A five-year retrospective study on ascarid infections in dogs in southern Italy#

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Fünfjährige retrospektive Studie zu Askarideninfektionen bei Hunden in Süditalien

Um die epidemiologische Situation und die Risikofaktoren von Askarideninfektionen (*Toxocara canis* und *Toxascaris leonina*) bei Hunden in Süditalien abzuklären, wurde die vorliegende retrospektive 5-Jahres-Studie durchgeführt. Es wurden Proben von 8149 Hunden kopromikroskopisch mit der FLOTAC-Technik an unserem Labor untersucht. Zusätzlich wurden 500 Kotproben mit der Mini-FLOTAC-Technik analysiert.

Von den analysierten Hundekotproben waren 9,2 % (95 % KI = 8,6–9,8) positiv für *T. canis*, und 0,5 % (95 % KI = 0,4–0,7) positiv für *T. leonina*. Bei 0,1 % der Hunde (95 % KI = 0,0–0,1) wurde eine Koinfektionen mit *T. canis* und *T. leonina* festgestellt. Der Vergleich der Ergebnisse der FLOTAC- und Mini-FLOTAC-Untersuchungen zeigte eine nahezu perfekte k-Übereinstimmung (k= 0,99, $p < 0{,}001$). Bei Hunden, die im Freien gehalten wurden (z. B. im Garten oder Zwinger), wurde signifikant häufiger *T. canis* und *T. leonina* festgestellt (Chi-Quadrat-Test, $P < 0{,}001$). Zudem zeigte die logistische Regression, dass bei jüngere Tiere (Welpen) signifikant häufiger *T. canis* nachgewiesen wurde ($P < 0{,}001$). Die Gesamtprävalenz während der Beobachtungsjahre zeigte sowohl für *T. canis* als auch für *T. leonina*, dass, wie vom European Scientific Counsel Companion Animal Parasites vorgeschlagen, die regelmässige Diagnose zu einer effizienten Bekämpfung dieser Parasiten beitragen könnte.

Schlüsselwörter: Kontrolle, FLOTAC, Prävalenz, Risikofaktoren, *Toxocara canis, Toxascaris leonina*

Summary

A 5-year retrospective analysis of ascarid infections (*Toxocara canis* and *Toxascaris leonina*) in dogs from southern Italy was performed to update the epidemiological scenario of these parasites and to identify the risk factors which may favour these infections in animals in this study area. A total of 8,149 dogs, referred to our labs for copromicroscopic analysis using the FLOTAC technique, was considered. A sub-sample of 500 faecal samples were analysed also with the Mini-FLOTAC technique. Of the overall dog samples analysed, 9,2 % (95 % CI = 8,6–9,8) resulted positive for *T. canis* while 0,5 % (95 % CI = 0,4–0,7) resulted positive for *T. leonina*. Co-infections with *T. canis* and *T. leonina* were found in 0,1 % of dogs (95 % CI = 0,0–0,1). The results obtained by the FLOTAC and Mini-FLOTAC examinations showed a nearly perfect *k* agreement ($k = 0{,}99$, $P < 0{,}001$) between these two techniques.

Chi-square test showed positivity to *T. canis* and *T. leonina* significantly ($P < 0{,}001$) associated with dogs housed outdoor (i.e., that lived in garden or in kennel). Moreover, the positivity for *T. canis* was significantly associated ($P < 0{,}001$) also with age (i.e., puppies), as shown by the logistic regression. The decreasing overall prevalence both for *T. canis* and *T. leonina* during the years of monitoring, showed that, as suggested by the European Scientific Counsel Companion Animal Parasites, the regular diagnosis could contribute to an efficient control of these parasites.

Keywords: control, FLOTAC, prevalence, risk factors, *Toxocara canis, Toxascaris leonina*

Introduction

Ascarids (also known as «roundworms») are large (10–15 cm in length) nematodes of medical and veterinary significance commonly found in the intestine of vertebrate hosts. [23,24] Of these, two species may affect the small intestine of dogs, namely *Toxocara canis* and *Toxascaris leonina*, the most important and widespread dogs' parasites worldwide.[33] Besides their impact on the health and welfare of dogs, *T. canis* is also of zoonotic importance, causing human toxocariasis, an inner systemic illness syndrome complex which can be highly pathogenic.[8] Humans become infected following the accidental ingestion of embryonated *Toxocara* eggs from contaminated soil, unwashed hands and food.[7,17]

The ascarid life cycle is direct but can include paratenic hosts as a source of infection for definitive hosts.[25] Briefly, thick-shelled eggs are released in the environment by definitive hosts and L3s develop within 2–6 weeks under suitable environmental conditions (i.e., 28–33 °C).[24] After ingestion of larvated eggs, the L3s invade the intestinal wall and, for *T. canis* and to a lesser extent also *T. leonina*, migrate to the liver and lungs («hepato-pulmonary migration»), reach the trachea and are swallowed and develop to adult males and females within 21–29 days in the small intestine.[23] In addition, *T. canis* may be transmitted also through transplacental and transmammary routes due to the arrest of some larvae in somatic tissues,[32] which are then reactivate in the bitch during the last trimester of pregnancy when they are transmitted to the litter *in utero*.

