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Endoparasites in household and shelter dogs from Central Italy

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ABSTRACT

Intestinal and respiratory parasites are among the most common pathogens in dogs and some of them are recognized as zoonotic agents. In Italy, various taxa have been reported, with variable prevalence estimates depending on study area, dog category and coprological exam technique. In this paper, we report the results of six years of passive surveillance. In the period January 2006–December 2012, 2,775 dog faecal samples from Lazio Region (Central Italy), were examined for parasites, 1,156 from household and 1,619 from shelter dogs, respectively. The following parasites were detected: *Giardia duodenalis*, *Cystoisospora* sp., Ancylostomatidae, *Toxocara canis*, *Toxascaris leonina*, *Trichuris vulpis*, *Eucoleus böhmi*, *Eucoleus aerophilus*, *Mesocestoides* sp., Taeniidae and *Dipylidium caninum*. Helminths were more frequent than protozoa, with total prevalences of 29.1% and 10.7%, respectively. *T. vulpis* and Ancylostomatidae were the most common parasites, with prevalences of 9.9% and 9.6% respectively. *T. vulpis* and Ancylostomatidae were significantly more prevalent in shelter dogs than in household ones. *T. canis* and *Cystoisospora* sp. were significantly more frequent in household dogs.

The assessment of the prevalence in sheltered and in household dogs is useful to infer the occurrence of different parasites in the origin population and to plan possible control intervention.

1. Introduction

The most common parasites in canine population are intestinal protozoa and helminths and respiratory nematodes. These parasites are worldwide studied because of their zoonotic potential as well as for their clinical relevance in dogs [1–11]. In Italy, various taxa have been reported, with variable prevalence estimates depending on study area, dog category (household, shelter, hunting, farm, stray) and coprological technique. The most frequent parasites recorded are: *Toxocara canis*, Ancylostomatidae, *Trichuris vulpis* and *Giardia duodenalis*, with prevalence ranging from 2% to 34%, 2% to 12%, 3% to 29% and 4% to 26%, respectively [11–18]. Higher prevalences for most of the direct-life-cycle parasites are usually reported in shelter dogs than in household ones, as a result of high animal density which may cause high environmental faecalization and a possible immunosuppression stress-induced.

In this context, a survey was carried out on dog faeces, from household and sheltered dogs, from Lazio Region – Central Italy. The aim of the present study was to provide an insight into the most common endoparasites presence and distribution, providing veterinarians useful knowledge for parasite prevention and control.

2. Materials and methods

We report the results of a passive surveillance study, performed on dog faecal samples sent to the Istituto Zooprofilattico Sperimentale del Lazio e della Toscana "M. Aleandri" of Rome for parasitological examination in the period January 2006 – December 2012. Stool samples were submitted by official or private veterinarians for routine controls and to investigate the causes of gastro-enteric or respiratory disorders. Replicate samples from the same dog were excluded from the data set. The first submitted sample for each dog was used. Dogs originated from shelter (SD) and from private owners (HD). Dogs defined as SD originated from shelters for stray dogs and from kennels of Police.

The basic set of diagnostic tests were the wet mount Lugol's iodine staining and the flotation in sugar-sodium nitrate solution (density 1300) [18]. One wet mount and one flotation slide were observed for each faecal sample. Identification of parasite cysts, oocysts and eggs was performed by morphological observation at 100×–400× magnifications.

Data are expressed as frequencies and percentages (%). Differences of prevalence between household and shelter dogs were calculated by the test of proportion. When Chi-square test was significant, Odds Ratio

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Table 1
Prevalence (%) of endoparasites in shelter (SD) and household (HD) dogs from Lazio Region, Central Italy.

