

Occurrence of zoonotic *Giardia* spp. in dog faeces from an urban park in Košice

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Abstract

Giardia is a zoonotic parasite posing a health risk to both animals and humans. This study monitored the occurrence of *Giardia* spp. cysts in dog faeces collected in an urban park in Košice between November 2025 and April 2026. Out of 98 faecal samples examined, 5 tested positive, yielding a prevalence of 5.1%. All positive samples originated from anonymous dogs, indicating inadequate faecal removal and associated risk of environmental contamination. These findings underscore the need for systematic surveillance and education promoting responsible behaviour among dog owners in public urban spaces.

Keywords: giardia duodenalis; zoonosis; urban park; dog faeces; prevalence; Slovakia

1 Introduction

Urban parks and dog-walking areas represent environments with a high concentration of dogs, which may serve as sources of various infectious pathogens. Inadequate removal of dog faeces leads to environmental contamination, thereby increasing the risk of parasite transmission between animals and to humans. Dog faeces may harbour a range of pathogens, including the unicellular *Giardia*, which causes giardiasis in its hosts.

Giardia is a zoonotic parasite that colonises the small intestine of its host. Its cysts are transmitted primarily via the faecal-oral route (i.e. cysts shed in faeces are accidentally ingested by another host, most often through contaminated water, food, or surfaces). Following ingestion, the parasite establishes infection in the host, where it reproduces by longitudinal binary fission and subsequently forms cysts that are shed into the environment. In urban settings, particularly in parks, favourable conditions thus arise for the circulation of the parasite among dogs.

The occurrence of *Giardia* is not systematically monitored by veterinary authorities, and available data derive predominantly from clinical examinations conducted by veterinary practitioners or from scientific studies tracking the prevalence of this parasite. In Slovakia, several studies have been carried out examining the occurrence of giardiasis in humans and dogs, particularly in animal shelters; however, data on the prevalence of *Giardia* in urban parks remain scarce.

For the reasons outlined above, it is important to pay attention to monitoring the occurrence of *Giardia* in urban environments. The aim of this study was to analyse the

prevalence of *Giardia* spp. in dog faeces in an urban park in Košice and to highlight the potential risks associated with its circulation in the environment. This study therefore addresses the following research question: how common are *Giardia* spp. cysts in dog faeces collected from one urban park in Košice, and what does their occurrence indicate about environmental contamination in the park?

2 Literature review

The genus *Giardia* belongs to the unicellular protozoan parasites colonising the digestive tract of a wide range of hosts, including humans and domestic animals. The most significant species is *Giardia duodenalis* (syn. *G. intestinalis*, *G. lamblia*). This parasite occurs in two morphological forms — as an active trophozoite in the small intestine of the host and as a resilient environmental cyst, which constitutes the infective stage responsible for transmission between hosts (Mojžišová et al., 2012).

Cysts are formed within the host organism during the process of encystation, in which two trophozoites each develop two rigid walls, producing cysts measuring $8\text{--}14 \times 6\text{--}10 \mu\text{m}$. They are subsequently shed into the external environment via faeces, with excretion occurring irregularly. Infection with *Giardia* occurs via the faecal-oral route, primarily through contaminated water, food, and faeces. Cysts can survive for extended periods under favourable conditions, particularly in cool and moist environments, while remaining susceptible to desiccation (Mojžišová et al., 2012).

From an epidemiological standpoint, *Giardia* is a globally distributed parasite infecting a broad spectrum of mammals. Studies report a mean prevalence of giardiasis in animals of approximately 13.6% (Hatam-Nahavandi et al., 2025). A significant aspect is the zoonotic potential of *Giardia duodenalis*, which represents a species complex with considerable genetic variability, comprising assemblages designated A–H (genetically distinct subtypes of the parasite that differ in which hosts they typically infect), whereby assemblages A and B are associated with human infections and are regarded as zoonotic (Pipiková et al., 2020).

2.1 International Occurrence and the Impact of the Urban Environment

Several studies highlight the significant role of the urban environment in the spread of *Giardia* spp. A 2025 Polish study analysed 1,937 dog faecal samples, with *Giardia duodenalis* confirmed in 219 dogs (11.3%) (Jańczak et al., 2025).

The importance of urban parks as sources of infective parasite stages is further supported by a study from Belgrade, which analysed 106 samples of soil, sand, and dog faeces collected from public parks. Parasitic contamination of soil was detected in 31.67% of samples, with *Giardia intestinalis* also identified in dog faeces at a prevalence of 2.78%. The results additionally indicated uniform contamination throughout the parks and underscored the role of dogs as the primary source of environmental pollution (Bogunović et al., 2022).

