

RESEARCH COMMUNICATION

Epidemiological survey on gastro-intestinal and blood-borne helminths of dogs in north-east Gabon

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ABSTRACT

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A survey of helminth parasites was carried out on 198 dogs living in almost complete liberty in villages in the northeast of Gabon. Faeces and blood samples were collected and analysed. *Dirofilaria immitis* antigen was detected in 13.6% of dogs using the SNAP 3Dx® test, a commercially available enzyme-linked immunosorbent assay (ELISA). Faecal examination revealed that 91.4% of dogs were infected by intestinal helminths. Ascarids were found in 58.5% of the samples. *Trichuris vulpis* was observed in 49.5% of cases, and *Uncinaria* spp. and *Ancylostoma* spp. in 34.8%, *Spirocerca lupi* in 25.3% and *Capillaria* spp. in 10.6%. Cestode embryophores were found in 8.6% of the samples.

Keywords: Dirofilariosis, dog, faecal examination, Gabon, helminths, intestinal parasite infection, zoonosis

INTRODUCTION

In Equatorial Africa, helminths, particularly nematodes and cestodes, regularly infect dogs as shown in prevalence studies conducted in Nigeria (Ugochukwu & Ejimadu 1985), the Congo (Pangui & Belot 1986) and the Democratic Republic of the Congo (Chartier & Chartier 1990). In Gabon, a country located on the Equator, under the Gulf of Guinea,

a survey carried out in Libreville showed that 64% (43/67) of dogs carried intestinal helminths and that 50% (24/48) were infected by *Dirofilaria immitis* (Beugnet & Edderaï 1998).

The aim of our study was to establish the prevalence of dirofilariosis and intestinal helminthosis in dogs, in a rural region of Gabon, situated 500 km to the east of Libreville. The survey comprised the collection of blood and faecal samples in 2003 followed by their analysis in the Parasitology Laboratory at the Ecole nationale vétérinaire (National School of Veterinary Medicine) in Lyon, France.

MATERIALS AND METHODS

Our study focused on a population of semi-stray dogs living in 16 areas of Ogooué-Ivindo, a north-eastern region of Gabon. The climate in this zone is typically equatorial with a dry season between mid-June and mid-August. The cumulative annual rainfall is approximately 1 700 mm.

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The survey was carried out on 198 mongrel dogs between 3 months and 14 years of age (average age: 2 years 7 months).

The screening for dirofilariosis was carried out by testing serum samples using the SNAP 3Dx® test (IDEXX Laboratories Inc. USA). The SNAP 3Dx test is a rapid in-clinic assay that simultaneously detects heartworm antigen and antibodies to *Borrelia burgdorferi* and *Ehrlichia canis* in whole blood, serum or plasma. Results of the heartworm antigen assay are reported here, while the seroprevalence of *B. burgdorferi* and *E. canis* was published elsewhere (Davoust, Bourry, Gomez, Lafay, Casali, Leroy & Parzy 2006).

Faecal samples were immersed in 10% formaldehyde on collection and poured into labelled 10 ml tubes. Intestinal parasites were identified using a faecal flotation enrichment technique. In this procedure, 5 g of faeces were collected from each tube, suspended in 20 ml of potassium iodomercurate and filtered through a sieve. The filtrate was poured into a 5 ml test tube, filled to the maximum, covered with a cover slip and centrifuged at 2500 rpm for 5 min. The cover slip was deposited on a slide labelled with the name of the sample, and examined under a compound microscope. Each type of parasite egg or larva was counted using 40x magnification, and the eggs and larvae were identified using magnifications of 100x and 400x.

RESULTS

The test for circulating *D. immitis* antigen was positive in 27 of the 198 sera tested (13.6%). Intestinal parasites were detected in 181 of 198 (91.4%) of the stool samples analysed (Fig. 1). *Toxocara canis* was detected in 58.5% (116/198), *Uncinaria* and *Ancylostoma* spp. in 34.8% (69/118), *Trichuris vulpis* in 49.5% (98/198) and *Capillaria* spp. in 10.6% (21/198) of the samples. *Spirocerca lupi* eggs were present in 25.3% (50/198) of the samples. Cestode embryophores were present in 8.6% of the samples (17/198); but the species could not be identified due to the absence of gravid segments.