| Parasite | Prevalence (%) | | | χ^2 P value | OR* (95% CI) |
|----------------------------|----------------|----------------|---------------------|---------------------|------------------|
| | SD N = 1619 | HD N = 1156 | Overall N = 2775 | | |
| <i>Trichuris vulpis</i> | 13.6 | 4.8 | 9.9 | < 0.0001 | 3.15 (2.32–4.27) |
| Ancylostomatidae | 12.4 | 5.8 | 9.6 | < 0.0001 | 2.29 (1.72–3.06) |
| <i>Giardia duodenalis</i> | 6.4 | 7.8 | 7.0 | 0.166 | |
| <i>Toxocara canis</i> | 5.0 | 9.3 | 6.8 | < 0.0001 | 0.51 (0.38–0.69) |
| <i>Cystoisospora</i> sp. | 2.7 | 5.3 | 3.7 | < 0.0001 | 0.49 (0.33–0.73) |
| <i>Eucoleus böhmii</i> | 2.9 | 0.1 | 1.7 | < 0.0001 | 0.03 (0.01–0.21) |
| <i>Toxascaris leonina</i> | 0.2 | 0.5 | 0.4 | 0.238 | |
| <i>Eucoleus aerophilus</i> | 0.4 | 0.5 | 0.4 | 0.557 | |
| <i>Mesocestoides</i> sp. | 0.0 | 0.3 | 0.1 | 0.072 | |
| Taeniidae | 0.0 | 0.3 | 0.1 | 0.072 | |
| <i>Dipylidium caninum</i> | 0.1 | 0.1 | 0.1 | 1 | |
| Any parasite | 35.3 | 28.4 | 32.4 | < 0.0001 | 1.38 (1.17–1.62) |

* OR (Odds Ratio): (baseline = “household”).

(OR) and 95% confidence interval were calculated for shelter versus household. A P value < 0.05 (two-tailed) was considered statistically significant. All performed analyses were elaborated by Stata v.12 (StataCorp LP, Texas, USA).

3. Results

A total of 2775 dog faecal samples were examined, 1156 from HD and 1619 from SD. Overall, the 32.4% of dogs were positive for at least one parasite. SD dogs (35.3%) were significantly more infected than HD ones (28.4%) (Table 1). Among positive dogs, in 79.4% one parasite species was detected, in 17.7% two parasite species were detected and 3.0% resulted affected by three to five parasite taxa (Fig. 1).

The following taxa were recorded: *Giardia duodenalis*, *Cystoisospora* sp., Ancylostomatidae, *Toxocara canis*, *Toxascaris leonina*, *Trichuris vulpis*, *Eucoleus böhmii*, *Eucoleus aerophilus*, *Mesocestoides* sp., Taeniidae and *Dipylidium caninum*. The most common parasites found were characterized by direct life cycles. Helminths were more frequent than protozoa (total prevalence: 29.1% and 10.7%, respectively). *T. vulpis* (30 HD, 146 SD) and Ancylostomatidae (47 HD, 131 SD) were the most common taxa recorded, exceeding both an overall prevalence of 9%. The most frequent associations between parasites were: Ancylostomatidae and *T. vulpis* (8 HD, 39 SD), *G. duodenalis* and *Cystoisospora* sp. (13 HD, 7 SD), *G. duodenalis* and *T. canis* (7 HD, 8 SD).

Protozoan infections were significantly more frequent in HD (13.1%) than in SD (9.1%), while metazoan infections were more frequent (P < 0.001) in SD (34.5%) than in HD (21.6%).

Dogs kept in shelters resulted more at risk for overall parasitosis (OR = 1.38) and in particular for *T. vulpis* (OR = 3.15) and Ancylostomatidae (OR = 2.29). To be kept in a shelter was found as a protective factor for *T. canis* (OR = 0.51) and *Cystoisospora* sp (OR = 0.49).

4. Discussion

In Italy, recent studies revealed overall prevalences of parasites in dogs ranging from 31% to 57% [14–16]. Overall result of the present study (32.4%) was consistent with these results. Regarding the identification of the parasites, Ancylostomatidae, *T. vulpis*, *T. canis*, *Cystoisospora* sp. and *G. duodenalis* are often reported as the most frequent, in Italy [13–17] and in other countries [2,3,10,19]. In this study, the two most prevalent parasites, *T. vulpis* and Ancylostomatidae, were also those more frequently found in association, a finding already reported by Mateus et al. [8]. This association can be explained by the same living environment of the immature stages of the two parasites, particularly in confined environment as shelters. The overall prevalence recorded in HD (28.4%) was higher than expected, but similar to what reported by Riggio et al. [14]. The relevance of this result arises from