Similar conclusions were drawn by Smith et al. (2015) in Calgary, Canada, where *Giardia* spp. infection was confirmed in 7.4% of dogs. The findings revealed a higher prevalence among individuals frequenting urban parks and a lower prevalence among dogs kept on a leash, highlighting the importance of animal behaviour in the transmission of infection.

A large-scale European study (Drake et al., 2022) involving 2,469 dogs from 12 countries (Austria, Denmark, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland, and the United Kingdom) confirmed the presence of *Giardia* in 17.3%

of dogs (428 individuals). *Giardia* spp. was detected in all countries under surveillance. Samples were collected from public spaces in urban areas, specifically from parks and other locations designated for dog walking and exercise.

2.2 The Situation in Slovakia

The occurrence of *Giardia* in Slovakia has been examined in several studies. Szabová et al. (2007) recorded a prevalence of 2.0% (5 positive out of 250 examined samples) in the Košice region, as part of a large-scale study encompassing 752 samples from 8 cities across Slovakia. Subsequently, Jarošová and Antolová (2020) identified a *Giardia* prevalence of 1.5% (2 positive samples) in an analysis of 135 dogs from four Slovak regions, with positive cases originating exclusively from animal shelters.

In contrast, studies focused specifically on shelters in the Košice region demonstrated markedly higher prevalences of *Giardia duodenalis*, ranging from 33.3% to 69.1% (Goldová et al., 2011; Štrkolcová et al., 2014), confirming the significance of high-density animal housing environments on a relatively small geographic scale.

In early 2026, an elevated occurrence of giardiasis in dogs was recorded in Bratislava, with veterinary practices reporting a high number of cases and new infections presenting daily (STVR, 2026).

2.3 Public Health and the Importance of Surveillance

From a public health perspective, it is noteworthy that urban parks and public spaces constitute high-risk environments for the transmission of faecally-associated parasites. Studies conducted in European cities confirm that *Giardia* spp. ranks among the most frequently detected parasites in such settings (Drake et al., 2022).

According to information provided by the State Veterinary and Food Administration of the Slovak Republic (2026), giardiasis is not subject to systematic surveillance, with monitoring depending primarily on data reported by private veterinary practitioners.

Given the reasons outlined above, it is important to conduct local epidemiological studies that would allow for a more precise understanding of the extent of environmental contamination and identification of risk factors associated with the spread of infection. Such data may serve as a basis for preventive measures and for raising awareness of hygiene in urban environments.

3 Methodology

Dog faecal samples were collected from an urban park in Košice between 3 November 2025 and 7 April 2026, with the aim of detecting the presence of *Giardia* spp. cysts.

Samples were collected at weekly intervals from public areas of the park, either directly from known dog owners or by gathering anonymous samples found in the environment (e.g. in grass, along pathways, near benches or trees). Collection largely followed the same route through the park, focused on the area with the highest occurrence of both faeces and dogs being walked. Selection of anonymous samples was random, based on where faeces were encountered in the environment; the only exception were samples collected directly from known dog owners walking their dogs in the park. No attempt was made to avoid repeated sampling from the same dog among the anonymous samples, as the identity of the dog and its owner could not be determined in these cases. Each sample was placed into a polyethylene bag, labelled with an identification number, and subsequently stored at 3°C until laboratory processing. Sample data were recorded in an Excel

spreadsheet together with the date of collection and the sample identification number. In the case of known individuals, additional data were recorded, including the dog's breed, age, and the date of the most recent anthelmintic treatment, where applicable.

Laboratory examination of the samples was carried out at the University of Veterinary Medicine and Pharmacy in Košice, at the Department of Epizootology, Parasitology and Protection of One Health. Appropriate personal protective equipment was used when handling biological material, including a laboratory coat and nitrile gloves.

Sample diagnosis was performed using a qualitative concentration method employing a 33% zinc sulphate flotation solution (a technique in which a dense salt solution causes the lighter parasite cysts to float to the surface of the sample, separating them from heavier faecal debris and making them easier to detect under the microscope), enabling the detection of *Giardia* spp. cysts, which were identified by light microscopy using an Olympus CX23 microscope at 20× magnification (Letková et al., 2010). Assemblage-level characterisation has not yet been performed.

4 Results and Discussion

4.1 Results

A total of 98 samples were examined during the study, of which 80 were anonymous and 18 were obtained from known owners. The presence of *Giardia* spp. cysts was confirmed in 5 samples, representing a prevalence of 5.1%. All positive samples originated from anonymous collections. The highest number of positive samples was recorded in December (2 cases), as shown in Table 1.

