

Gastrointestinal helminth parasites of dogs in rural areas of the north east of Algeria

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Abstract

Canine faeces are an important source of pathogens for the pet population, for dog owners and for the community in general. A total of 100 faecal samples taken from dogs, were examined for helminth eggs. 80 % of dogs examined are parasitized. *Toxocara canis* and *Ancylostoma caninum* were the most commonly observed parasites. *T. canis* was observed with a prevalence of 68 % in the El Kala region, while in the region of Guelma, *A. caninum* were predominant with a rate of 71%. *Dipylidium caninum* and *Trichuris* were present but with low proportions especially in the region of Guelma. The climatic conditions seem to play a role in the excretion of helminth eggs, while the age plays a primordial role in particular for *T. canis* as well as for *A. caninum*. The absence of conscience of the owners of dogs and the lack of participation of the veterinarian' role increase the risk of the parasitism of these animals and consequently for the public health in particular our children in the Northeast of Algeria.

Keywords: Dogs, Helminths, Eggs, Coproscopy, Algeria

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الديدان المعوية الطفيلية لدى الكلاب في المناطق الريفية في شمال شرق الجزائر

فوزي معطي الله^١، وفاء خلايفية^١، سناء لعماري^١ و سعيدة معطي الله^٢

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الخلاصة

براز الكلاب هو مصدر مهم لأمراض الحيوانات الأليفة، أصحاب الكلاب والمجتمع ككل. في هذا السياق تم فحص ١٠٠ عينة براز. ٨٠٪ من الكلاب التي تم فحصها توجد بها طفيليات. لوحظ ان توكسوكارا كانيس وأنكيلوستوما كانينيوم، الطفيليات الأكثر شيوعا. الإصابة توكسوكارا كانيس بلغت ٦٨ في المائة في منطقة القالة، بينما كان معدل الإصابة بأنكيلوستوما كانينيوم في منطقة قالمة، ٧١ في المائة. ديبيليديم كانينيوم و تريتشوريس وجدت ولكن بنسب منخفضة وخاصة في منطقة قالمة. يبدو أن الظروف المناخية تلعب دورا في إفراز بيض الديدان الطفيلية، في حين أن العمر يلعب دورا رئيسيا، وخاصة لتوكسوكارا كانيس وأنكيلوستوما كانينيوم. إن عدم وعي أصحاب الكلاب وعدم مشاركة دور الطبيب البيطري بالتحسيس خاصة، يزيد من خطر هذه الطفيليات وبالتالي على الصحة العامة وخاصة أطفالنا في شمال شرق الجزائر.

Introduction

Gastro intestinal helminths are among the most common pathogenic agents encountered in dogs, especially in newly whelped or neonates and they constitute one of the main

causes of pathogen of the gastro intestinal tract in dogs (1).

Some of these helminths are responsible for zoonotic diseases such as *Toxocarasis* and *giardiasis* (1-3). So, *Toxocara canis* and *Ancylostoma caninum* are, respectively,

the primary species of roundworms and hookworms infecting dogs worldwide (4-6).

Prevalence of digestive parasites is difficult to estimate and different epidemiological surveys show large variations (7). The clinical symptoms of helminth infected dogs depend on the age of animal, the severity of infection, location and developmental stage of the worms. Majority of dogs infected with worms are asymptomatic, however young puppies show clinical signs which include poor growth, potbelly, vomiting, diarrhea, coughing or nasal discharge (8).

There is still inadequate information on these infections in dogs in Algeria. Knowledge of the type of gastrointestinal helminths in dogs in a particular area is important to identify the zoonotic risk in the prevention and control of infections. However and in view of the close association of dog and human beings and the growing trend of breeding of pets, it is necessary to fill this gap in our knowledge, through a study at estimating the prevalence of gastrointestinal helminths in dogs in this locality with special attention to potential zoonotic diseases.

Materials and methods

Study areas

The study was conducted in two different bioclimatic areas in the northeastern of Algeria (Guelma and El Kala) (Fig. 1). Guelma is located in the heart of a large agricultural region at 290m altitude, far from about 50km from the Mediterranean Sea. It is surrounded by mountains (Maouna, Dbegh, and Houara) which give it the name of city plate; its area enjoys great fertility thanks to the Seybouse and a large dam that provides a large irrigation perimeter. The temperature varies from 4°C in winter to more than 35°C in summer. Rainfall varies from 400 to 500mm / year in the South to nearly 1000mm/year in the North. About 57% of this rainfall is recorded during the wet season (October-May). The climate is classified from sub-humid to semi-arid. While the coastal area (El-Kala), with a climate strongly marked by the proximity of the sea and is characterized by high humidity and a mild winter temperature (averages of January > 10°C). Average maximum temperatures are high in July-August and exceed 30°C. An altitude of 1m and a humid climate characterize this area.

