

Article

<https://doi.org/10.61900/SPJVS.2023.04.06>**THE PREVALENCE OF INTESTINAL PARASITES IN DOGS FROM SHELTERS
IN CONSTANȚA COUNTY-ROMANIA****Andrada Hermina RUSU¹, Larisa IVĂNESCU¹, Gabriela MARTINESCU¹,
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Abstract

This study was designed to evaluate the prevalence of gastrointestinal parasites in shelter dogs from Constanța, a south-eastern county from Romania. In order to assess, in 2022 and 2023, individual and pooled fecal samples, were collected from 611 dogs from 9 shelters. Fecal samples were examined using standard flotation and sedimentation methods. The overall prevalence of gastrointestinal parasites was 74.63%. Eggs of hookworms (*Ancylostoma* sp. and *Uncinaria* sp.) were the most frequently detected (55.97%), followed by *Cystoisospora* sp. (31.91%), *Trichuris vulpis* (27.33%), *Toxocara canis* (21.27%), *Capillaria* sp. (2.78%) and *Toxascaris leonina* (1.96%). Cases of single infestation were found in 217 (35.51%) of the tested dogs. Mixed infestations with two or more species of parasites were observed in 239 samples, representing 39.11% of the total samples analyzed. These results will be useful for establishing health care programs in dog shelters and for implementing effective strategies in controlling the intestinal parasites, in order to restrain the spread of zoonotic parasites and to raise awareness of their impact on public health.

Key words: shelter dogs, gastrointestinal parasites, prevalence

Animal shelters play an important role in human and animal health, therefore veterinary monitoring of livestock can prevent possible epidemiological outbreaks.

Given the fact that Romania ranks 6th in Europe for the total amount of dogs according to “Statista”, which in relation to the number of inhabitants, places us in the lead with a number of more than 200 dogs per thousand inhabitants, further studies on the epidemiology of parasitic diseases in stray animals are urgently needed. Although Romanian law requires local authorities to have a service for managing stray dogs and through it, community dogs to be collected from the public domain and placed in specialized shelters, where, if they are not adopted within 14 days, they should be euthanized, in Constanța county euthanasia is not an option, and the captured dogs are identified, dewormed, vaccinated, sterilized and ready for adoption. Because in Constanța county there are only four public shelters, and the number of the stray dogs is increasing, a lot of improvised shelters appeared, in order to protect the stray dogs and to give them a proper life, but even if they are well-intended,

these shelters do more harm than good to public health, ignoring the general methods of prevention in veterinary medicine.

Given that in recent years the number of adoption applications has been decreasing, most shelters are overcrowded, and the animals face various stressors (Tuber *et al.*, 1999). All these factors are leading to parasitic contamination of the environment and the easy spread of parasitic infections, which further lead to an increased risk of zoonotic diseases in the human population and a strong impact on public health.

Because shelter dogs live in close cohabitation and poor hygienic conditions, the parasitism may pose a serious problem (Tamara *et al.*, 2021). A contaminated environment is conducive to parasite transmission in dogs, and the major pathogens that cause illness in shelter dogs are those transmitted by ingestion of parasites in different stages of development. (Ortuno *et al.*, 2011).

The occurrence of gastrointestinal parasites is variable and depends on many factors, such as age, living conditions, health status of the animal, diagnostic techniques used, and region studied

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(Táparo *et al.*, 2006; Mircean *et al.*, 2017; Lara-Reyes *et al.*, 2021).

MATERIAL AND METHOD

Constanța is a county located in the south-east of Romania, being bordered to the east by the Black Sea, to the west by the Lower Danube and to the north by Tulcea County. It has a surface area of 7.104 km² and a total population of 573,331 inhabitants.

The climate of Constanța is continental, and the influences of the Black Sea are felt in the cold season, the temperatures remaining above the freezing point during the warm season, the climate being affected by the sea breeze. The average annual temperature varies between 9.9 °C and 11.7°C. Multiannual average precipitation varies from 261 mm at Sulina station to 488 mm at Cernavoda (Maftai *et al.*, 2008).