More than one parasite was found in the faeces of 61.6% of the dogs containing intestinal parasites (122 out of 181 infected dogs). Sixty dogs were infected by two species. The most common combination involved 29 dogs infected with *Toxocara canis* and *Trichuris vulpis*. Sixty-two (34%) of the dogs were infected by at least three species, 22 of these harboured *Toxocara canis*, *Ancylostoma* spp. and *Trichuris vulpis*.

A more detailed study of *Ancylostoma* spp. (hookworm) infection in the dogs showed that 73% of the 69 infected dogs were less than 4 years of age. It was noted that 98% of these dogs strayed freely through the villages and 76% frequented the forest where they could come into indirect contact with the wild fauna. Similarly, of the 117 dogs with ascarid infection, 64% were either puppies or young adults, less than 4 years old. The dogs that had tapeworm embryophores in their stools were also young: 59% of them were under 4 years of age. Analysis of the data using the Chi-square test showed that dogs under the age of 4 years were more prone to parasitic infection than those aged 4 years and above ($P < 0.001$).

DISCUSSION

Previous studies have shown that the SNAP 3Dx® screening test for dirofilariosis had 100% specificity and 98.1% sensitivity (O'Connor, Esty, Machenry, Hanscom, Bartol & Lawton 2002). This test is extremely easy to perform. The prevalence of dirofilariosis in the survey area (13.6%) was moderate compared with the 50% previously reported in Libreville (Beugnet & Edderai 1998). Infection with *D. immitis* frequently occurs in tropical countries where its mosquito vectors are present throughout the year.

Use of the faecal flotation enrichment method is justified because this technique has good sensitivity. Our faecal survey, however, does not necessarily reflect the real level of infection. For instance, the excretion of cestode eggs is erratic, and the study was conducted in dogs that had owners but were nevertheless allowed to roam freely in the villages. Most of the dogs had never received veterinary care or anthelmintic treatment. The typically equatorial climate of Gabon, characterised by constant high temperatures, an annual average of 26 °C, perpetual high humidity between 80% and 96% and an abundant rainfall, promotes the maturation and survival of the infective stages, namely eggs or helminth larvae.

Soil type and texture have a direct influence on the outdoor survival of eggs and larvae. Moist, sandy and shaded soils are far more conducive to parasite survival than concrete areas that are regularly cleaned. The dogs in the Gabon villages of the Ogooué-Ivindo region are, therefore, in an environment that is particularly favourable for the parasites.

The more detailed hookworm study, as confirmed in other studies focusing on these parasites, showed

TABLE 1 Results of prevalence surveys of canine intestinal parasite infection in Africa, the USA, Indonesia and France

Continent	Country	Region	Authors	Year	No. of samples	Technique	<i>Ancylostoma</i> spp./ <i>Uncinaria</i> spp.	<i>Toxocara canis</i>	<i>Toxascaris leonina</i>	<i>Dipylidium caninum</i>	Taeniidae	<i>Trichuris vulpis</i>	
							(%)	(%)	(%)	(%)	(%)	(%)	
Africa	Nigeria	Calabar	Ugochukwu & Ejimadu	1985	254	FE	71	29	8	2	2	0.4	
		Kainji Lake	Okaeme	1985	121	FE	37	10	ND	28	10	5	
	Kenya	Nairobi	Wachira <i>et al.</i>	1993	156	N	88	3	ND	45	10	ND	
	Sierra Leone	Ouest and Freetown	Hassan	1982	1 277	FE	46	13	6	4	ND	ND	
	Congo	Brazzaville	Pangui & Belot	1986	832	FE	69	ND	ND	ND	ND	ND	
	Congo (DR)	Bunia	Chartier & Chartier	1988	62	N	67	4	ND	58	29	0	
	South Africa	Free State Province	Minnaar <i>et al.</i>	2002	63	N	27	21	32	44	33	ND	
	Senegal	Dakar	Pangui & Kaboret	1993	72	N	79	8	ND	86	44	ND	
	Gabon	Libreville	Beugnet & Edderai	1998	67	FE	55	9	1	6	1	6	
		Ogoué-Ivindo	Davoust <i>et al.</i>	2003	198	FE	35	59	0.5	2	9	49	
	Asia	Indonesia	Bali	Damriyasa <i>et al.</i>	2001	45	N	89	51	ND	18	7	ND
	America	United States	All	Blagburn	2001	6 458	FE	20	15	1	ND	ND	14
Europe	France	All	Franc <i>et al.</i>	1997	420	FE	18	36	2	15	ND	28	

