardia sp.** was found to be the only pathogen responsible for the clinical picture expressed (Graph 3).

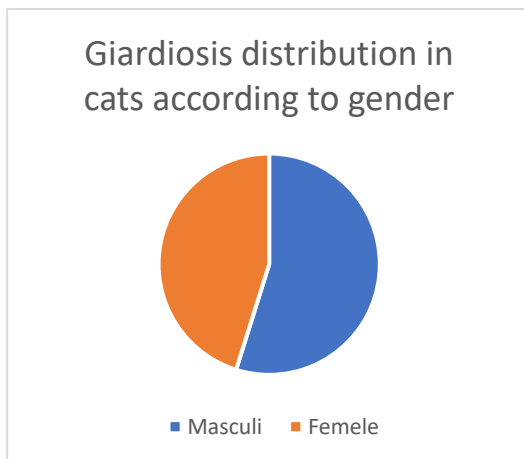


Graph 4 Giardiosis according to gender

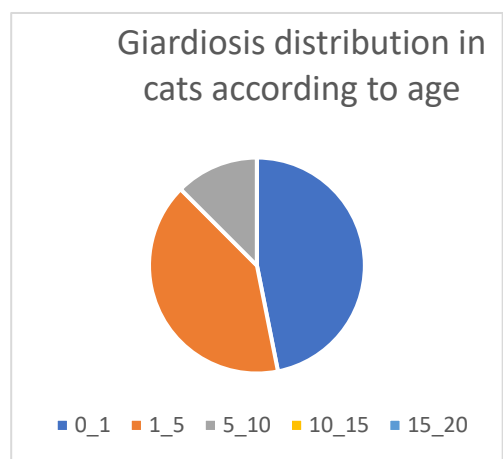


Graph 5 Giardiosis in dogs according to age

Of the total number of cases, 74% of cases were diagnosed in males and only 22% of cases were diagnosed in females. Taking into account that most cases were recorded in young dogs aged up to one year, uncastrated, we cannot blame the hormonal status, which can be a cause of lower immunity (graph 4). Of the total number of cases, 50% were recorded in young animals aged up to 1 year, 12% in the age category of 10-15 years, and 14% in the age category of 15-20 years, and only 7% in the age category of 1-5 years. The data correspond to those recorded in the literature, where giardiasis appears as a disease of the youth, with developing immune system (graph 5).



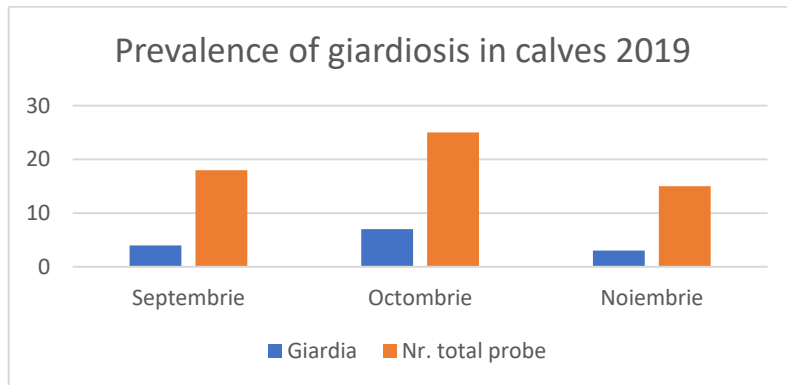
Graph 6. Giardiosis cats according to gender



