

## Short note

# First report on occurrence of zoonotic helminth *Toxocara canis*, *Toxascaris leonina* and *Ancylostoma caninum* in domestic dogs from province of Djelfa, Algeria

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**ABSTRACT.** A total of 85 faecal samples of domestic dogs were collected from six localities, including Birine, Sidi Ladjel, Dar Chioukh, Aïn Maâbed, Aïn El-Ibel and Djelfa city from province of Djelfa, Algeria. Samples were tested for presence of *Toxocara canis*, *Toxascaris leonina* and *Ancylostoma caninum* eggs by formol-ether concentration and flotation techniques. Microscopic examination revealed an infection rate of 9.4%, 15.3% and 1.15% for *T. canis*, *T. leonina* and *A. caninum*, respectively. Males were more frequently infected with *T. leonina* as compared to females, while, no difference was observed regarding *T. canis* and *A. caninum*. Prevalence of *T. canis* and *T. leonina* did not vary significantly with age ranges of dogs. In contrast, *A. caninum* seems to be more found in dogs aged of 6–12 months. Prevalence of the three species did not vary significantly in dogs without diarrhea and those with diarrhea. Through these preliminary findings, dogs from steppic region of Djelfa can play a potential role in the dissemination of these neglected zoonotic helminths, which may endanger health of peoples, particularly, pastoral community.

**Keywords:** prevalence, zoonotic helminths, dogs, Djelfa, Algeria

## Introduction

Domestic dog (*Canis familiaris*) is considered a typical pet that lives in close contact with humans, protecting human himself and his home, helping to hunt animals and as sheepdog, particularly in rural areas. Dogs are infected with numerous parasites having a significant impact on the health and well-being of animals and may endanger severely health of humans. Among zoonotic parasites, *Echinococcus granulosus*, *Toxocara canis* (roundworm), and *Ancylostoma caninum* (hookworm) responsible of neglected zoonotic diseases, which are distributed worldwide [1,2]. *E. granulosus* is tapeworm so that adult stage inhabits the intestine of dogs and other canids, and larvae stage (metacestodes) infect liver and others organ of intermediate hosts, including livestock's and humans, causing cystic echinococcosis (CE) [3]. Cystic echinococcosis is endemic

in many countries including North Africa and has highest global impact on public health [4,5]. *T. canis* is a roundworm that infects small intestine of definitive hosts (dogs and other canids), which excrete unembryonated and non-immediately infective eggs via faeces into external environment. Within 2–8 weeks, eggs embryonate after three stages including one-cell stage, two-cell stage and early morula, so that resulting an infectious third-stage larva (L3), that hatching after ingestion of embryonated eggs by paratenic hosts such as pigs, rodents, birds and humans [6,7]. Human toxocarosis is considered among one of the most commonly reported zoonotic helminthiasis. Infections may range from asymptomatic to severe diseases, and develop under four syndromes (visceral larva migrans, ocular larva migrans, neurotoxocarosis and covert or common toxocarosis) [6,8]. Another ascarid less pathogenic with low zoonotic

Table 1. Occurrence of *T. canis*, *T. leonina* and *A. caninum* in dogs from Djelfa province

Locality	N° of examined dogs	N° of infected dogs		
		<i>Toxocara canis</i>	<i>Toxascaris leonina</i>	<i>Ancylostoma caninum</i>
Birine	20	7	9	0
Sidi Ladjel	36	1	3	1
Dar Chioukh	9	0	0	0
Aïn Maâbed	5	0	0	0
Aïn El-Ibel	2	0	0	0
Djelfa city and around	13	0	1	0
Total	85	8	13	1

significance is *Toxascaris leonina* that represents the only known species within genus *Toxascaris*. Adults of *T. leonina* parasite intestinal tract of domestic and wild carnivorous, while, larvae can develop in paratenic hosts such as mice, rabbits and chickens, and humans as accidental hosts [9–11]. *A. caninum* is also a zoonotic hookworm that infects small intestine of dogs and occasionally felids,

causing serious troubles (diarrhoea, blood loss, anemia, and occasionally death) particularly in puppies [12]. Other hookworms with zoonotic concern such as *A. ceylanicum* and *A. braziliense* are known to parasite dogs and cats. Human infections with *Ancylostoma* species were associated mainly with skin diseases (cutaneous larva migrans and creeping eruptions) and eosinophilic enteritis [1]. Prevalence of *T. canis*, *T. leonina* and *A. caninum* varies considerably of region to another where several factors can intervene on this variation. Compared to Europe and other regions from America and Asia, limited data are available regarding epidemiology of these zoonotic helminths in dogs from Africa, particularly those of North Africa (Algeria). Prevalence of some cestodes, including *E. granulosus*, *Taenia* spp., *Mesocestoides lineatus* and *Dipylidium caninum* has been reported at stray dogs in east of Algeria [13]. *T. canis*, *T. leonina* and *A. caninum* remain neglected zoonotic helminths, particularly in rural community. The present report provides preliminary data on occurrence of these zoonotic nematodes in domestic dogs from steppic region of Djelfa.