The study was conducted between 2022 and 2023, in nine dog shelters, of which three were public, two private and four were improvised shelters, located in Constanța County. The public shelters were in Constanța city, (n=271), Hârșova city (n=47) and in Năvodari city (n=20). The private shelters were one in Cernavodă city (n=50) and one in Techirghiol city (n=42), and the improvised shelters were in Ovidiu city (n=49), and the other three in Nicolae Bălcescu village (n=33), Runcu village (n=72) and Peninsula village (n=27). The four improvised shelters are isolated, situated on the outskirts or outside the villages. Two of the

shelters have all the animals kept together, free, without having limited access, another has all the dogs kept in bunk cages in a garage. The last improvised shelter, from Runcu, has 2/3 of the dogs kept in closed pens without light, gathered two or three together in a pen and 1/3 of the dogs are kept free in the yard.

In order to carry out our research, individual and pooled fecal samples, were collected from 611 dogs from 9 shelters situated in Constanța County during the study period.

The samples were collected from dogs which had spent 2 months or more in the facility.

Fecal specimens were placed in screw-topped containers with uniquely labeled identification number and date of collection. Data on sex, age, status, were also recorded.

Fecal samples were processed by direct smear for detection of motile trophozoites or cysts of protozoa, flotation technique, using saturated sodium chloride for extraction of lighter helminth eggs and coccidian oocysts or sporocysts and sedimentation technique for recovering heavier helminth eggs.

RESULTS AND DISCUSSIONS

The results showed that more than half of the dogs (456/611) were infected with at least one species of gastrointestinal parasites, and the overall prevalence of GI parasites was 74.63 %.

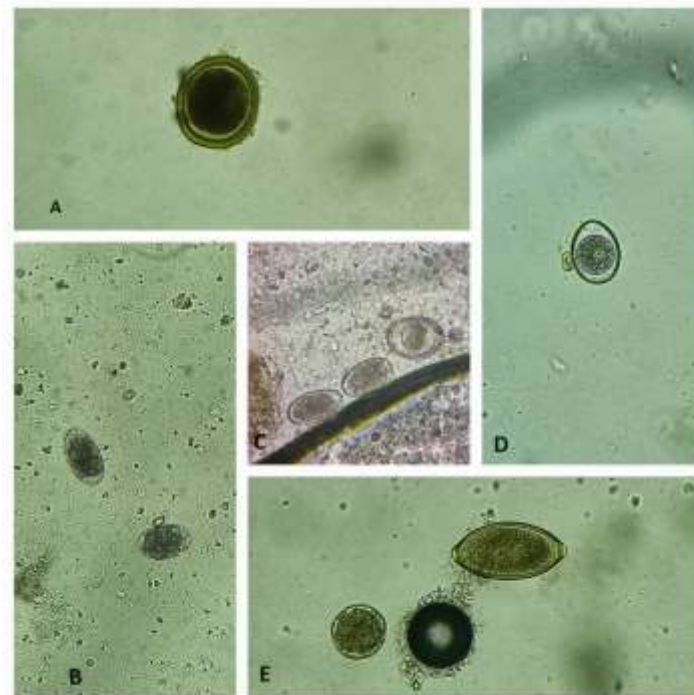


Figure 1. Eggs, cysts and oocysts of intestinal parasites, in fecal samples from stray dogs from Constanța County. (A) Egg of *Toxocara* spp., (B) Egg of *Ancylostoma* spp., (C) Egg of *Toxascaris leonina*, (D) Oocyst of *Cystoisospora* spp., (E) Egg of *Trichuris vulpis*

Numerous studies have had similar results, indicating a parasite presence of 67.1% (Ursache *et al.*, 2016) and 66.6% (Mircean *et al.*, 2017) in dogs in Romania, 81.4% in Palestine in stray dogs and 48.4% in pets (Othman *et al.*, 2021), 75.4% in Serbia (Sommer *et al.*, 2017) and 58.3% (Ilic *et al.*, 2021), 63.5% (148/233) in northern Spain (Regidor-Cerrillo *et al.*, 2020), between 48.1% and 64.9% in Croatia (Brezak *et al.*, 2017) and 32.2% also in Croatia (Faraguna *et al.*, 2023), 64.5% in Bulgaria (Iliev *et al.*, 2020), 54.05% in dogs from Romania (Soran *et al.*, 2020), 37.2% in Mexico (Reyes *et al.*, 2021), 26 % in Greece (Papazahariadou *et al.*, 2007), 30.4 % in Turkey

(Senlik *et al.*, 2006) and 40.7 % in Albania (Shukullari *et al.*, 2015).