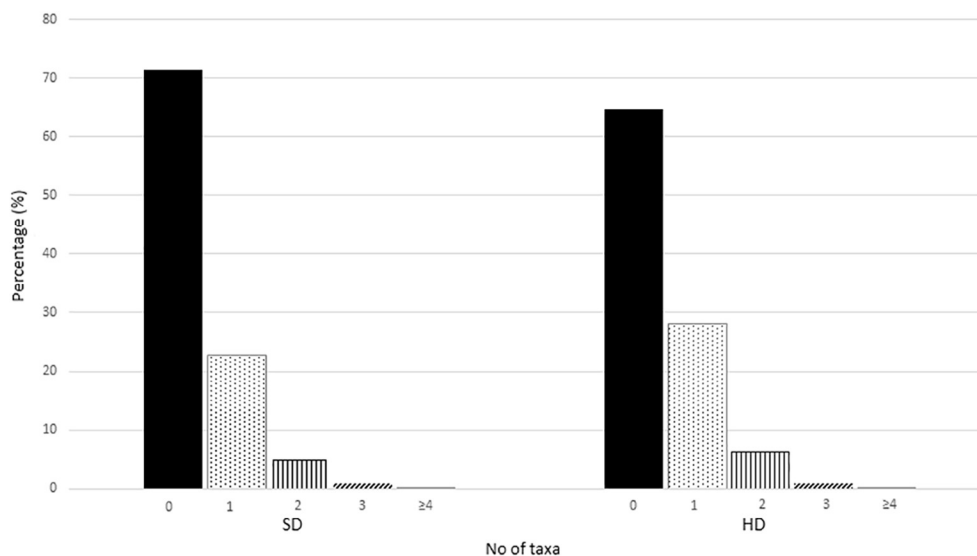


Fig. 1. Relative frequencies (%) of shelter (SD) and household (HD) dogs with the number of parasite taxa.

the origin of the HD stool samples, mainly from the metropolitan area of Rome. The relative high prevalence in HD can be due to the minor sensitivity of some of the taxa detected to the most common anti-parasitic drugs used (*T. vulpis*; *G. duodenalis*). Nevertheless, SD showed significantly higher values of overall prevalence for some of the taxa recorded as expected [2,13,16]. In this population, the wild environment where stray dogs lived when captured, can explain the origin of infection. Indeed, animals from shelters may have been more exposed to infection due to the immunosuppressive effects of stress and because of the contact with other animals [17]. It is also possible that sheltered animals are controlled and treated less frequently than those living with a family [11].

Regarding *T. canis*, the prevalence was reported higher in HD or SD, depending on the study [4,13,16,20]. Our finding – a higher prevalence in HD – could be a consequence of a frequent practice to analyse for parasites puppies (often naturally infected by ascarids) after their arrival in a family and before any antihelminthic treatment. The young age is a recognized risk factor for toxocarosis [10].

In the present study, *G. duodenalis* was the third most frequent parasite, with similar prevalence in HD and SD. This protozoan was the most prevalent dog parasite in three previous studies from Italy [13,15,16], with a prevalence reaching 26%. Indeed, the prevalence in the present study can be considered underestimated for the low sensitivity of the wet mount Lugol's iodine staining test. Probably for the same reason, we found a low prevalence for tapeworms, as in other studies [21,22]. This evidence discloses inadequate the common antihelminthic treatments that are performed as routine parasite control in community of dogs (shelter) and in dogs kept in families.

Among the most frequently recorded parasites, *G. duodenalis* and *T. canis* are considered of public health significance for their zoonotic potential [10,12,15,16]. Dogs can harbour both *G. duodenalis* species-specific assemblages (C–D) and zoonotic ones (A–B). Previous surveys on dogs originating from Rome Province reported a 23.5% [23] and a 30.7% [24] of infections caused by zoonotic assemblage A. Other studies in different Italian areas did not report any zoonotic assemblage [16,17]. Nevertheless, the public health hazard of dogs shedding *G. duodenalis* cysts should be evaluated, considering that repeated treatments are often needed to obtain its eradication from a confined animal population [25].

5. Conclusions

Since the composition of helminths and protozoan fauna in shelter and household dogs may differ, the knowledge of the different taxa that should be addressed by pharmacological treatment is essential. The presence of important zoonotic protozoa like *G. duodenalis* has to be considered in the choice of drugs to be used.

Competing interest

None.

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