Animal population

The local dogs (not standardized) came from villages whose owners were available at the time of sampling. Study was conducted between January and June 2016. The animal population studied consists of 100 dogs of different ages and sexes, distributed equally (50 dogs) in each region. It was mostly puppies that formed the dog population in El Kala while young dogs and adults were examined in the

Guelma area. The animals in question were roaming freely with ruminants. Anthelmintics treatments are not common for their owners. Dogs defecate in the environment without collecting faeces. At night, these dogs take their kennels beside the houses of their owners.



Figure 1: Areas of study.

Faecal sample collections and processing

The faeces samples are kept in plastic containers (forcoprosopy), well identified (age and sex of the dog). Afterwards, we go to the parasitology laboratory for a coprological examination. A clinical exam is done in parallel for each dog to record clinical abnormalities. The coproscopic examination is carried out using the McMASTER method giving both a qualitative and quantitative evaluation of parasitic infection. The results are expressed in number of eggs per gram of feces (OPG). The coproscopy were carried out according to the McMaster method in magnesium sulphate ($d=1.28$ at 25°C) with a ratio of 5 g of faeces per 75 ml of solution (1,2,8,9).

Statistical analysis

For the statistical analysis of the data, the one-way analysis of variance (ANOVA) test was used to determine significance of monthly variations of epg excretion, and variations of epg excretion by sex. The correlation test is used for the age criterion and the excretion of epg.

Results

About 80 dogs/100 are parasitized (Prevalence = 80%). The coprological analysis identified us: *Toxocara canis*, *Ancylostoma caninum* and *Dipylidium caninum* in dogs of Guelma then, we found in addition to previous parasites of *Trichuris* in El Kala area.

The number of epg of *T. canis* is higher of the parasitism in El Kala with 68% (7900 epg / total of 11550 epg). In Guelma, we recorded 6275 epg, representing 27% of the parasitic population of this area.

On the contrary, *A. caninum* come first in Guelma with a remarkable rate of 71% (16725epg / total of 23450 epg). This parasitic species was in second place in the El Kala region with a 17% (1975) rate of parasite total.

The eggs of *Trichuris* were present only in dogs at the area of El Kala with a small amount (450 epg) (Prevalence = 4%). Also, *D. caninum* is observed with 1225 epg (Prevalence = 11%). Whereas it is just a total of 450 epg that was found in Guelma (2%).

Monthly variations of egg excretion in both study are not significant ($P = 0.708 > 5\%$). The age criterion is very important and especially involved for *T. canis* in El Kala whose puppies raised high numbers of epg. While the number of epg of *A. caninum* was very high in young dogs and adults in the region of Guelma. A positive correlation is calculated between the number of epg and the age factor ($r = 1$) in El Kala and Guelma areas. Also, males are more parasitized than females in both study areas (no significant differences $P > 0.05$).

A poly parasitism is observed in 50% of the canine population in Guelma, while that in El Kala is raised to 64%.

The Clinical examination of dogs revealed the following symptoms: diarrhea (20%), hair loss (15%), and paleness of the mucous membranes (25%). Weight loss is the common clinical sign for all dogs (100%).

Table 1: Results of eggs excretion in dogs (El Kala, Guelma)

Age (mounth)	Helminth (EPG)							
	<i>T. canis</i>		<i>A. caninum</i>		<i>D. caninum</i>		<i>Tricuris</i>	
	<i>E</i>	<i>G</i>	<i>E</i>	<i>G</i>	<i>E</i>	<i>G</i>	<i>E</i>	<i>G</i>
<12	6000	2500	275	725	700	250	175	/
Nb=30 Nbi=26 (87%)		Nb=8 Nbi=4 (50%)						
13-24	900	2500	850	6000	275	100	175	/
Nb=10 Nbi=6 (60%)		Nb=20 Nbi=14 (70%)						
25-36	600	775	400	5000	150	100	100	/
Nb= 8 Nbi=6 (75%)		Nb=8 Nbi=8 (100%)						
>37	400	500	450	5000	/	/	/	/
Nb= 2 Nbi=2 (100%)		Nb=14 Nbi=14 (100%)						

Nb: Number of dogs, Nbi: Number of infested dogs, EPG: Eggs per gram, T: *Toxocara*, A: *Ancylostoma*, D: *Dipylidium*, E: El Kala, G: Guelma, %: Infestation rate.