Ancylostoma sp./Uncinaria sp. eggs were the most frequently observed in feces samples (55.97 %), followed by *Cystoisospora sp.* (31.91%), *T. vulpis* (27.33 %), *Toxocara canis* (21.27 %), *Capillaria sp.* (2.78%), *Toxascaris leonina* (1.96%) and *Demodex* (0.49%) (Table 1).

Even though it is not the subject of this study, following the examination of fecal samples, the adult mite *Demodex canis* was also identified.

Table 1

| Parasite species | Number of parasite species in infected dogs/shelter type | | | | | | | | | | | Total Prevalence |
|----------------------------------|--|-----------------|------------------|--|-------------------------|---------------------|-----------------------------|----------------|---------------|-------------------|--|------------------|
| | Public shelter n=338 | | | | Private shelter n=92 | | Improvised shelter n=181 | | | | | |
| | Constanța n=271 | Hârșova n=47 | Năvodari n=20 | Total prevalence Public shelters n=338 | Cernavodă n=50 | Techirghiol n=42 | Nicolae Bălcescu n=72 | Ovidiu n=49 | Runcu n=72 | Peninsula n=27 | Total prevalence Improvised shelters n=181 | |
| <i>Ancylostoma/Uncinaria sp.</i> | 121 | 47 | 20 | 55.62% | 0 | 0 | 33 | 49 | 72 | 0 | 85.08% | 55.97% |
| <i>Trichuris vulpis</i> | 18 | 47 | 5 | 20.72% | 0 | 0 | 33 | 49 | 15 | 0 | 53.59% | 27.33% |
| <i>Toxocara canis</i> | 42 | 47 | 5 | 27.81% | 0 | 0 | 0 | 0 | 36 | 0 | 19.89% | 21.27% |
| <i>Isospora canis</i> | 115 | 47 | 0 | 47.92% | 0 | 0 | 33 | 0 | 0 | 0 | 18.23% | 31.91% |
| <i>Toxascaris leonina</i> | 0 | 0 | 0 | 0% | 0 | 0 | 0 | 0 | 12 | 0 | 6.63% | 1.96% |
| <i>Capillaria sp.</i> | 0 | 17 | 0 | 5.02% | 0 | 0 | 0 | 0 | 0 | 0 | 0% | 2.78% |
| <i>Demodex</i> | 0 | 3 | 0 | 0.88% | 0 | 0 | 0 | 0 | 0 | 0 | 0% | 0.49% |

The prevalence of parasitic elements

In our study, *Ancylostoma/Uncinaria* is the most common enteric pathogen, being found in the stool samples of 55.97% of the studied dogs. A similar result was also obtained in Bulgaria, 54.1% (Iliev *et al.*, 2020), 29.53% in Brazil (Souza *et al.*, 2023), 8.00% in Palestine (Othman *et al.*, 2021), and in Romania 33% (Mircean *et al.*, 2017) and 10.4% (Ursache *et al.*, 2016).

The prevalence obtained for *Trichuris vulpis* is 27.33%, a result comparable to other studies carried out in Romania, 25% (Mircean *et al.*, 2017), 20% (Ursache *et al.*, 2016), in Bulgaria 15.1% (Iliev *et al.*, 2020) and respectively 10.42%

(Iliev *et al.*, 2017) and 7.7% in Serbia (Ilic *et al.*, 2021).

In the case of protozoa, their prevalence was 31.75%, being entirely represented by *Isospora canis*, while other studies from Romania showed a positivity of 11.9% for protozoa, of which 8.57% was for *Isospora canis* (Soran *et al.*, 2020), or 16.1% (Ursache *et al.*, 2016). In Serbia the prevalence is 8% (Ilic *et al.*, 2021) and 4.1% in Bulgaria (Iliev *et al.*, 2020).

