

3. Title : Helminth survey of dogs in Bangkok, Thailand

Principal Investigator : George S. Manning, CPT, MSC

Assistant Investigators : Keturat Sukhawat, M.T.  
Vithoon Viyanant, B.Sc.  
Manit Subhakul, B.Sc.

Period of Report : 1 April—31 September 1968

#### OBJECTIVES

Interest in the helminth parasites of dogs has recently been stimulated by reports that many are potentially transmissible to man. Vaughn and Jordan<sup>(1)</sup> found that even in "well-ordered" neighborhoods there was frequent transmission of intestinal parasite infections among dogs, and indirect transmission of these infections to children was considered likely. In addition, no significant differences were found between "well-cared-for" dogs and strays as far as prevalence of parasitic infections is concerned.

Interest in dog parasites has not been limited to those species that cause intestinal infections in man. Occasionally humans become exposed to the larval forms of canine parasites and, since man is an unsuitable host, the larvae fail to mature but wander in the tissues resulting in eosinophilia, and/or damage to various internal organs, including the brain.

Recently a link between certain nematode infections and bacterial and viral agents has been postulated. Several studies have shown a relationship between ascarid larvae migration and poliomyelitis<sup>(2)</sup>. Epilepsy<sup>(1)</sup>, Japanese B encephalitis and Escherichia colitis have all been linked to some degree to larval nematode migration. As Woodruff<sup>(3)</sup> states "it would seem surprising if larvae migrating from the intestine to the tissues did not take with them intestinal bacteria and other microorganisms".

Other diseases such as visceral larva migrans and cutaneous larva migrans have been shown to result from man becoming infected with the parasites of dogs.

The climatic conditions in Bangkok are suitable for year-round transmission, especially of the soil transmitted parasites, thus providing ideal conditions for their propagation. This study evaluates the annual fluctuations in prevalence and the zoonotic potential of the parasites encountered in the dogs of Bangkok.

#### DESCRIPTION

During the past year (September 1967—October 1968) 2599 dogs have been examined for intestinal helminths. The approximate age was noted (either younger or older than one year) and a stool specimen collected from each dog. The dogs were supplied by the Rabies Control Center in Bangkok. Stools were concentrated by the formalin-ether technique as this gave better results in a preliminary trial than the zinc sulfate flotation method.

Occasional autopsies were performed so that adult helminths could be collected for species identification and a more accurate assessment of tapeworm infection made. Tapeworm infection can be diagnosed only if proglottids are recovered from the feces, or eggs from disintegrated proglottids can be found on microscopic examination. Since proglottids are not shed continuously, Lillis<sup>(4)</sup> found that from stool exams alone, "about 40—50% of the Taenia infections and about 95% of the Dipylidium infections will be missed". Specific identification of some of the parasites was not possible because of low infection rates.

No attempt was made to examine for filariae or blood parasites.

## PROGRESS

The findings of the monthly stool examinations are summarized in Table 1. Strongyloides stercoralis, Gnathostoma spinigerum and Spirocerca lupi were the only species that displayed any significant annual fluctuations in prevalence. This should be taken into consideration when one-time surveys are made on any parasitic population.

The sex and age distribution of parasitic infections is summarized in Table 2. Toxocara canis infections were more prevalent in young dogs than adults and more females were infected than males. Differences in age and sex had little effect on the prevalence of any of the other parasites.

From a single stool examination approximately 90% of the 2599 dogs examined were positive for at least one parasite. From autopsies it was found that over 25% of the dogs examined were infected with Dipylidium caninum. This is the only intestinal parasite found in which prevalence varied significantly from the results of the stool examinations.

## DISCUSSION

The prevalence of the various infections recorded here are similar to those found by others<sup>(5-7)</sup> in previous surveys of dogs in the Bangkok area. However, the aforementioned surveys were taken, for the most part, at one time during the year so that fluctuations in prevalence could not be detected. In most cases the values that they report fall within the monthly range of values that are listed in Table 1., but because the studies were made at different times of the year there is little resemblance among their results.

HELMINTHS ENCOUNTERED THAT ARE POTENTIALLY TRANSMISSIBLE TO MAN. As work progresses in the field of animal parasitology, and the techniques for detecting these parasites improve, more and more species are added to the list of those that are capable of infecting man. Therefore it is not surprising that the majority of the parasites found in the dogs of Bangkok have been recorded as occurring also in man.

Ancylostomiasis.—Aside from causing an occasional intestinal infection in man canine hookworm larvae penetrate the skin of humans and cause cutaneous larvae migrans, a cutaneous lesion that results from the wandering of the larvae primarily within the stratum germinativum. In highly allergic individuals Ancylostoma ceylanicum may cause severe skin reaction, though not typical creeping eruption.

Ample opportunities exist for the acquisition of human intestinal infections or cutaneous larva migrans as 82% of the dogs examined were found to be infected with A. caninum and/or A. ceylanicum.

Trichuriasis—Trichuris vulpis is one of the most prevalent parasites of dogs in the Bangkok area infecting approximately 13% of those examined. Several cases of human T. vulpis infections have been recorded and it is assumed to be quite common in man. However, because the eggs are difficult to distinguish from T. trichiura, the human whipworm, many cases are probably identified as the human species.

Strongyloidosis—Strongyloides stercoralis was found in 12% of the dogs examined and is of particular interest because of the variety of manifestations an infection may take in man. Strongyloides has been shown to cause creeping eruption, visceral larva migrans and act as a vehicle for Escherichia coli. There is some doubt as to whether the species of Strongyloides found in the dog is capable of infecting man. However, one of (G.S.M.) demonstrated experimentally that the variety found in Bangkok is capable of causing intestinal infection in man.