Toxocara canis can cause serious disease in puppies with entailing respiratory signs, general failure to thrive and intestinal disorders,[6] whereas *Toxascaris* infection in adult dogs is usually well-tolerated,[10,15] but may cause pica, digestive disturbances and reduced growth in juveniles.[33]

From an epidemiological perspective, animal hosts parasitized by adult worms in their gut, can shed parasite eggs, hence being considered as a source for dissemination of the infection.[10] A thorough understanding of the epidemiology and risk factors associated with infection is required for defining effective strategies to control the infection in dogs also preventing the risk of human infection,[14,16,25] as recommended by the European Scientific Counsel Companion Animal Parasites (ESCCAP). According to ESCCAP guidelines, a regular coprological examination, at least one-two times a year for dogs that live indoor and four times a year for dogs that live outside or have contact with other animals or frequent places at risk (e.g., parks, sandpits, playgrounds, etc.), is a good alternative to standard deworming advice.[9] Moreover, a lifelong control strategy is suggested, because not only puppies are exposed to parasites, but the risk continues throughout the whole lifetime.[9] For this purpose, an accurate diagnosis is crucial for an appropriate treatment. Routine diagnosis of patent infections with ascarids is mostly carried out by egg identification in faeces using copromicroscopic techniques.[7] Furthermore, to differentiate the eggs of *T. canis* and *T. cati* that are not clearly distinguishable by microscopy,[36] a PCR targeting the second internal transcribed spacer (ITS-2) of ribosomal DNA (rDNA) was developed for species identification.[11, 13]

Epidemiological surveys on endoparasites prevalence in dogs have been conducted in many countries, the reported infection rates, however, depend on the country, the age of the animals, the lifestyle of the animals (e.g., stray, kennelled or owned dogs), and the faecal examination method used.[25] Recently, Rostami et al.[30,31] assessed the global prevalence of *T. canis*[31] and *T. leonina*[30] infections in dogs, resulting in an overall prevalence of 11,1 % and of 2,9 %, respectively. Similar prevalence values were reported in Europe with values of 10,8 % and 2,0 % for *T. canis* and *T. leonina*, respectively.[30,31] The same scenario was revealed during a nationwide survey in Italy on endoparasites of dogs showing a prevalence of 9,0 % of *T. canis* and 1,0 % of *T. leonina*, respectively.[2] A study conducted in the city of Naples (southern Italy) on canine faecal contamination revealed a prevalence of 0,7 % for *T. canis* and 1,4 % for *T. leonina* whereas high prevalence values for *T. canis* (14,8 %) were found in kennel dogs of the Campania region of southern Italy.[28,29]

A 5-year retrospective analysis of ascarid infections (*T. canis* and *T. leonina*) in dogs from southern Italy was performed to update the epidemiological scenario of these parasites and to identify the risk factors which may favour these infections in animals in this study area.

Materials and methods

Study design

A retrospective study was conducted reviewing the data from 5-year of routine diagnostic activity (2015–2020) performed at the Laboratories of Parasitology and Parasitic Diseases at the Department of Veterinary Medicine and Animal Production (PAR-UNINA), at the Centre of Monitoring of Parasitosis (CREMOPAR) and at the Veterinary Hospital of Naples «Frullone» (VH-Frullone), University of Naples Federico II, Italy. A total of 8,149 dogs from southern Italy, referred to our labs for routine copromicroscopic analysis, was considered. The most part of the dogs was apparently healthy (90 %), while in few cases showed abnormalities in faecal consistency or diarrhoea (10 %).

Copromicroscopic analysis

Each canine faecal sample was screened for intestinal parasites (helminths and protozoa) using the FLOTAC dual technique with sodium chloride (specific gravity, s.g. = 1,20) and zinc sulphate (s.g. = 1,20) as flotation solutions and a detection limit of 2 eggs/oocysts/cysts/larvae per gram (EPG/OPG/CPG/LPG) of faeces.[5] Furthermore, *at random*, a total of 500 faecal samples, positive and negative for ascarid eggs, were tested also with the Mini-FLOTAC technique,[4] using sodium chloride and a detection limit of 5 EPG to compare the performance of the two flotation-based techniques on the detection of these parasites.