Discussion

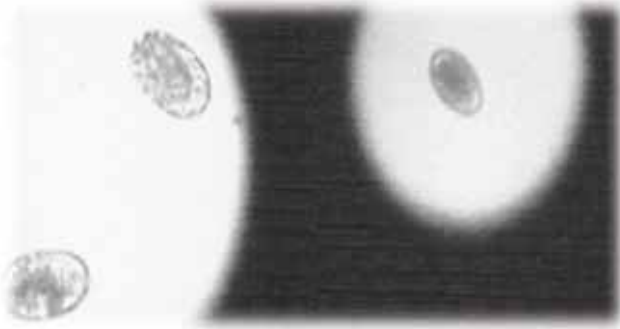
The use of McMaster egg counting method is justified by the fact that this technique has a good sensitivity. In addition; this method also makes it possible to highlight small, light, predominant eggs in dog faeces, unlike sedimentation methods. Also, our epidemiological survey could be conducted with research of quantitative results (7-9).

Variations were shown between carnivore infection rates in rural areas between the two study areas. The high prevalence obtained in this survey is mainly for *A. caninum*

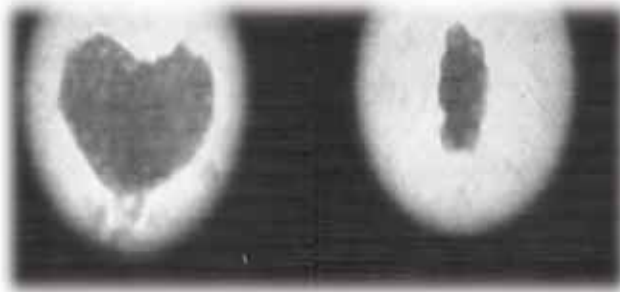
and *T. canis*. Prevalence of parasitism is higher in comparison with previous work in Nigeria (68%) (10) and Ghana (62.6%) (11). It is slightly lower than that reported in Mexico (85%) (12). As a result, many conditions (climatic and environmental) in these countries, particularly in Africa (13), are conducive to the development, survival and transmission of infectious stages of parasites, mainly by contributing to the 34% prevalence reported in Europe (14,15) and 36% reported in the United States (6).

The number of the epg of intestinal helminthic parasites per revealed host showed that the single infestation was less frequent, and poly parasitism was detected with high rates

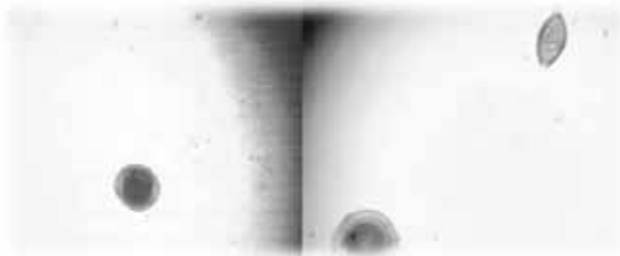
in both regions. Our results do not agree with the results of other studies (2,3,16). While (17) explained that interactions between parasite species depend on parasite burden rather than the presence of other species. (18) have suggested that two or more parasites would only occur in a host if they are not competing if they or have different physiological needs.



A. caninum



D. caninum



T. canis and *Trichuris*

Figure 2: (Original). Helminthic species (X10).

It is important to note the high observed rate of *T. canis* / *A. caninum* combination and the low rates of their separate combination with other species determine the affinity of this combination? The answers to these questions are

essential for a good understanding of the epidemiology and control of these diseases (6).

Toxocara canis

A prevalence of 72% for *T. canis* in El Kala shows the essential role of climatic factors for the development of this parasitic species. Similarly, Ascarid eggs have an optimal development between 15 °C and 30 °C and between 80% and 90% moisture which makes this area a favorable environment for parasite development (19). The area of Guelma also by sub humid climate is also favorable for this parasitic species. The importance of the age factor is significantly demonstrated, especially in El Kala area (a majority of puppies), with regard to helminth infestations (20,21). Various surveys conducted worldwide indicate that prevalence of *Toxocara* infection in canid definitive hosts ranged from 86-100 % in puppies and 1-45 % in adult dogs (11,12,14,16,17,19,20,22,23). This finding is related to the evolutionary cycles of parasites and the risk of infestation. This is consistent with other studies that have reported similar results (5,6,24). The prevalence of ascariasis infections in puppies is consistent with the transmission pattern of the parasite which is predominantly by transplacental and transmammary pathways in the early days of puppy life which increase the occurrence of the parasite at an early age (21,25).