The prevalence we found for *Toxocara canis* (21.27%), is lower compared to Palestine, 46.0% (Othman *et al.*, 2021) or other studies from Romania, in dogs with owners where it is 34.8% (Ursache *et al.*, 2016), but higher than in Bulgaria, where a prevalence of 6.4% was recorded (Iliev *et al.*, 2020) or in Brazil, where the prevalence is 7.52% (Souza *et al.*, 2023) and Serbia where it is 18.5% (Ilic *et al.*, 2021).

Following a study using published data from 26 European countries over the past 25 years,

the average European prevalence for *Toxocara canis* was 14.6% in dogs (Overgaauw *et al.*, 2020).

Cases of single infestation were found in 217 (35.51 %) of the sampled dogs.

Mixed infestations with two or more parasite species were observed in 239 samples, representing 39.11% of the total analyzed samples (figure 2).

The most frequently detected co-infestations were with *T. vulpis*/*Cystoisospora* sp./*Ancylostoma* sp. (10.31%) and *T. vulpis* /*Ancylostoma* (8.83 %) (Table 2) .

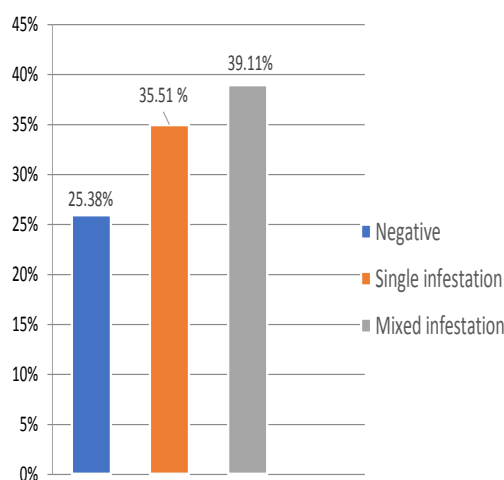


Figure 2 The prevalence of single and mixed infestation in sampled dogs

Table 2

| Cases of mixed infestations (n=611) | |
|--|--------------|
| Coinfestation | Positive (%) |
| <i>T. canis</i> + <i>Ancylostoma/Uncinaria</i> sp. | 14 (2.29) |
| <i>T. vulpis</i> + <i>Ancylostoma/Uncinaria</i> sp. | 54 (8.83) |
| <i>T. canis</i> + <i>Cystoisospora</i> sp. | 24 (3.92) |
| <i>Cystoisospora</i> spp.+ <i>Ancylostoma/Uncinaria</i> sp. | 22(3.6) |
| <i>T. vulpis</i> + <i>Ancylostoma/Uncinaria</i> sp.+ <i>Cystoisospora</i> sp. | 33 (5.4) |
| <i>T. vulpis</i> + <i>T. canis</i> + <i>Cystoisospora</i> sp. | 18 (2.94) |
| <i>T. canis</i> + <i>Ancylostoma/Uncinaria</i> sp + <i>Toxascaris leonina</i> | 12 (1.96) |
| <i>T. canis</i> + <i>Ancylostoma/Uncinaria</i> sp + <i>T. vulpis</i> | 15 (2.45) |
| <i>T. canis</i> + <i>Ancylostoma/Uncinaria</i> sp. + <i>Cystoisospora</i> sp+ <i>T. vulpis</i> | 30 (4.90) |
| <i>T. canis</i> + <i>Ancylostoma/Uncinaria</i> sp. + <i>Cystoisospora</i> sp. + <i>Capillaria</i> sp.+ <i>T. vulpis</i> + <i>Demodex</i> | 3 (0.49) |
| <i>T. canis</i> + <i>Ancylostoma/Uncinaria</i> sp. + <i>Cystoisospora</i> sp. + <i>Capillaria</i> sp.+ <i>T. vulpis</i> | 14 (2.29) |

After examining the samples taken from the 4 improvised shelters, we found that in the case

of two shelters, where the dogs were kept free in a fenced area, the results of the copro-parasitological

examinations were identical for all the canine population present in the shelters, and the

identified parasitic elements were common in the entire dog population (*Table 3*).