Statistical analysis

Risk factors analysis and evaluation of prevalence per year

Dogs were classified into five age groups: puppies (less than 1 year); young (1–3 years); adult (4–6 years); old (7–10 years); and very old (> 10 years). Furthermore, the dogs belonged to 98 breeds were classified into three groups (small, medium and large) based on their breed size.

The prevalence and the 95% confidence intervals (95% CI) were calculated using the free online software «Sample Size Calculator» (Creative Research Systems, CA, USA).

The positivity for *Toxocara* and *Toxascaris* eggs were analysed in association with the variables (housing, sex, age and dog breed size) using the Chi-square test and Logistic Regression analysis. Moreover, the association of the factor «year of monitoring» with positivity was also evaluated.

The association was considered significant at $P < 0,05$. All statistical analyses were performed using the SPSS® software (version 22,0, IBM Corporation, Armonk, USA).

EPG evaluation

The arithmetic mean EPG, min and max values were calculated for each parasite. Differences between the EPG obtained for each parasite and the housing (indoor/outdoor) were analysed using one-way ANOVA and Kruskal–Wallis test, for both *T. canis* and *T. leonina*.

Table 1: Number of analysed dogs, positive dogs and 95% confidence of interval (95% CI) per year.

Year	Positive samples/total samples		Prevalence (%) (95% CI)	
	T. canis	*T. leonina*	*T. canis*	*T. leonina*
2015	116/957	10/957	12,1 (10,2–14,4)	1,0 (0,5–2,0)
2016	138/1170	9/1170	11,8 (10,0–13,8)	0,8 (0,4–1,5)
2017	142/1267	13/1267	11,2 (9,6–13,1)	1,0 (0,6–1,8)
2018	154/1467	6/1467	10,5 (9,0–12,2)	0,4 (0,2–0,9)
2019	112/1583	3/1583	7,1 (5,9–8,5)	0,2 (0,1–0,6)
2020	85/1705	3/1705	5,0 (4,0–6,2)	0,2 (0,1–0,6)

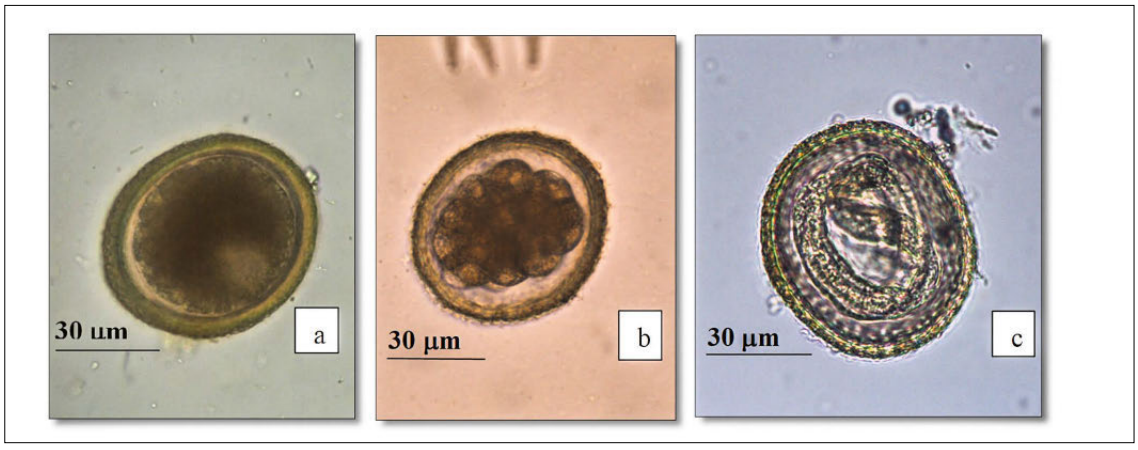

Figure 1a, b, c: Different morphotypes of *T. canis* eggs: a) freshly shed egg; b) embryonated egg; c) larvated egg (40x magnification).

Differences were considered significant at $P < 0,05$. All statistical analysis were performed using SPSS® software (version 22,0, IBM Corporation, Armonk, USA).