Graph 7. Giardiosis in cats according to age

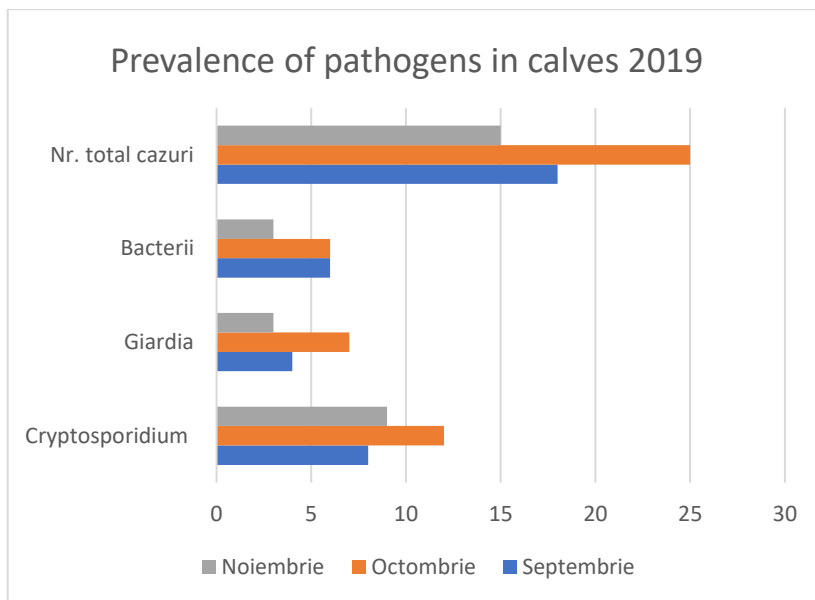
The distribution according to gender of the cases of giardiosis in cats, in contrast to the situation reported in dogs, is balanced by 55% of cases recorded in males and 45% of cases recorded in females (Graph 6). In cats, out of a total of 32 cases, 49% were diagnosed in cats aged 0-12 months, 41% in cats aged 1-5 years, and 13% in cats aged 5 to 10 years (Graph 7).

Scientific results: Cattle Research and Development Center in Dancu



Graph 8. Prevalence of giardiasis in calves 2019

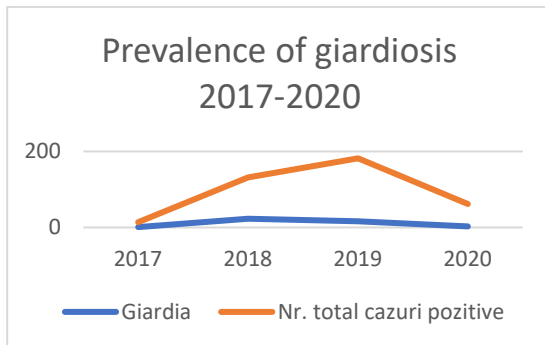
The samples were collected over a period of three months: 18 samples in September, 26 samples in October and 14 samples in November. From the total samples collected, *Giardia sp.* had a prevalence of 23% in the samples collected in September, 27% in October and 20% in November (graph 8).



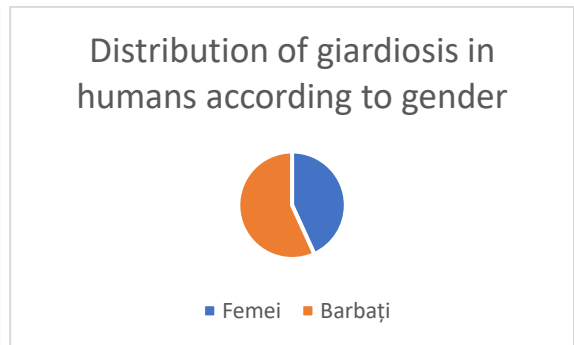
Graph 9. Prevalence of pathogens in calves 2019

Of the total number of samples collected in September, a prevalence of 43% of *Cryptosporidium sp.* Cysts was observed, 23% of *Giardia sp.* cysts, and 33% of bacteria, pathogens causing diarrheal syndrome in calves up to the weaning period. In October the prevalence was 47% for *Cryptosporidium sp.*, 29% for *Giardia sp.*, and 24% for bacteria (*Clostridium*, *Camphylobacter*, *Salmonella*). In November, the prevalence was 61% for *Cryptosporidium sp.*, 19% for *Giardia sp.*, and 20% for bacteria (graph 9).