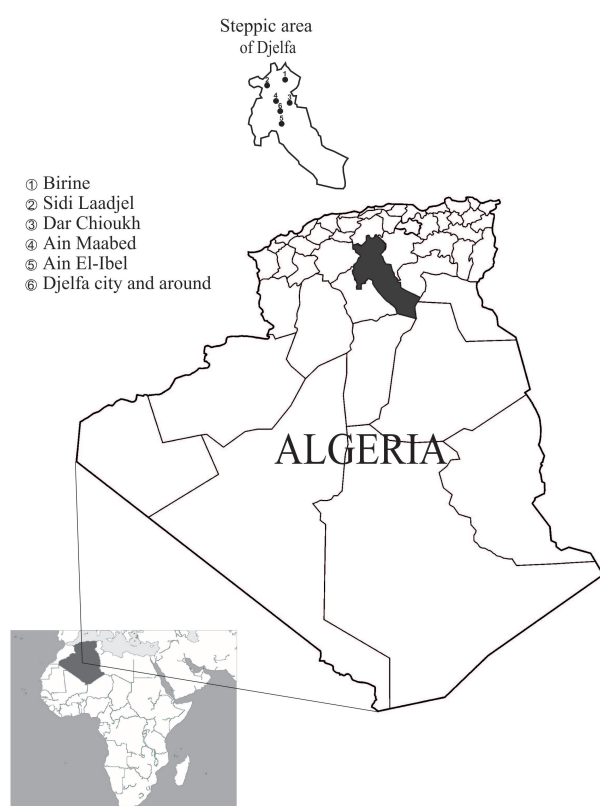


Figure 1. Geographic map showing location of the sites concerned for collection of faecal samples in dogs (map was constructed using CorelDRAW X8 software)

## Materials and Methods

The present study was conducted between March 2019 and March 2020 in six localities, including five rural areas (Birine, Sidi Ladjel, Dar Chioukh, Aïn Maâbed and Aïn El-Ibel) and one urban area (Djelfa city and around) from province of Djelfa that located in the central part of northern Algeria (Figure 1). Djelfa is semi-arid (center and north parts) to arid (south part) steppic region. Its climate is characterized by hot and dry summer, and cold winter with strong periods of frost. Breeding of

Table 2. Distribution of *T. canis*, *T. leonina* and *A. caninum* in dogs by sex, age and presence or absence of diarrhoea

	N° of examined dogs	N° of infected dogs (%)		
		<i>Toxocara canis</i>	<i>Toxascaris leonina</i>	<i>Ancylostoma caninum</i>
<b>Sex</b>				
Male	65	7 (10.8%)	12 (18.5%)	0 (0%)
Female	20	1 (5%)	1 (5%)	1 (5%)
$\chi^2$ (p-value)		0.59 (0.4397)	12.75 (0.0257)	3.28 (0.0697)
<b>Age</b>				
< 6 months	15	1 (6.7%)	0 (0%)	0 (0%)
6–12 months	10	1 (10%)	1 (10%)	1 (10%)
> 12 months	60	6 (10%)	12 (20%)	0 (0%)
$\chi^2$ (p-value)		1.33 (0.5133)	3.69 (0.1578)	7.58 (0.0224)
<b>Diarrhoea</b>				
Presence	15	1 (6.7%)	4 (26.7%)	0 (0%)
Absence	70	7 (10%)	9 (12.85)	1 (1.4%)
$\chi^2$ (p-value)		0.16 (0.6883)	1.81 (0.1775)	0.21 (0.6415)

small ruminants (sheep and goats) represents the main agricultural activity, particularly among the pastoral populations.

A total of 85 faecal samples were collected from domestic dogs (65 males and 20 females) either directly from rectum or from ground immediately after defecation. All dogs were sampled only one time and each specimen was placed into a sterile plastic container, labeled by mentioning some information's (date of sampling, age, sex, presence or absence of diarrhoea, activity of dogs), and transported in an isotherm box to the laboratory. Samples were subjected to macroscopic observation to check the presence or absence of adult parasite stages. Microscopic examination was performed after formol-ether concentration technique [14] and flotation method using saturated sodium chloride solution (NaCl) (specific gravity 1.2). Parasitic species were identified on basis of morphology of eggs according to standard taxonomic key [15]. Statistical analysis was performed using R software (version 4.0.3) and chi-square test was exploited to assess prevalence variation of each parasitic species according to animal attributes (sex, age and diarrhea status) and sampled area. Chi-square values were calculated with p-value < 0.05 that was regarded statistically significant.