K-agreement

The Cohen's κ value was calculated to evaluate the agreement between the FLOTAC and the Mini-FLOTAC techniques in detecting ascarid eggs. The κ measure was interpreted as follows: 0, no agreement; 0,01–0,20, poor agreement; 0,21–0,40, fair agreement; 0,41–0,60, moderate agreement; 0,61–0,80, substantial agreement; and 0,81–1,0, nearly perfect agreement.[35] All statistical analyses were performed using the SPSS® software (version 22,0, IBM Corporation, Armonk, USA) and the significance level was set at $P < 0,05$.

Results

Of the 8,149 dog samples analysed, 9,2% (95% CI= 8,6–9,8) resulted positive for *T. canis* while 0,5% (95% CI= 0,4–0,7) resulted positive for *T. leonina*. Co-infections with *T. canis* and *T. leonina* were found in 0,1% of dogs (95% CI= 0,0–0,1). Furthermore, co-infections with other helminths and protozoa were found (data not shown). In addition, different morphotypes of *T. canis* eggs were found (freshly shed, embryonated, larvated) (Figure 1). The samples analysed per year and positivity was reported in Table 1. A statistically significant decreasing ($P < 0,001$) overall prevalence both for *T. canis* and *T. leonina* was registered during the years of monitoring.

Analysis of risk factors

A total of 4,618 dogs analysed were male, while 3,531 were female. Age of dogs ranged from 1 month to 23 years (median =16 months).

Statistical analyses showed positivity to *T. canis* and *T. leonina* significantly ($P < 0,001$) associated with dogs housed outdoor (i.e., that lived in garden or in kennel). Moreover, the positivity for *T. canis* was significantly associated ($P < 0,001$) with age (i.e., puppies) and breed size (i.e., medium).

Detailed results according to the different variables considered (housing, sex, age and dog breed size) are reported in Table 2.

The logistic regression identified a strong association between positivity to *T. canis* and the variables: «out-

Table 2: Number of dogs analysed, positive dogs, prevalence and 95% confidence of interval (95% CI) for each variable considered in statistical analyses for *T. canis* and *T. leonina* infection. Moreover, the P value for each variable is reported.

		T. canis		*T. leonina*	
	No. analysed	**Positive**	**% (95% CI)**	**Positive**	**% (95% CI)**
Housing					
Indoor	6,972	311	4,5 (4,0–5,0)	21	0,3 (0,2–0,5)
Outdoor	1,177	436	37,0 (34,3–39,9)	23	2,0 (1,3–3,0)
P value			P < 0,001		*P < 0,001*
Sex					
Male	4,618	429	9,3 (8,5–10,2)	26	0,6 (0,4–0,8)
Female	3,531	318	9,0 (8,1–10,0)	18	0,5 (0,3–0,8)
P value			*P*= 0,511		*P*= 0,972
Age					
Puppies (<12 months)	2,846	458	16,1 (14,8–17,5)	20	0,7 (0,4–1,1)
Young (1–3 years)	1,569	172	11,0 (9,5–12,6)	16	1,0 (0,6–1,7)
Adult (4–6 years)	2,676	65	2,4 (1,9–3,1)	6	0,2 (0,1–0,5)
Old (7–10 years)	683	38	5,6 (4,0–7,6)	2	0,3 (0,1–1,2)
Very old	375	14	3,7 (2,1–6,3)	0	0 (0,0–1,3)
P value			*P* < 0,001		*P*= 0,786
Dog breed size					
Small	1,713	42	2,5 (1,8–3,3)	4	0,2 (0,1–0,6)
Medium	4,593	618	13,5 (12,5–14–5)	34	0,7 (0,5–1,1)
Large	1,845	87	4,7 (3,8–5,8)	6	0,3 (0,1–0,7)
P value			*P* < 0,001		*P*= 0,394

door», «puppies», and «dog breed size medium and large». In contrast, the variable «old» was associated with a low *T. canis* prevalence. The Odds Ratios and related *P values* are reported in Table 3.

Regarding *T. leonina*, the logistic regression indicates only a strong association with outdoor housing (Odds Ratio = 6,60; *P* = 0,000).

EPG evaluation

Regarding EPG, the higher means were obtained for *T. canis* and *T. leonina* in outdoor dogs. All the results obtained are reported in Table 4 (min, max and mean EPG) for each parasite and each housing (i.e., outdoor and indoor).

The ANOVA test showed that the *T. canis* mean EPG of outdoor dogs was statistically different from the mean EPG revealed in indoor dogs ($P < 0{,}001$), while the Kruskal-Wallis test did not show any significant difference ($P > 0{,}05$) for *T. leonina* between medians of EPG in outdoor and indoor dogs.

