TOXOCARA AND *GNATHOSTOMA* AMONG STRAY CANINES IN BANGKOK

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Abstract. Stomachs and intestines of 88 adult and 112 young stray dogs were obtained from the Rabies Control Subdivision, Bangkok, and examined especially for the presence of *Gnathostoma spinigerum* and *Toxocara canis*. Forty-five dogs were found positive for *T. canis* (overall prevalence 22.5%) but none were found infected with *G. spinigerum*. The prevalence of *T. canis* in young dogs was 37.5% (42 of 112) whereas in adult dogs was only 3.4% (3 of 88). The total number of *T. canis* recovered from the 45 positive dogs was 272 (averaging 6.0 worms/dog). This includes 268 worms from 42 young dogs (averaging 6.4 worms/dog) and four worms from three adult dogs (averaging 1.3 worms/dog). The average number of worms, according to sex and stage, per young dog were as follows: male worms 2.4 ± 3.5 (range 0 - 15), female worms 2.8 ± 3.5 (0 - 16), immature worms 1.2 ± 2.5 (0 - 9), and all worms 6.4 ± 8.2 (1 - 34). The maximum number of worms per young dog was 34 while the minimum was one, and 35.7% (15/42) of these young dogs harbored only one worm. The body length of the recovered *T. canis* were as follows: males measuring 3.0 - 12.0 cm (averaging 7.1 ± 2.1 cm), females 4.1 - 18.2 cm (11.0 ± 4.1 cm), and immature worms 0.7 - 3.7 cm (2.1 ± 0.8 cm).

INTRODUCTION

There are at least five genera of helminths which are natural parasites of canines that cause serious clinical problems in humans such as cutaneous and/or visceral larva migrans. Among these are the dog ascarid, *Toxocara canis* and the gastric nematode, *Gnathostoma spinigerum*. Human toxocarosis is caused by the larval ascarid nematodes of dogs (*T. canis*), cats (*T. cati*) or other carnivorous animals (*Toxascaris leonina*). The disease is characterized by two clinical manifestations-visceral larva migrans and ocular toxocarosis, and at times by one extra category-covert toxocarosis (Taylor *et al,* 1988). Typically it is a disease affecting young children and is cosmopolitan in distribution. Human infections are acquired by the ingestion of infective ova from soil or larvae in uncooked tissues of paratenic hosts (Beaver *et al,* 1984; Gilles, 1996).

Human gnathostomosis is caused primarily by the larval stage of *G. spinigerum* (Daengsvang, 1980; Radomyos and Daengsvang, 1987; Miyazaki, 1991) and occasionally by some other species-*G. hispidum* (Nawa *et al,* 1989), *G. doloresi* (Ogata, *et al,* 1988), *G. nipponicum* (Ando *et al,* 1988; Sato *et al,* 1992) and *G. binucleatum* (Almeyda-Artigas, 1991). The disease is categorized into external (cutaneous) and internal (visceral) gnathostomosis of which some fatal cases were reported in the latter (Daengsvang, 1980). The highest incidence of gnathostomosis is in Thailand (Daengsvang, 1986) and a rather high prevalence is reported from Japan (Miyazaki, 1991) and Mexico (Almeyda-Artigas, 1991; Ogata *et al,* 1998; Koga *et al,* 1998). Human infections are usually acquired by consumption of raw or improperly cooked fresh-water fish which harbor the infective larvae (Daengsvang, 1980; Miyazaki, 1991).

In Thailand there are very few publications concerning gastric and intestinal helminths of dog. However, it was reported by Hinz in 1980 that the infection rates in stray dogs in Bangkok were 6.5% for *T. canis* and 2.8% for *G. spinigerum*. On the contrary, we failed to find *G. spinigerum* in quite a number of dogs autopsied by the Veterinary Public Health Division, Bangkok Metropolitan during the same year (unpublished data). The purpose of this study is to investigate the prevalence of *T. canis* and *G. spinigerum,* and to obtain the parasites from the intestines and stomachs of stray dogs in Bangkok.

MATERIALS AND METHODS

From February to September 1998, the stomachs and intestines of 200 stray dogs including 88 adult and 112 young dogs were obtained from the Rabies Control Subdivision, Veterinary Public Health Di-

vision, Health Department, Bangkok Metropolitan Administration. The stomach of adult dogs were examined especially for *G. spinigerum* and the intestine of young dogs were done so for *T. canis*. The organs were separated and thoroughly cut open along the longitudinal axis. Worms seen by the naked eyes were collected, and contents of the organs were subjected to a simple sedimentation technique using normal saline solution. Cleaned sediments were then examined under the stereomicroscope and small-sized worms were collected. All worms recovered were counted, cleaned and allowed to relax in distilled water, and their body length measured.

