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Intestinal and lung parasites in owned dogs and cats from central Italy

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ABSTRACT

Prevalence and risk factors of intestinal and lung parasites were investigated in 239 owned dogs and 81 owned cats from central Italy. In 36 dogs and 20 cats found infected by nematodes, pre and post-treatment faecal egg count (FEC) was also evaluated. About 31% of dogs and about 35% of cats resulted positive for at least one intestinal or lung parasitic species. Helminthic, intestinal and zoonotic infections resulted prevalent in examined animals. Examined dogs resulted infected by *Toxocara canis* (13.0%), *Toxascaris leonina* (1.7%), *Trichuris vulpis* (3.3%), *Ancylostoma caninum* (2.0%), *Uncinaria stenocephala* (1.25%), *Strongyloides stercoralis* (0.8%), *Angiostrongylus vasorum* (0.4%), *Dipylidium caninum* (1.25%), Taeniidae eggs (0.4%), *Giardia duodenalis* (3.8%), and *Cystoisospora* (*Isospora*) spp. (7.5%). Examined cats were infected by *Toxocara cati* (22.2%), *Capillaria aerophila* (1.2%), *Ancylostoma tubaeformae* (1.2%), *U. stenocephala* (3.7%), *Aelurostrongylus abstrusus* (1.2%), *Mesocestoides* sp. (1.2%), *D. caninum* (1.2%), *G. duodenalis* (1.2%) and *Cystoisospora* spp. (4.5%). The presence of clinical signs and the young age (less than 6 months) were identified as risk factors by univariate and multivariate statistical analysis. In 63.9% treated dogs and in 80.0% treated cats, percentages of post-treatment FEC reduction higher than 90% were found. Results obtained in this study are discussed.

1. Introduction

Intestinal and lung parasites are frequently recorded in dogs and cats and can be responsible for severe clinical forms. For these reason they are considered very important pathogens in the clinical practice of these companion animals (De Santis et al., 2006; Sager et al., 2006; Claerebout et al., 2009; Epe, 2009; Traversa et al., 2010). Moreover, intestinal and lung parasites of dogs and cats include zoonotic species raising public health concerns, such as *Toxocara* spp. and *Ancylostoma caninum* responsible respectively for human visceral and cutaneous larva migrans or *Capillaria aerophila* occasionally reported as a cause of human pulmonary capillariosis (Sager et al., 2006; Sommerfelt et al., 2006; Claerebout et al., 2009; Lee et al., 2010; Traversa et al., 2010). Appropriate de-worming strategies based on the active monitoring of parasite distributions and the identification of specific risk factors, are considered fundamental to reduce the risk of infection in dogs and cats and to prevent human infections (Robben et al., 2004; Capelli et al., 2006; De Santis et al., 2006; Sager et al., 2006; Martìnez-Carrasco et al., 2007; Claerebout et al., 2009; http://www.esccap.org). However, despite the use of the recommended frequency of anthelmintic treatments, high yearly incidences of some intestinal nematode species (*Toxocara canis*, hookworms and *Trichuris vulpis*) were recently observed in dogs (Sager et al., 2006; Claerebout et al., 2009) and the incomplete effectiveness of the treatment was included among supposed causes of these findings (Sager et al., 2006). Furthermore, the anthelmintic resistance of some nematode species affecting dogs, including that of *A. caninum* against pyrantel, has been recently reported (Kopp et al., 2007, 2008; Geary et al., 2011). Hence the importance to perform

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Table 1
Breed, sex and age of 239 owned dogs and 81 owned cats from central Italy examined for intestinal and lung parasitic infections.

	Males	Females	>6 months	≤6 months
Dogs				
Mixed breed	38	52	64	26
Pure breed	89	60	94	55
Total	127	112	158	81
Cats				
European shorthair	40	32	47	25
Persian	6	3	8	1
Total	46	35	55	26

parasitological studies aimed to check the success of the treatment of infected dogs and cats, especially in the case of zoonotic species. According to the European Specialist Counsel Companion Animal Parasites (ESCCAP), the faecal egg count reduction test (FECRT) can be used in dogs and cats to assess the effectiveness of the treatment against nematode infections and a reduction in faecal egg count of 90% or more would be expected with most effective anthelmintics (http://www.esccap.org).