The overall samples were classified in three EPG classes: 2–100, 101–500 and >500. Higher number of faecal samples analysed showed EPG from 2 to 100 for both *T. canis* (73,6; 95 % CI = 70,3–76,7) and *T. leonina* (80,0; 95 % CI= 64,3–89,7), as reported in Figure 2.

The overall mean EPG decreased both for *T. canis* and *T. leonina* during the years of monitoring as shown in Figure 3.

Comparison of results obtained with FLOTAC and Mini-FLOTAC

Of the 500 faecal samples analysed by FLOTAC and Mini-FLOTAC, 146 resulted positive for *T. canis* and eight for *T. leonina* with FLOTAC, while 144 were positive for *T. canis* and eight for *T. leonina* with Mini-FLOTAC. Therefore, a nearly perfect k agreement ($k = 0{,}99$, $P < 0{,}001$) was found. The mean EPG by FLOTAC and Mini-FLOTAC for *T. canis* was 122,0 (min-max EPG: 2–6,800) and 120,0 (min-max EPG: 5–6,725) respectively, with no statistically significant difference ($P > 0{,}05$). For *T. leonina* the mean EPG was 202,0 (min-max EPG: 10–4,528) and 195,0 (min-max: 10–4,500) respectively, with no statistically significant difference ($P > 0{,}05$).

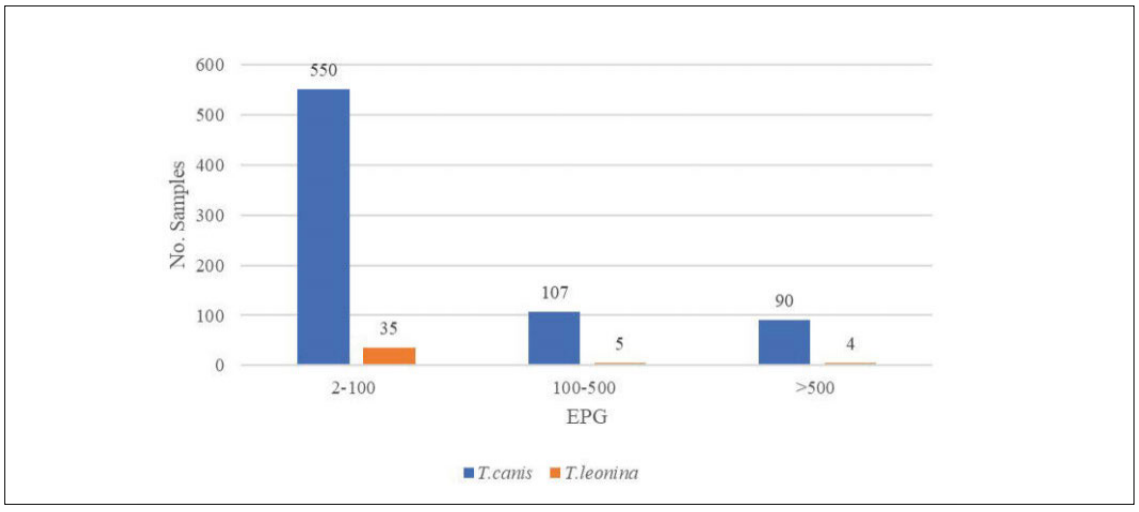

Figure 2: Number of samples for each EPG class (2–100, 100–500 and >500) for *T. canis* and *T. leonina*.

Table 3: Results of the logistic regression analysis.

Variable category	Standard Error	Odds ratio (95 % CI)	*P value*
Housing Outdoor	0,099	9,27 (8,788–10,789)	0,000
Age Puppies Old	0,153 0,228	1,39 (1,027–1,889) 0,56 (0,354–0,879)	0,031 0,007
Dog breed size Medium Large	0,160 0,192	2,17 (1,430–3,360) 1,67 (1,053–2,706)	0,000 0,007

Discussion

The results of this 5-year retrospective study show prevalence values of *T. canis* and *T. leonina* in dogs in southern Italy very similar to the national prevalence reported by Brianti et al.,[2] (i.e., 9,0% for *T. canis* and 1,0% for *T. leonina*).