Results of the research conducted at Praxis Test Laboratory



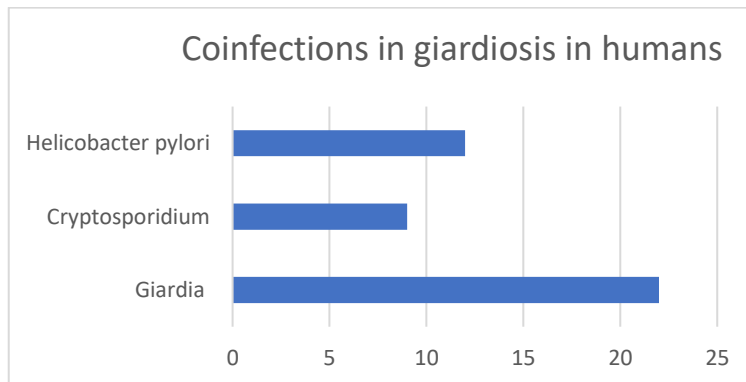
Graph 10 Prevalence of giardiosis 2017-2020



Graph 11 Distribution of giardiosis according to gender

In the period 2017-2020, 11.002 coproprarasitological examinations were performed at Praxis laboratory, of which only 391 were positive. Of the total positive cases, 12% are represented by infection with *Giardia sp.*, and the remaining 88% are as follows: *Chilomastix mesnili*, *Iodamoeba buetschlii*, *Entamoeba hartmani*, *Entamoeba coli*, *Endolimax nana*, *Blastocystis hominis*, *Ascaris lumbricoides*, *Enterobius vermicularis*, *Cryptosporidium sp* (graph 10).

Regarding the distribution of giardiasis according to gender, it is balanced with 59% of cases in men, and 41% in women (graph 11).



Graph 12 Coinfection in giardiasis in humans

In 52% of cases, *Giardia sp.* was diagnosed as the only cause in the appearance of the clinical picture., which shows that it is an opportunistic parasite, but whose pathogenicity can produce a digestive picture. In 27% of cases, *Giardia sp.* was diagnosed in coinfection with *Cryptosporidium sp.*, and in 27% of cases in coinfection with *Helicobacter pylori*, which by local action modifies local biochemistry.

Conclusions

1. The research was conducted at the Faculty of Veterinary Medicine in Iași, Dancu Cattle Research and Development Center, and Praxis Test Laboratory in Iași for human medical tests, in order to establish the zoonotic risk of giardiasis and the main source of contamination with cysts of *Giardia sp.*

2. The results show that giardiasis is an underdiagnosed protozoosis in both veterinary medicine and human medicine, due to the sensitivity in making a correct diagnosis. The quick antigen detection test is expensive to use in every clinical case suspected of parasitosis, given the non-specific clinical picture. The diagnosed cases were due to the lack of a preliminary diagnosis, or due to the ineffectiveness of the treatment subsequently established. Many *Giardia sp.* infestations have been treated without a prior definite diagnosis.

3. The results obtained at Dancu Farm show that giardiasis is a protozoosis, commonly found in cattle farms, being one of the main causes of diarrhea in calves. The sources of contamination with *Giardia sp.* are represented by drinking water, cow milk and the environment. Taking into account the early age of the calves from which samples were taken, milk is the main source of cyst contamination, which means that the number of asymptomatic carrier adult cows is high within the farm.

4. The conclusions demonstrate the presence of a high rate of giardiasis in pets (dogs, cats), in farm animals (cattle), and in humans; each representing a source of contamination of the environment, as well as of the other categories.

5. Thus giardiasis is an opportunistic parasite, which we can contract from the environment, food or drinking water, the cysts of *Giardia sp.*, being resistant to common decontamination methods.

6. The results showed for both humans and animals that water can be a major source of *Giardia sp.* infection, imposing the more frequent rigorous control of drinking water (in Romania water testing does not involve checking for the presence of *Giardia sp.* and *Cryptosporidium sp.* protozoa).

7. Cow milk is an important source of contamination with *Giardia sp.*, emphasising the importance of heat treatment before consumption.

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