In Italy, few recent studies deal with distribution and risk factors of canine and feline intestinal and lung parasites in owned animals (Capelli et al., 2006; Traversa et al., 2010; Zanzani et al., 2010). Thus, the main aims of the present investigation were to obtain data on prevalence of intestinal and lung parasitic infections in owned dogs and cats in this part of the country and to identify potential risk factors.

Furthermore, the faecal egg count reduction test (FECRT) was also performed on some nematode infected animals in order to evaluate the absence/reduction of nematode eggs after the anthelmintic treatment.

2. Materials and methods

2.1. Animals

Between January 2008 and July 2010, 239 owned dogs and 81 owned cats of different breed, sex and age and living in Pisa district (Tuscany, central Italy), were examined (Table 1). Animals were randomly selected among patients of private veterinary clinics and of a veterinary teaching hospital in the area. Among examined animals, 192 dogs and 72 cats were asymptomatic, while 47 dogs and 9 cats were symptomatic. Clinical signs included various degrees of diarrhoea, perianal pruritus, mucous stool, presence of blood in faeces and/or cough, wheezing, mucoid sputum, sneezing, dyspnoea and heart failure.

2.2. Parasitological analysis

From all examined animals, individual faecal samples (4–8 g each) were collected. Samples were macroscopically examined to detect the presence of proglottids, nematodes and/or fragments of parasites and then they were screened microscopically by flotation test (2 g of faeces) with a low density solution (s.g. 1.2), to evaluate the presence of worm eggs and/or protozoal (oo)cysts (Taylor et al., 2007). For the isolation of lungworm first stage larvae (L_1), the Baermann technique was used (Taylor et al., 2007). Although classified as a heartworm, for similarity of clinical manifestations and parasitological diagnosis (Traversa et al., 2010; http://www.esccap.org), *A. vasorum* was inserted in the lungworm group. Hookworm third stage larvae (L_3) obtained from faecal cultures were identified at the species level on the basis of their morphology (Levine, 1968). A commercial rapid immunoassay (RIDAQUICK® *Cryptosporidium*/*Giardia* Combi cassettes, R-Biopharm Italia srl) was used to detect *Giardia* and *Cryptosporidium* faecal antigens. Specific molecular assays for the genotyping of *Giardia* and *Cryptosporidium* were performed only on samples resulted positive to this test.

Table 2
Sex and age of 36 dogs and 20 cats infected by nematodes (hookworms, roundworms, whipworms and hairworms) and examined for the evaluation of pre and post-treatment faecal egg count (FEC).

	Sex	Age > 6 months	Age ≤ 6 months
Dogs	20 Males	10	10
	16 Females	5	11
Cats	11 Males	4	7
	9 Females	3	6

2.3. Genotyping of Giardia duodenalis

DNA was extracted directly from ELISA-positive faecal samples with the extraction kit QIAamp DNA Stool Mini Kit (QIAGEN Gmbh, Hilden, Germany). The amplification of the 432 bp region of the glutamate dehydrogenase gene (gdh) and the genotyping of *G. duodenalis* were performed according to the PCR-RFLP protocol published by Read et al. (2004).

2.4. Faecal egg count reduction test (FECRT)

The reduction of faecal egg count (FECR) after the treatment was evaluated according to the method reported by ESCCAP (http://www.esccap.org). In particular, two faecal samples (6–8 g) from 36 dogs and 20 cats of different sex and age (Table 2) infected by intestinal nematodes (hookworms, roundworms, whipworms, hairworms) were collected the day of the treatment (day 0) and 14 days after the treatment (day 14) and faecal egg count was performed on both samples by using a low density solution (s.g. 1.2) McMaster technique with a sensitivity of 50 EPG (Taylor et al., 2007). Mean values of three repetitions were calculated. According to their age, animals were never treated with anthelmintics before or they were not treated in the 5–12 months preceding the study.

Each animal was treated with a commercial anthelmintic formulation selected by the respective veterinary practitioner. Among selected drug formulations, on label and off label anthelmintic compounds were included. For each treated animal, the faecal egg count reduction percentage after the treatment was calculated with the formula $R = [(\text{mean epg PreT} - \text{mean epgPostT}/\text{mean epgPreT}) \times 100]$.

A percentage of reduction ≥90% was presumed to indicate the effectiveness of the treatment (http://www.esccap.org).