Ancylostoma caninum

Ancylostoma infection is directly dependent on the ecology of free larval stages, which require a moist and sufficiently hot soil, and the frequency of cutaneous contact with these L3s (barefoot, agricultural work) (26,27). The air currents entering the region of Guelma makes it a Mediterranean climate favoring the maturation, then the survival of the infesting elements (eggs or larvae of helminths). It is characterized by constant and high temperatures, a hygrometry always important (Climate subhumid to semi-arid) with an abundance of rains. The area of Guelma ensures by their climatological characters a favorable environment for the development of this parasite which explains the large number of epg. The nature and texture of soils have a direct influence on the survival of eggs and larvae in the outdoor environment. Thus, wet and shady (rural) soils are more favorable to the multiplication of the parasite than concrete soils cleaned daily of their droppings. Dogs in our villages are therefore particularly vulnerable to parasitism. The study shows, as in other studies conducted on these parasites, that the affected animals are mainly young dogs. Indeed, this corresponds to the animal population of Guelma (7). This high rate of infestation in this age group is explained, in particular, by the low immunity developed by the young dogs, as well as by the small thickness of their skin favorable to the penetration of the larvae of *Ancylostoma*. Also, in our

survey, infected dogs lived in an outdoor environment and had access to the forest environment and may have become contaminated with fecal matter from wild animals (28).

Dipylidium caninum* and *Trichuris

We recorded a low prevalence of *D.caninum* (4 % and 2 % for El Kala and Guelma, respectively). This result is in line with what has been reported in Africa (11,24,29). Also, in our investigation, infested dogs lived in an outdoor environment and had access to the forest environment and may have become contaminated with fecal matter from wild animals. Some Authors (3,30) indicated that necropsy provides more detailed information. However, we could not perform necropsy in this study because dogs could not be killed for such purposes. *D. caninum* a zoonotic tapeworm of which human is an occasional host. The presence of this parasite in study areas is important for public health, especially for children who are more likely to be infected with dipylidase than adults (31). The eggs of the *Trichuris* are naturally more common in adult dogs because the infection is done in the external environment, by ingestion of extremely resistant eggs. This may explain the low number of epg by this parasitic species in our study whose dogs are mostly young (32). Comparing with other results such as the study by (8) in Maracaibo, Venezuela, seven species of helminths were reported from 614 dogs examined, another study in Ibadan, Nigeria (33), six species of helminths have been reported in 959 dogs examined and in Spain (Cordoba) (30) with 300 dogs, we can say that the low number of helminth specimens found may be due to the decrease in the number of dogs (100 dogs) examined in our study.

Finally and concerning the symptoms identified during the examination of the dogs, we recorded in addition to the general weakness (slimming) of dogs, a diarrhea, a paleness of the mucous membrane and hair loss. Our results are in accord with (20) whom reported that the majority (71.72 %) of the 244 infected dogs showed no clinical signs and the Anemia, weakness and diarrhea were evident in 16.80 %, 11.40 %, and 10.25 %, of dogs respectively. The first indication of *T. canis* infection in young animals is retarded growth and weight loss, a dull coat and often a pot-bellied appearance, vomiting, diarrhea, (23,27,34). As other authors have noted, a large number of *A. caninum* infections in pups or young dogs can cause acute or peracute disease, with bloody or black diarrhea, anaemia and depression (34). By contribution to these results, we can say the hair loss (15%) reinforces these results, especially for *T. canis* infestation and the presence of diarrhea leads us to diagnose towards infestations by hookworms.

Conclusion

The present study has detected the high prevalence of gastrointestinal helminths identified in Northeastern of Algeria: *T. canis*, *A. caninum* and to a lesser degree *D. caninum*, which are zoonotic constituting a public health problems. In this sense, a larger study with a larger number would be essential to clarify the situation of the internal parasitism of our dogs. The control of the environment is also very important. To reduce the risk of contamination, the stool must be collected and destroyed. Finally, intervention measures are necessary to reduce the risk of transmission of parasites from dogs to humans due to lack of veterinary control.

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