Table 1.
Occurrence of *Giardia* spp. cysts in samples across months

	All tested samples	Positive samples	Prevalence (%)
November	16	0	0.0
December	13	2	15.4
January	14	0	0.0
February	24	1	4.2
March	20	1	5.0
April	11	1	9.1
Total	98	5	5.1

The data indicate that positive samples occurred only in certain months.

4.2 Discussion

The recorded prevalence of *Giardia* spp. of 5.1% confirms the presence of this parasite in the monitored urban environment. This result is consistent with published data from comparable studies, with differences between individual studies potentially attributable to methodological and environmental factors.

Compared to the Polish study, which reported a prevalence of 11.3% (Jańczak et al., 2025), the value obtained in the present study is lower. This discrepancy may be attributed primarily to the considerably smaller number of samples analysed, as well as differences in

dog population density, environmental conditions, and the degree of compliance with hygiene measures. A further contributing factor is that the Polish study was conducted at a national level, whereas the present study is local in scope. Conversely, the results are more closely aligned with those of the Belgrade study, in which *Giardia intestinalis* was detected at a prevalence of 2.78% (Bogunović et al., 2022), reflecting the variability of occurrence in urban environments. A broader European perspective is provided by Drake et al. (2022), who recorded a mean prevalence of *Giardia* spp. in dogs of 17.3% across 12 European countries (428 positive individuals out of 2,469), highlighting the wide geographical distribution of this parasite across Europe.

In comparison with published Slovak studies, the prevalence identified in the present study is higher than those previously reported, which ranged from 1.5% to 2.0% (Szabová et al., 2007; Jarošová & Antolová, 2020). This difference may indicate either temporal changes in parasite occurrence or reflect the specific characteristics of the study environment, given that urban parks represent settings with a high concentration of dogs and potential environmental contamination (Drake et al., 2022). By contrast, the markedly higher values recorded in shelters (33.3–69.1%) highlight the role of population density and hygienic conditions in the spread of giardiasis (Goldová et al., 2011; Štrkolcová et al., 2014).

The higher occurrence of positive samples during winter months is consistent with the biological properties of *Giardia* cysts, which demonstrate greater stability in cool and moist environments (Mojžišová et al., 2012). However, given the relatively low number of positive samples, this trend cannot be statistically confirmed.

The fact that all positive samples originated from anonymous collections may indicate the significance of environmental contamination and inadequate removal of dog faeces. Nevertheless, this conclusion should be interpreted with caution, as the anonymous nature of the samples precludes the identification of individual animals or the exclusion of repeated sampling from the same dog.

Interpretation of the results is further limited by the diagnostic method employed. The flotation method has lower sensitivity compared to PCR, meaning that some samples may have gone undetected. Furthermore, single-point examination of samples does not account for the intermittent cyst shedding that is characteristic of *Giardia* (i.e. infected dogs do not release cysts in their faeces every day, so a single sample taken on one occasion can be negative even in a truly infected animal) (Mojžišová et al., 2012).

From an environmental and public health perspective, the findings indicate the presence of a potential source of infection in a public space. Given the zoonotic potential of certain assemblages of *Giardia duodenalis* (Pipíková et al., 2020), environmental contamination poses a theoretical risk to humans as well, particularly in the absence of adequate hygiene practices. Based on the data obtained, however, the precise magnitude of this risk cannot be determined. Because assemblage-level identification was not performed in this study, the results cannot establish whether the detected cysts belong to the zoonotic assemblages A or B; the findings should therefore be read as evidence of environmental contamination and a potential — not a confirmed — zoonotic transmission risk.

As the study was conducted in a single location, the results cannot be generalised to a broader geographic area. Future studies should encompass a greater number of sites, more systematic sample collection, and the use of more sensitive diagnostic methods, such as PCR, which also enable the identification of genetic assemblages and more accurate assessment of zoonotic potential.

5 Conclusion

The results of this study confirmed the presence of *Giardia* spp. in dog faeces collected in the monitored urban park in Košice, with a prevalence of 5.1%, indicating environmental contamination of a public space. The recorded value is comparable to data from other studies; however, given the methodological limitations — particularly the nature of sample collection and the diagnostic method employed — the results should be interpreted as an indicative estimate of occurrence. From an environmental and public health perspective, the findings point to a potential, but not confirmed, zoonotic risk and clearly underscore the importance of adherence to hygiene measures. Further research encompassing a greater number of sites and more sensitive diagnostic methods is required for a more accurate assessment of the epidemiology of *Giardia* in urban environments.

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