OCCURRENCE OF THE INFECTIVE STAGE OF *ANGIOSTRONGYLUS CANTONENSIS* IN THE YELLOW TREE MONITOR (*VARANUS BENGALENSIS*) IN FIVE PROVINCES OF THAILAND

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Abstract. Twenty-two yellow tree monitors (*Varanus bengalensis*) were trapped and transported from 5 provinces, namely Lampang, Phitsanulok, Kamphaeng Phet, Tak and Prachin Buri to look for the infective larvae stage of *Angiostrongylus cantonensis*. In 4 provinces all of the yellow tree monitors were infected with the infective stage larvae of *A. cantonensis* altogether. Twenty-one of the 22 yellow tree monitors (95.5%) in the five provinces were infected. Our results of this study extend our knowledge of natural prevalence of *A. cantonensis* in yellow tree monitors. The snail eating habbit of the yellow tree monitor might possibly be the source of the larvae.

INTRODUCTION

Angiostrongylus cantonensis is a nematode parasite which inhabits in the pulmonary arteries and heart of rodents, such as *Rattus norvegiens, Rattus rattus, Rattus assimilis, Rattus exulans, Rattus argentiventer*, etc.

The life cycle of *A. cantonensis* involves a molluscan intermediate host (Makerras and Sandars, 1955), usually a terrestrial snail or a slug. However, some freshwater mollusks has also been found to be infected in nature (Lim *et al*, 1965) or experimentally (Alicata and Brown, 1962; Richards and Merritt, 1967; Chao *et al*, 1987).

In 1992, Radomyos *et al* found that the yellow tree monitor (*Varanus bengalensis*) can be an experimental host for *Angiostrongylus cantonensis* infection. The experimental yellow tree monitor was infected by third stage larvae and the parasites still persisted and survived as third stage larvae. More than 90% of the third stage larvae were recovered from yellow tree monitors and all were still alive. However, the parasite could not develop further to the adult stage, even though the infective stage larvae could survive for as long as 4-6 weeks in the yellow tree monitors. This is of epidemiological importance where people like to eat raw yellow tree monitors especially liver as well as raw snails (Radomyos *et al*, 1992; 1993).

Therefore, a study of natural *Angiostrongylus cantonensis* infection in yellow tree monitors was conducted in order to find the infective stage and geographic distribution of this parasite in five provinces of Thailand.

MATERIALS AND METHODS

Animals

Twenty-two yellow tree monitors (*Varanus bengalensis*) were captured from 5 provinces *ie* Lampang, Phitsanulok, Kamphaeng Phet, Tak and Prachin Buri. Areas sample were vacant lots and fields covered with tall grass. An attempt was made to sample yellow tree monitors living near human habitats.

Collection and parasite examination of yellow tree monitors

Yellow tree monitors were captured alive in traps and were transported in traps to the laboratory at the Faculty of Tropical Medicine, Mahidol University where they were killed with ether and carbon dioxide gas, identified as sex, weighed and dissected. The abdominal cavity was opened and the mesenteric arteries were carefully examined for the presence of worms. Brain, heart, kidney, liver and muscles were also examined. The number of infected larvae were noted

in each organ. All tissues and larvae were fixed in 10% neutral buffered formalin for subsequent histologic examination. To confirm the species of parasite, the infective larvae from positive yellow tree monitors were used to infect rats, the definitive host, during 28-45 days. The dissection of the rats was done to find the adult worms in their lungs.

RESULTS

The percentage of the infective stage of *Angiostrongylus cantonensis* in yellow tree monitors (*Varanus bengalensis*) is shown in Table 1. In 4 provinces all of yellow tree monitors were infected with the infective stage larvae of *A. cantonensis* altogether. 21 of the 22 yellow tree monitors (95.5%) in the five provinces were infected.

Table 2 shows the appearance of lesions in various organs. Liver was the most common site for the infective stage larvae.

Table 1

Percentage of infective stage of *Angiostrongylus cantonensis* in yellow tree monitors (*Varanus bengalensis*) in five provinces of Thailand.