ND Not determined

F Fecal examination

N Necropsy

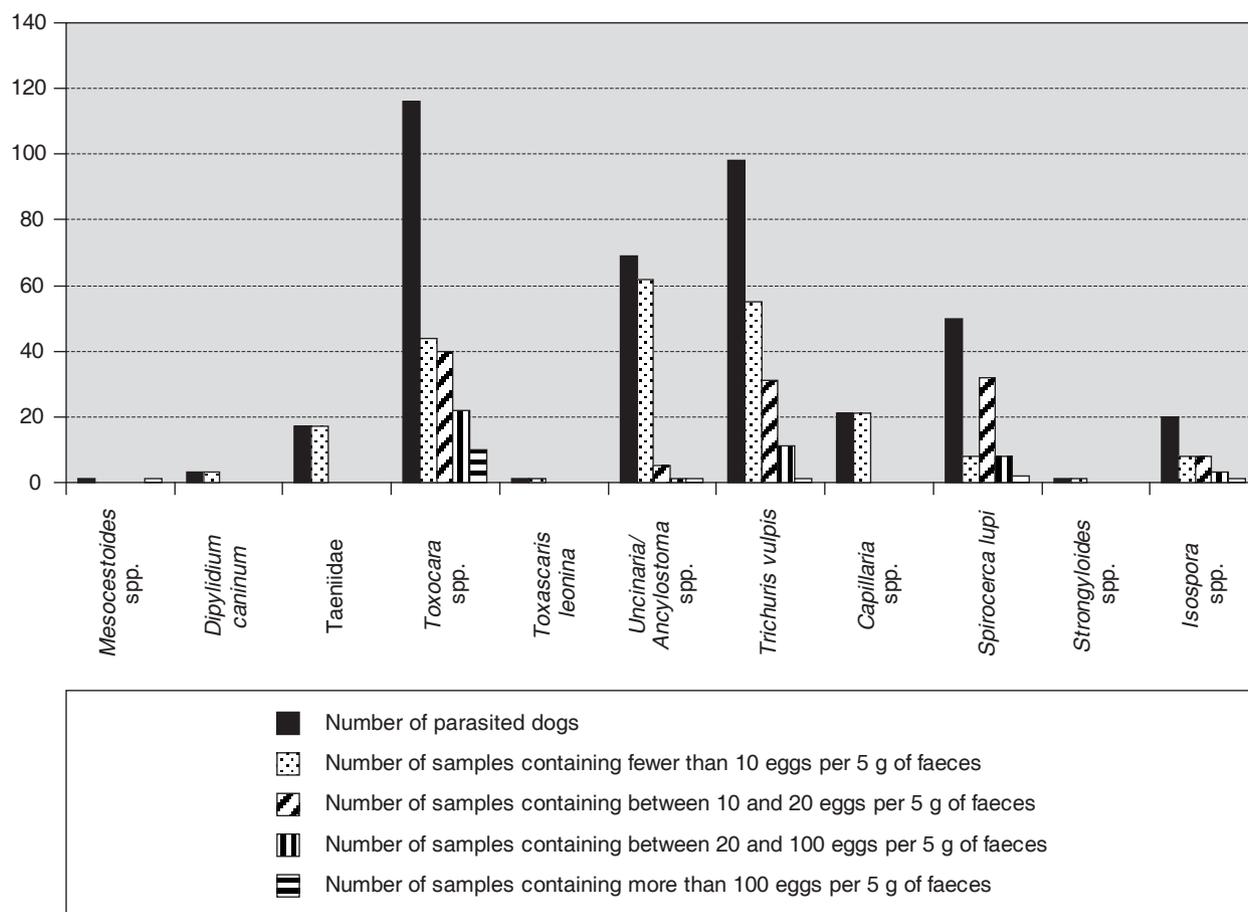


FIG. 1 Results of coproscopies conducted in 198 dogs

that the animals affected were mainly puppies and young dogs, as 73% of the 69 dogs infected by hookworm were under 4 years of age. This result is comparable with the 76% found in the study conducted in Libreville by Beugnet & Edderai (1998). The high level of infection in this age group can be explained by a poorly developed immunity in the young dogs, and the thinness of their skin, which is conducive for penetration by hookworm larvae. This is not to exclude other routes such as via milk or faeces. Moreover, in our study, 98% of the 69 dogs infected by hookworm lived outdoors and were sources of parasites for non-infected dogs and 76% of them had access to the forest which could have been contaminated by faeces of other carnivores. In the study by Beugnet & Edderai (1998), it was extrapolated that there was an 85% prevalence of these parasites in untreated stray dogs. In the Congo, the prevalence of hookworm reached 68.6% in a population of 832 dogs (Pangui & Belot 1986). In Dakar (Senegal), prevalence rates of 79.7% (57/72) for *Ancylostoma braziliense* and 17.4% (12/72) for *A. caninum* were observed at autopsy (Pangui &

Kaboret 1993). In our study, *Ancylostoma* spp. eggs were found only 35% of the dogs examined.

The two species of ascarids, *Toxocara canis* and *Toxascaris leonina* were regularly encountered in our survey. In the study conducted by Beugnet & Edderai (1998), the prevalence of ascarids was 10% in a canine population ($n = 67$) under veterinary surveillance in Libreville, but the prevalence was over 59% in dogs not receiving any veterinary care (Beugnet & Edderai 1998).

Table 1 shows the results of faecal surveys carried out on dogs in Africa, the USA, Indonesia and France. In the Ogooué-Iwindo region of Gabon, the prevalence of ascarid infection was higher than in other African countries and in Bali (Indonesia) (Darmiyasa, Surathma, Dwinata, Apsari, Schares, Nöckler, Schein & Bauer 2001). This difference is, perhaps, related to the test populations, some of which benefited from anthelmintic treatment. It is also noteworthy that, regardless of the region investigated, the prevalence of *Toxocara canis* was always far higher than that of *Toxascaris leonina*. In our study,

the prevalence of *Toxascaris leonina* was 0.5%, compared to 8% and 32% in Nigeria and South Africa, respectively (Ugochukwu & Ejimadu 1985; Minnaar, Krecek & Fourie 2002).