In agreement with other studies, *T. canis* resulted most prevalent in puppies, due to higher number of sources (e.g., transplacental and transmammary transmission) and of risk factors (e.g., puppies stay close with other dogs; immune system of young dogs is not completely developed) of infections in puppies than in other age categories.[1,21,24,26] This is of great importance considering that many authors have shown that the puppies could represent a potential risk of infection not only for other dogs, but also for humans. Indeed, in some studies on dogs' fur a higher prevalence of subjects with eggs of *T. canis* was shown, representing another route of transmission through contact with coat for humans, as reported in a recent systematic review on this topic.[20]

As for the logistic regression analysis, the age class «puppies» was associated with the positivity to *T. canis*, while the age class «old» was associated with a low positivity to the parasite. For both *T. canis* and *T. leonina* a higher prevalence was found in dogs that lived in garden or in kennel than those with an indoor lifestyle. Living outdoors or having access to a garden seems to be a risk factor for ascarid infections in dogs, as also shown for cats.[22,37] It could be due to the higher probability of outdoor dogs to become infected by capturing paratenic hosts (e.g., rodents and birds), especially those without supervision, or by ingestion of infectious roundworm eggs from the environment. It is well recognized, in fact, that public parks, playgrounds, sandpits etc. can be an important source of infection for both dogs and humans.[1,7] In Italy, environmental contamination with *T. canis* eggs was evaluated in different cities, with a prevalence of 33,6% in the Marche region, 7,0% in Milan, 3,6% in Messina and Teramo, 2,5% in Bari, 1,9% in Rome, 0,7% in Naples and in Padua and 0,5% in Alghero, as reviewed by Traversa et al.[34]

Table 4: Min-max EPG values and mean for *T. canis* and *T. leonina* in two different housing groups.

	***T. canis* EPG**		***T. leonina* EPG**	
Housing	**mean**	**min-max**	**mean**	**min-max**
Outdoor	1,118,5	2–34,600	1,364,8	4–22,640
Indoor	48,0	4–1,174	24,4	10–50,0
Overall	494,1	2–34,600	664,1	4–22,640

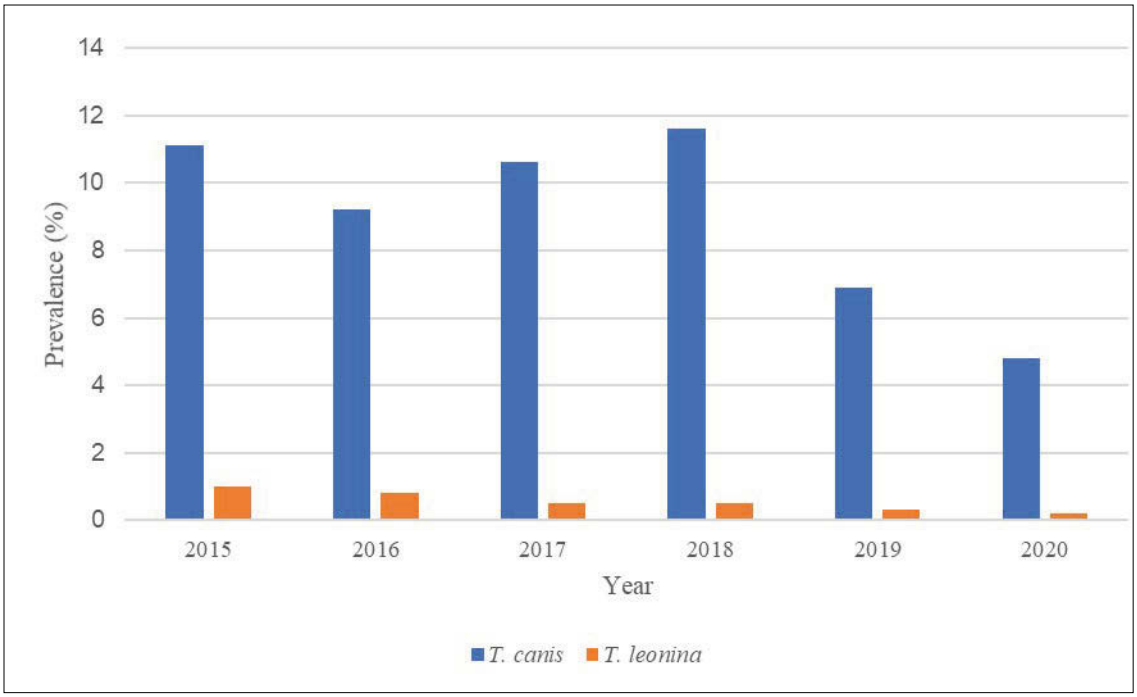

Figure 3: Number of samples for each EPG class (2–100, 100–500 and >500) for *T. canis* and *T. leonina*.