## Results

Microscopic examination of faecal samples revealed a prevalence of 9.4%, 15.3% and 1.15% for *T. canis*, *T. leonina* and *A. caninum*, respectively. No other parasitic species were detected from microscopic observation. All identified species were recorded in dogs from rural area of Sidi Ladjel. Both *T. canis* and *T. leonina* were found in rural area of Birine, while, *T. leonina* was observed only in Djelfa city (Table 1). Five dogs from Birine area exhibited associated excretion of *T. canis* and *T. leonina* (data not shown in Table 1). Detection of *T. canis* ( $X^2=20.23$ ; P-value=0.0011) and *T. leonina* ( $X^2=18.43$ ; P-value=0.0024) in dogs was significantly related to sampled area where Birine rural region showed the highest number of positive dogs, while, detection of *A. caninum* ( $X^2=1.37$ ; P-value=0.9268) was not significantly associated to sampled area.

Males were found to be significantly more positive for presence of *T. leonina* eggs than females. In contrast, no difference was recorded between males and females for presence of *T. canis* and *A. caninum* (Table 2). Prevalence of *T. canis* and *T. leonina* did not vary significantly with age ranges of dogs as compared to *A. caninum* (Table 2). Infection rate of all parasitic species did not vary

significantly in dogs without diarrhea and those with diarrhoea (Table 2). Should be noted that one male puppy with diarrhoea (< 6 months) showed double infection (*T. canis* and *T. leonina*) (data not shown in Table 2).

## Discussion

The present report provides preliminary data on prevalence of *T. canis*, *T. leonina* and *A. caninum* in domestic dogs from province of Djelfa. *T. canis* was recorded with infection rate of 9.4%. This findings is in agreement with previous studies from Africa (Morocco, South Africa, Ghana, Zambia, Malawi) [16,17], Europe (Spain, Albania, Denmark, France, Italy, Netherlands, Portugal, Romania, Slovakia, Switzerland) [18], America [19,20–22] and Asia [17]. Other surveys worldwide have reported a high prevalence [17–19,21–23]. Contrariwise, the rate infection from several reports did not exceed 3% [17–19,21,22,24]. *T. leonina* was detected in 15.3% of examined dogs. Similar results were documented in some studies, while, its prevalence (higher or lower) varies considerably across the world [11]. Prevalence of *A. caninum* seems to be low in the present report as well as in few previous studies [25–29]. However, hookworms (*Ancylostoma* spp.) are considered among the most prevalent intestinal parasites in dogs [30,31]. Variations of prevalence data of these nematodes worldwide are certainly influenced by different factors, including host associated factors such as age of dogs, animal behavior and ownership (pet or stray dogs), as well as environmental factors like hygienic conditions, area type (rural or urban), and even climatic conditions. Additionally, size and repetition of samples, sample types (feces, soil or postmortem isolation of adults), diagnostic techniques, veterinary preventive measures, deworming programs and systematic anthelmintic treatment may affect prevalence variations. In the present report, sample size seems to be most likely factor implicated in the significant variation of prevalence recorded among localities, particularly for *T. canis* and *T. leonina*. Age of dogs is significant risk factor for variations of prevalence data. Mostly, young dogs ( $\leq 12$  months) found to have a higher risk of infection by concerned parasites, particularly *T. canis* as compared to adults [17,19,22,30]. Our results showed that age was not associated with infection rate variations of *T. canis* and *T. leonina*. Therefore, sample size for age ranges of examined

dogs may lead to poor assessment of age effect as an associated risk factor. In addition, occurrence of *A. caninum* in one case should not be considered for interpreting of prevalence variations according age. Similar to our findings regarding prevalence of *T. canis* in males and females, generally, there is no sex influence [22]. On the other hand, males were known to be more infected than females [17,30]. *T. canis*, *A. caninum* and with less degree *T. leonina* are known to be involved in diarrhea particularly in young dogs, while, infection of adults can pass unremarked. Despite there is no significant difference between infected dogs without diarrhea and those with diarrhea, pathogenic role of these parasites cannot be neglected since presence of five infected dogs (one puppy and four adults) suffering diarrhoea, especially, for one puppy less than 6 months exhibiting double infection (*T. canis* and *T. leonina*). Nevertheless, it should not exclude other pathogens or other factors that can cause diarrhoea.

In the light of this report, dogs from steppic region of Djelfa can play a potential role in the dissemination of zoonotic nematodes *T. canis*, *T. leonina* and *A. caninum*, which may endanger health of peoples, particularly, pastoral community. Therefore, other studies should be conducted for further investigation on the epidemiology of these neglected zoonotic diseases, both in dogs and humans. In addition, different preventive measures, deworming programs and well-controlled anthelmintic treatments are required to minimize this danger to human health.

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