RESULTS

Of the total number of stomachs and intestines from the 200 dogs examined, 45 were found positive for *T. canis* (overall prevalence was 22.5%) but none were found infected with *G. spinigerum*. The prevalence of *T. canis* in young dogs was as high as 37.5% (42 of 112) whereas in adult dogs it was only 3.4% (3 of 88) (Table 1). The total number of *T. canis* recovered from the 45 positive dogs was 272 (averaging 6.0 worms/dog). This includes 268 worms from 42 young dogs (averaging 6.4 worms/dog) and four worms from three adult dogs (averaging 1.3 worms/dog) (Table 2).

Table 3 shows maximum and average numbers, sex, and body length of *T. canis* recovered from 42 young dogs. The average number of worms per young dog were as follows: male worms 2.4 ± 3.5 (range 0 - 15), female worms 2.8 ± 3.5 (0 - 16), immature worms 1.2 ± 2.5 (0 - 9), and all worms 6.4 ± 8.2 (1 - 34). The maximum number of worms per young dog was 34 while the minimum was only one, and 35.7% (15/42) of these young dogs were found to harbor only one worm. The body length of the recovered *T. canis* were as follows: males measure from 3.0 - 12.0 cm (averaging 7.1 ± 2.1 cm), females 4.1 - 18.2 cm (11.0 ± 4.1 cm), and immature worms 0.7 - 3.7 cm (2.1 ± 0.8 cm) with the maximum length at 12.0 cm and 18.2 cm for male and female worms, respectively.

Table 1

Prevalence of *T. canis* among stray dogs in Bangkok.

Dogs	No. examined	No. positive	% positive
Adult	88	3	3.4
Young	112	42	37.5
Total	200	45	22.5

Table 2

Total and average number of *T. canis* recovered from the intestines of stray dogs in Bangkok.

Dogs	No. of worms recovered				Average no. of worms/dog
	Male	Female	Immature	Total	
Adult	3	-	1	4	1.3
Young	100	119	49	268	6.4
Total	103	119	50	272	6.0

Table 3

Number, sex and body length of *T. canis* recovered from the intestines of young stray dogs in Bangkok.

T. canis	No. of worms per dog		Body length of worms (cm)	
	Range	Average	Range	Average
Male	0 - 15	2.4 ± 3.5	3.0 - 12.0	7.1 ± 2.1
Female	0 - 16	2.8 ± 3.5	4.1 - 18.2	11.0 ± 4.1
Immature	0 - 9	1.2 ± 2.5	0.7 - 3.7	2.1 ± 0.8
Total	1 - 34	6.4 ± 8.2	-	-

DISCUSSION

Canines, as a natural final host, harbor several genera of medically important helminths which are zoonotic. Among these there are at least five genera-*Toxocara, Gnathostoma, Ancylostoma, Spirometra* and *Alaria*-that can cause cutaneous and/or visceral larva migrans in humans (Beaver *et al,* 1984).

In Bangkok, the most common helminth infecting stray dogs are hookworms. The infection rate is 100% (infection rate of *A. caninum* alone is also 100%-Radomyos, personal communication) while that of *T. canis* is 6.5% (Hinz, 1980). In the present study, the prevalence of *T. canis* in adult dogs was found to be 3.4% which is only slightly lower than that of the previous report. However, the infection rate of *T. canis* in young stray dogs (37.5%) is much higher. This is not unexpected because adult (sexually mature) dogs will somehow acquire some resistance to reinfection of *T. canis* (Beaver *et al,* 1980). Despite the abundance of stray dogs in Bangkok, the overall prevalence of *T. canis* in adult and young dogs is only 22.5% with the maximum number of worms in one dog being 34. This infection rate is about one third of that reported by Dubinsky (1998) in the Slovak Republic which is as high as 75% in urban stray dogs. However, the infection rate in rural dogs is only 28.9%.

The body length of female *T. canis* (4.1-18.2, averaging 11.0 cm) was found to be much longer than that of male worms (3.0-12.0, averaging 7.1 cm). These figures are obviously bigger than those reported by Warren in 1971 (cited by Beaver *et al,* 1984) of which are 4-6 cm for mature males and 6-10 cm for females. However, the maximum lengths of 12.0 cm for males and 18.2 cm for females in the present study do not exceed the corresponding lengths of 13 cm and 20 cm of the previous record.

Daengsvang (1980) has summarized the prevalence of *G. spinigerum* infection in stray dogs in Bangkok as reported by several authors as follows. In 1933 the infection rate was 100% (a total of 5 stomachs); in 1962, 10% (100 stomachs) to 18% (1,000 stomachs); between 1965-1970, 1.1% (17,855 stomachs and 277 fecal samples). In the present study, we were not able to discover any *G. spinigerum* from any stomach samples. This is not surprising since we have had this experience about 18 years ago.

In conclusion, dogs still have a great potential in transmitting helminthic diseases to Thai people. This is not only attributed to the fact that they are in very close contact with humans, but they themselves are good definitive and/or reservoir hosts. Many dogs are born free and lived unraised by humans. However, by instinct they tend to wander and are frequently hidden by kind people from dog catchers of the Rabies Control Sector. In addition, other paratenic hosts play an important role in these two zoonotic infections.

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