Regarding EPG, higher means of roundworms were found in outdoor dogs than indoor for both parasites, contributing to the spread of infection and environmental contamination, also on vegetables for human consumption.[12,27]Some studies investigating lettuce purchased in farmer markets and supermarkets have been conducted to assess the environmental contamination with the faecal matter of canids, cats and other hosts. The results obtained confirmed that stray dog, cats and wild animals can spread in the environment resistant parasite stages (e.g., *Toxocara* spp. eggs) that can contaminate food, water and soil, representing a risk for humans.[12] The environmentally spreading of *Toxocara* eggs by dogs can represent a problem also for wild carnivores, representing a connection between domestic and wildlife cycle, complicating the epidemiological scenario of this parasite.[7]

However, in our retrospective study a small reduction during the last two years for both the parasites was found. This decreasing may be due to a monitoring and control plan (at least one-two times a year for dogs that live indoor and four times a year for dogs that live outside, as suggested by ESCCAP), named «FLOTAC and PETS», started in 2014 by the PAR-UNINA-CREMOPAR, that involved an increasing number of veterinary clinics, veterinary practitioners and the VH-Frullone. This project implemented the awareness of veterinarians concerning the parasite control practices of dogs and cats and the importance of using an accurate copromicroscopic diagnosis before treatment.[18]

Indeed, the use of specific, sensitive, precise and accurate quantitative copromicroscopic techniques, as the FLOTAC and Mini-FLOTAC, can be very useful for a reliable diagnosis and an effective treatment.[4,5,9] These techniques have been successfully used in different studies on roundworms detection in pets, [19] as well as in this study. A nearly perfect *k* agreement was found between the FLOTAC and Mini-FLOTAC techniques and no statistically significant difference was found between the mean EPG obtained. Therefore, an easy-to-use Mini-FLOTAC technique can be useful for a rapid, reliable and point-of-care diagnosis of roundworms in pets, also in labs or ambulatories with basic equipment, because at difference of FLOTAC, Mini-FLOTAC doesn't require centrifuge or other specific instruments, but only the microscope.[4]

However, this study shows some limitations. Indeed, we didn't perform a pre-programmed sampling considering the ESCCAP classification: dogs that live indoor (group A), dogs that live outdoor (group B), dogs that live outdoor and eat prey animals (group C), dogs that goes outdoor to hunt without supervisors (group D), because we used findings of our diagnostic routine, analyzing them by a retrospective analysis. Moreover, we didn't evaluate the difference of prevalence or intensity of egg shedding, between dogs considered healthy and those with abnormal fecal consistency / diarrhoea. Finally, we didn't perform either an accurate morphological or molecular differentiation between *T. canis* and *T. cati* eggs, because usually during our diagnostic routine we don't use further analyses above the copromiscopic techniques.[11,13]

Since the environmental control of roundworms is difficult, due to different ways of transmission for dogs, the ESCCAP in Europe and the Companion Animal Parasite Council in USA recommend a regular diagnosis and treatment.[3,9] Moreover, we have seen that following these suggestions, a decreasing of *Toxocara* infections was registered in our region during last years. For these reasons, a standardization and harmonization of diagnostic tools and treatment protocols could be very important.

This article is dedicated to and took inspiration from Peter Deplazes, founding member of ESCCAP, who studied in depth the epidemiologic and zoonotic aspects of ascarid infections in dogs and cats.

Etude rétrospective de cinq ans sur les infections aux ascaris chez le chien dans le sud de l'Italie

Une analyse rétrospective sur 5 ans des infections à ascaris (*Toxocara canis* et *Toxascaris leonina*) chez les chiens du sud de l'Italie a été réalisée afin de mettre à jour le scénario épidémiologique de ces parasites et d'identifier les facteurs de risque pouvant favoriser ces infections chez les animaux de cette zone d'étude. Au total, 8149 chiens ont été analysés dans notre laboratoire avec une analyse copromicroscopique en utilisant la technique FLOTAC. De plus, un sous-échantillon de 500 échantillons fécaux

Uno studio retrospettivo di cinque anni sulle infezioni da ascaridi nei cani nell'Italia meridionale

Uno studio retrospettivo di 5 anni, sulle infezioni da ascaridi (*Toxocara canis* et *Toxascaris leonina*) nei cani in Italia meridionale, è stato effettuato per aggiornare lo stato epidemiologico di questi parassiti e per identificare i fattori di rischio che possono favorire l'insorgere di queste infezioni negli animali di questa area. I campioni di feci di 8149 cani sono stati analizzati copromicroscopicamente presso i nostri laboratori utilizzando le tecniche FLOTAC. Inoltre, un sottocampione di 500