Province	*Angiostrongylus cantonensis*		
	No. examined	No. positive	Percent
Lampang	8	8	100.0
Phitsanulok	6	5	83.3
Kamphaeng Phet	4	4	100.0
Tak	3	3	100.0
Prachin Buri	1	1	100.0
Total	22	21	95.5

Table 2

Number of infective stages of *Angiostrongylus cantonensis* in a variety of organs of yellow tree monitors (*Varanus bengalensis*).

No.	Province	Organ							
		liver	lung	heart	stomach	intestine	spleen	muscle	brain
1.	Lampang	1,036*	-	-	-	-	-	-	-
2.	Lampang	390	-	-	65	-	-	-	-
3.	Lampang	39	-	-	-	-	-	-	-
4.	Lampang	131	-	-	-	-	-	-	-
5.	Lampang	180	-	-	-	-	-	-	-
6.	Lampang	1,715	-	-	-	-	-	-	-
7.	Lampang	520	-	-	-	-	-	-	-
8.	Lampang	250	-	-	-	-	-	-	-
9.	Phitsanulok	1,249	-	-	-	-	-	-	-
10.	Phitsanulok	492	-	-	-	-	-	-	-
11.	Phitsanulok	62	-	-	-	-	-	-	-
12.	Phitsanulok	142	-	-	-	-	-	-	-
13.	Phitsanulok	37	-	-	-	-	-	-	-
14.	Kamphaeng Phet	180	-	-	-	-	-	-	-
15.	Kamphaeng Phet	294	-	-	-	-	-	-	-
16.	Kamphaeng Phet	228	-	-	-	-	-	-	-
17.	Kamphaeng Phet	272	-	-	-	-	-	-	-
18.	Tak	2,156	+	-	-	-	-	+	-
19.	Tak	115	-	-	-	+	-	-	-
20.	Tak	166	-	-	-	-	-	-	-
21.	Prachin Buri	560	-	-	-	-	-	-	-

* Number of infective stage larvae of *Angiostrongylus cantonensis*

\+ Positive but could not count the number of larvae

DISCUSSION

The rat lung worm, *Angiostrongylus cantonensis*, the causative agent of an eosinophilic meningoencephalitis in man, has been shown to use a wide range of molluscan intermediate hosts (Alicata and Jindrak, 1970). In Thailand, *Pila* sp, which are eaten by humans, are a possible source of human infection (Punyagupta *et al*, 1970), or *Achatina fulica* (Brockelman *et al*, 1976). There are several reports of naturally infected frogs and toads harboring third stage larvae such as *Hyla aurea* in New Caledonia (Ash, 1968), *Bufo asiaticus, Rana catesbeiana, Rana limnucharis* and *Rhacopholus leucomystax* in Okinawa Prefecture, Japan (Asato *et al*, 1978). No other reports of vertebrates as complete intermediate hosts of *A. cantonensis* are known. However it has been shown that the first stage larvae of *A. cantonensis* can develop into infective third stage larvae in the tadpole stage of the clawed frog, *Xenopus laevis* in the experimental laboratory (Oku *et al*, 1980). Only one report from Thailand stated that yellow tree monitors can be infected only with third stage larvae while the parasite still persisted and survived in the experimental laboratory (Radomyos *et al*, 1993). Our results of this study extend our knowledge of natural prevalence of *A. cantonensis* in yellow tree monitors. The snail eating habbit of the yellow tree monitor might possibly be the source of the larvae. There was a high percentage of positive findings of infected yellow tree monitors as a natural paratenic host (21 out of 22, 95.5%). Thus, the susceptibility of yellow tree monitors to infection with this worm is high and is potentially important in the dispersal of the worm.

Most larvae were found in the livers of yellow tree monitors, so presumably this is the specific site of larvae deposit. It has been reported that the distribution of third stage larvae of *A. cantonensis* takes place in submucosal layer of the snail alimentary tract or the intestinal wall (Brockelman *et al*,1976).

Only five provinces (four in the north and one in the east of Thailand) were include in this survey, and would be interesting to study futher areas in the northeast of Thailand because the people in that area like to eat raw yellow tree monitors as well as snails.

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