Ascariasis—Human gastrointestinal infections with the adult canine ascarids, Toxocara canis and Toxascaris leonina, are rare, however the larvae upon entrance to the body migrate through the tissues and have been implicated with a variety of diseases and are probably a serious problem in Bangkok (3% of the dogs infected with T. canis; 6% with T. leonina). The difficulty in diagnosing human infections, however, makes it impossible to ascertain how extensive such infections are. A good description of the clinical manifestations of the diseases is given by Burrows and Lillis.

MONTH Total examined	SEP 269	OCT 207	NOV 239	DEC 44	JAN 95	FEB 250	MAR 220	APR 211	MAY 204	JUN 220	JUL 210	AUG 203	SEP 227	TOTAL 2599
Parasites	No. % Pos. Pos.													
<i>Ancylostoma caninum</i> and <i>A. ceylanicum</i>	227 84	176 85	220 92	38 86	17 75	203 81	179 81	176 83	144 71	180 82	165 79	187 92	178 78	2144 82
<i>Trichuris vulpis</i>	52 19	38 18	33 14	4 9	3 3	38 15	25 11	28 13	17 8	26 12	24 11	35 17	15 7	338 13
<i>Strongyloides stercoralis</i>	51 19	34 16	30 13	2 5	5 5	27 11	12 5	15 7	10 5	35 16	31 15	24 12	38 17	314 12
<i>Toxocara canis</i>	17 6	11 5	16 7	5 11	1 1	8 3	6 2	3 1	8 4	1 1	0 0	5 2	3 1	84 3
<i>Gnathostoma spinigerum</i>	13 5	4 2	6 3	0 0	0 0	0 0	0 0	0 0	1 1	7 3	2 1	6 3	3 1	42 2
<i>Diphyllobothrium mansoni</i>	12 4	8 4	21 9	3 7	7 7	18 7	24 10	20 9	11 5	18 8	16 8	24 12	14 6	196 8
<i>Spirocerca lupi</i>	31 12	26 13	43 18	8 18	16 17	46 18	52 23	48 23	19 9	55 25	51 24	55 27	33 15	483 19
<i>Toxascaris leonina</i>	15 6	11 5	10 4	5 11	6 6	18 7	19 8	20 9	15 7	15 7	7 3	11 5	16 7	196 6
<i>Opisthorchis viverrini</i>	7 3	3 1	3 1	2 2	1 1	3 1	4 1	2 1	2 1	1 1	2 1	5 2	0 0	35 1
TOTAL	253 94	915 94	227 95	41 93	79 83	222 89	202 91	190 90	166 81	195 89	188 90	195 96	193 85	

\* In addition to the species listed above the following were found: *Taenia* spp. (3), *Dipylidium caninum* (2), and *Fasciola/Fasciolopsis* (1).

Table 2. Age distribution of parasitic infections (expressed as %).

	Hookworm	<u>O. viverrini</u>	Taenia spp	<u>S. stercoralis</u>	<u>T. leonina</u>	<u>D. mansoni</u>	<u>G. spinigerum</u>	<u>T. canis</u>	<u>S. lupi</u>	<u>T. vulpis</u>
Female under 1 year (400 examined)	86.0	2.0	0.3	8.5	9.0	9.7	2.3	7.3	6.5	14.5
Male under 1 year (275 examined)	82.2	0.7	0.4	10.2	5.8	6.2	1.8	3.3	20.0	9.1
Female over 1 year (834 examined)	78.7	1.0	0.1	11.6	6.7	8.6	2.2	2.6	21.5	12.2
Male over 1 year (912 examined)	84.6	1.5	0.0	12.3	6.0	7.0	1.9	1.0	19.7	10.9

Others—Human Gnathostoma spinigerum infections occur frequently in Thailand and the worms are generally found wandering in the tissues where they cause cutaneous larva migrans and visceral larva migrans, with many human autopsies revealing encysted worms in the brain. Gnathostoma (2% of dogs infected overall) displayed a distinct annual prevalence cycle in the dogs examined, however, no explanation can be given for this phenomenon.

Sparganosis, which is most common in South East Asia, occurs from infections of the larvae of Diphyllbothrium mansonii. Approximately 8% of the dogs examined were found to be infected, indicating that transmission occurs readily, thus the possibility of human infection is considerable.

Human cases of Spirocerca lupi have been recorded and at least one case of prenatal infection described. Spirocerca infections are very common in the dogs of Bangkok, but because of their preference for the esophagus and aorta, present difficulties in diagnosis. The prevalence is probably much higher than the the average 19% that we diagnosed.

Infections of Dipylidium caninum are rarely found on stool examination alone, however, over 25% of the dogs autopsied were found to be infected. As, Faust and Russell state "while infection in man is not common, especially considering the available sources of infection in dogs and cats it is by no means rare".

Another Parasite, Opisthorchis viverrini has been recognised as one of the most serious human parasitic diseases in Thailand and dogs may serve as an important reservoir host. Manning found that approximately 1% of the humans examined in the Bangkok area had O. viverrini eggs in their stools (503 examined, 4 positive); this is almost identical to the infection rate found in dogs.

#### SUMMARY

A survey of 2599 stray dogs from Bangkok was made from September 1967 to October 1968. From a single stool examination over 90% of the dogs examined were found to be infected with one or more parasites. Of the parasite species identified all are potentially transmissible to man and can be expected to occur in the population.

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