a été analysé avec la technique Mini-FLOTAC. Sur l'ensemble des échantillons fécaux canins analysés, 9,2 % (IC à 95 % = 8,6 à 9,8) se sont révélés positifs pour *T. canis* tandis que 0,5 % (IC à 95 % = 0,4 à 0,7) ont été positifs pour *T. leonina*. Des co-infections avec *T. canis* et *T. leonina* ont été trouvées chez 0,1 % des chiens (IC à 95 % = 0,0–0,1). Les résultats obtenus par les examens FLOTAC et Mini-FLOTAC ont montré un coefficient Kappa presque parfait (k = 0,99, p < 0,001) entre ces deux techniques. Le test du chi carré a montré une positivité significative quant aux infections à *T. canis* et *T. leonina* (P < 0,001) associées à des chiens hébergés à l'extérieur (jardin ou chenil). De plus, la positivité pour *T. canis* était également significativement associée (P < 0,001) à l'âge (c'est-à-dire aux chiots), comme le montre la régression logistique. La diminution de la prévalence globale au cours de la période de surveillance a montré que le diagnostic régulier pourrait contribuer à un contrôle efficace de ces parasites à la fois pour *T. canis* et *T. leonina*, comme suggéré par le the European Scientific Counsel Companion Animal Parasites.

Mots clés: contrôle, FLOTAC, prévalence, facteurs de risque, *Toxocara canis, Toxascaris leonina*

campioni fecali è stato analizzato con la tecnica Mini-FLOTAC. Il 9,2 % (95 % CI = 8,6–9,8) dei campioni totali analizzati è risultato positivo a *T. canis* mentre lo 0,5 % (95 % CI = 0,4–0,7) è risultato positivo a *T. leonina*. Co-infezioni con *T. canis* e *T. leonina* sono state trovate nello 0,1 % dei cani (95 % CI = 0,0–0,1). I risultati ottenuti con gli esami FLOTAC e Mini-FLOTAC hanno evidenziato una concordanza quasi perfetta ($k = 0,99$, $P < 0,001$) tra queste due tecniche. Il test del Chi-quadro ha mostrato una significativa associazione tra la positività all'infezione da *T. canis* e *T. leonina* ($P < 0,001$) ed i cani che vivono all'esterno (giardino o canile). Inoltre, la positività per *T. canis* è risultata significativamente associata ($P < 0,001$) anche all'età (cioè ai cuccioli), come mostrato dalla regressione logistica. La riduzione della prevalenza per *T. canis* e *T. leonina* durante il periodo di monitoraggio ha dimostrato che una diagnosi regolare potrebbe contribuire ad un controllo efficace di questi parassiti come suggerito dall'European Scientific Counsel Companion Animal Parasites (ESCCAP).

Parole chiave: controllo, FLOTAC, prevalenza, fattori di rischio, *Toxocara canis, Toxascaris leonina*

In studi retrospectiv sur tschun onns pertuccond infecziuns cun ascarids ell'Italia Meridiunala

Per eruir la situaziun epidemiologica ed ils facturs da resca d'infecziuns cun ascarids (*Toxocara canis e Toxocara leonina*) tier tgauns ell'Italia Meridiunala, ei il studi presentau vegnius menaus tras sur tschun onns. Emprovas da 8149 tgauns ein vegnidas intercuretgas copromicroscopicamein en nies laboratori cun la tecnica FLOTAC. Ultra da quei ein 500 emprovas vegnidas analisadas cun la tecnica FLOTAC-mini.

Dallas emprovas dad excrements da tgauns analisadas eran 9.2% (95% KI = 8,6-9,8) positivas sin *T. canis* e 0.5% (95% KI = 0,4-0,7) positivas sin *T. leonina*. Ins ha constatau ina coinfecziun cun *T. canis* e *T. leonina* tier 0.1% dils tgauns (95% KI = 0,0–0,1). La cumparegliaziun dils resultats dallas perscrutaziuns cun FLOTAC e cun FLOTAC-mini ha mussau in concordanza *k* bunamein perfecta ($k = 0,99$, $P < 0,001$). Tier tgauns teni el liber (p.ex. en curtgin ni en in claus) ei vegniu anflau significantamein pli savens *T. canis* e *T. leonina* (test chi-quadrat, $P < 0.001$). Ultra da quei ha la regressiun logistica mussau che tgauns pli giuvens (cunegls) eran pertuccai significantamein pli savens da *T. canis* (P = 0,001).

La prevalenza totala durond ils onns d'observaziun ha mussau schebein tier *T. canis* sco era tier *T. leonina*, che, sco proponiu digl European Scientific Counsel Companion Animal Parasites, la diagnosa regulada savess contibuir tier ina controlla effizienta da quels parasits.

Plaids-clav: Controlla, FLOTAC, prevalenza, facturs da resca, *Toxocara canis, Toxocara leonina*

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