The prevalence of trichuriasis in Gabon (49 %) was higher than that reported by other authors in Africa (Table 1). In Nigeria, the prevalence rate was only 5.4% (Okaeme 1985). It therefore seems that climatic and sanitary conditions are not responsible for the prevalence observed. *Trichuris* eggs, like those of *Toxocara* and *Toxascaris*, are highly resistant to harsh environmental conditions and can, perhaps because of their thick shell, survive well in mud and anaerobic conditions.

The prevalence rate (25%) for *S. lupi* that we observed was high, bearing in mind that faecal excretion of their eggs is intermittent. Lesions, such as presence of oesophageal nodules, observed in necropsy allow a better evaluation of the rate of infection.

Three gravid proglottids of *Dipylidium caninum* were found in three separate samples in our study and 8.6% of the dogs were carriers of taeniid embryophores. Levels of 86% and 58% were recorded in Dakar (Sénégal) and Bunia (Democratic Republic of Congo), respectively (Pangui & Kaboret 1993; Chartier & Chartier 1990). The low prevalence is related to the low numbers of livestock in the Gabon village studies. In Senegal, 44.9% of dogs ($n = 72$) were infected with *Taenia hydatigena* (Pangui & Kaboret 1993).

Several intestinal parasites of dogs in Gabon dogs are capable of infecting man: *Ancylostoma caninum*, *Toxocara canis* and possibly *Echinococcus granulosus*. The transmission of these parasites is often due to poor hygiene (Petithory, Beddok & Quedoc 1994).

Our study by faecal examination did not enable us to evaluate the parasite infection-related zoonotic risk to dogs posed by echinococci (*E. granulosus* or *Echinococcus multilocularis*). Since the samples contained taeniid eggs, additional studies using molecular biology techniques are planned using the frozen faeces that were collected from the same 17 dogs.

The incidence of parasitic infection in the canine population, confirms that intestinal helminthosis of carnivores is an important health problem. In the light of this, sanitation and improved food and water as well as environmental conditions could reduce the level of human and canine infection in villages of

Equatorial Africa. In addition, dogs can also occasionally transmit zoonotic parasites to man, cutaneous and visceral larval migrans being two of the more important ones. Whilst it would seem correct to regularly deworm dogs, this is practically impossible in view of the fact that the villagers have not the means to treat their own parasitic infestations.

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