Table 3

The prevalence of parasitic elements in improvised shelters

| Parasite species | OVIDIU SHELTER | | N.BĂLCESCU SHELTER | | RUNCU SHELTER | | PENINSULA SHELTER | | Total Prevalence n=181 |
|------------------------------|------------------------------------|------|------------------------------------|------|------------------------------------|--------|------------------------------------|----|---------------------------|
| | Positive samples/collected samples | P% | Positive samples/collected samples | P% | Positive samples/collected samples | P% | Positive samples/collected samples | P% | |
| <i>Ancylostoma/Uncinaria</i> | 49/49 | 100% | 33/33 | 100% | 72/72 | 100% | 0/27 | 0% | 85.08% |
| <i>Trichuris vulpis</i> | 49/49 | 100% | 33/33 | 100% | 15/72 | 20.83% | 0/27 | 0% | 53.59% |
| <i>Isospora canis</i> | 0/49 | 0% | 33/33 | 100% | 0/72 | 0% | 0/27 | 0% | 18.23% |
| <i>Toxocara canis</i> | 0/49 | 0% | 0/33 | 0% | 36/72 | 50% | 0/27 | 0% | 19.88% |
| <i>Toxascaris leonina</i> | 0/49 | 0% | 0/33 | 0% | 12/72 | 16.66% | 0/27 | 0% | 6.62% |

Analyzing the table content, we can see a very high prevalence, of 85.08%, for *Ancylostoma/Uncinaria* sp., followed by *T. vulpis* (53.59%), *Toxocara canis* (19.88%), *Isospora canis* (18.23%) and *Toxascaris leonina* (6.62%), which denotes the fact that these improvised shelters represent a great danger to public health with a serious impact on the population.

Within the study, an evaluation of the protozoa prevalence in the public shelter from Constanta was also carried out, regarding the type of shelter flooring.

Despite the few published data, the floor covering of shelters is known as a factor of parasitic infection in animal shelters.

In our study, the type of shelter flooring was found to be relevant for the epidemiology of species, particularly for protozoan infections. A higher prevalence of protozoa infestation was found in dogs kept without concrete floor and drainage (56%), compared with the dogs that were kept on concrete floor 35% (*Table 4*).

A similar result was obtained in Romania (Soran *et al*, 2020), a higher prevalence for protozoa infestation being found in dogs kept without concrete (6.56%), compared to the dogs kept in shelters with concrete floor (4.76%).

Table 4

The prevalence of protozoa related to the type of flooring in Constanța Public Shelter

| Parasite species | MDF Flooring | | Concrete floor | |
|-----------------------|--------------|-------|----------------|-------|
| <i>Isospora canis</i> | 51/91 | (56%) | 63/180 | (35%) |

No significant differences were found in prevalence of different parasite species in males and females, results being in agreement with other studies. Additionally, other factors such as season may impact the appearance and frequency of cysts in the stool.

CONCLUSIONS

The results of this study show a high prevalence of digestive parasitic diseases in stray shelter dogs from Constanța County, underlining the need to establish proper monitoring and control

programs for parasitic elements through a rigorous shelter sanitation and correctly applied deworming.

Stray dogs represent a permanent reservoir of pathogens that are directly transmitted in nature through feces. That is why studies on the prevalence of digestive parasites are essential and must be carried out in a sustained manner.

The epidemiological investigation of the main digestive parasitosis found in stray shelter dogs in Constanța County represents an essential and complex approach in establishing the risks involved in parasitic zoonoses.

The high prevalence for intestinal parasitic co-infections in dogs reported here, creates real concerns and exponentially increases the degree of infestation among people. Therefore, in order to prevent possible zoonotic outbreaks, deworming must be done more often and more responsibly.

A big red flag are the improvised shelters, which are not regulated by law and play an important link in the zoonotic chain. The results obtained are high enough to worry us and to make us take measures to limit the spread of parasitic diseases.

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