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Metacercarial load of freshwater crabs *Liberonautes latidactylus* in an endemic paragonimiasis focus in Liberia, West Africa

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K e y w o r d s : Freshwater Crab, Metacercariae, *Liberonautes,* Liberia

Introduction

Frequency and intensity of infection with metacercariae of the crab second intermediate host of *Paragonimus uterobilateralis* are factors of considerable importance to a functioning transmission chain in the parasite's life cycle. The greater the frequency of infection with, and the density of, *Paragonimus* metacercariae within a crab population, the greater the chance that some of the infectious trematode larvae reach and infect a suitable mammal host. In fact, these two factors reflect the degree of favourable conditions present in an active disease focus.

The frequency of infection (i.e. the number of crabs in a population harbouring *Paragonimus* metacercariae) tends to vary from one locality to another and probably from one year to another, and is of great epidemiological interest. Similarly, the intensity or density of crab infections (i.e. the "metacercarial load" of single individual crabs expressed in the number of *Paragonimus* metacercariae per crab) is of considerable medical importance.

We report here on a series of studies, carried out over the past five years, which have provided data on the frequency and intensity of infection of crabs in the Haindi/Mawua focus of paragonimiasis in Liberia, West Africa. This focus has been described by SACHS and VOELKER (1982), and both infected crabs and infected mammals are regularly found here. In 1983, the prevalence of *Paragonimus uterobilateralis* infection in children in the Mawua village was 7 % (SACHS et al., 1986), being now in a decrease probably due to constant health education in the area. However, the prevalence rate of infected crabs during our current examinations in 1989 in two creeks

was observed to be still 75 % and 82.4 % respectively. This clearly indicates that the disease risk has persisted at the focus continuously.

Material and Methods

The parasitological examination of crabs involved isolation and counting of metacercariae from individual crabs. In the period from 1985 to 1988, metacercariae were used for the experimental infection of rats and mice, to gain adult fluke material for biochemical studies. In 1989, metacercariae were isolated to study their distribution in an individual crab's body. This was done in an attempt to search for an explanation of the high prevalence of pulmonary paragonimiasis in Liberian children.

To isolate metacercariae, crabs were minced in a meat grinder, and the pulp sieved and washed by repeated sedimentation procedures so as to eliminate floating tissues and particles. The final clear sediment was poured into a Petri dish and examined under a stereo microscope at ×10 magnification for the presence of metacercariae. By this method, when carefully undertaken, it was possible to detect very low infections, even of crabs with only one metacercaria.

Results

Table 1 and 2 show the results of the parasitological examinations of 116 freshwater crabs *Liberonautes latidactylus*, all collected in the Haindi/ Mawua paragonimiasis focus. The results are listed separately for male (Table 1) and female crabs (Table 2), for comparing the situation in the two sexes. An arbitrary differentiation was made between light infection (1 - 9 metacercariae per crab), medium infection (10 - 50 metacercariae per crab), heavy infection (51 - 99 metacercariae) and very heavy infection (100 and more metacercariae per crab).

Table 1

Metacercarial load of 62 male freshwater crabs (*Liberonautes latidactylus*) from the Haindi/Mawua *Paragonimus uterobilateralis* focus in Liberia

Period	*n* crabs	Number of metacercariae per crab					
		1	2 - 5	6 - 9	10 - 50	51 - 99	100 and more
1985	20	5	7	2	4	2	–
1988	8	1	2	2	–	2	1 (125 Mc)
1989/A*	14	2	4	2	5	1	–
1989/B*	13	1	3	3	3	2	1 (358 Mc)
1989/C*	7	2	3	2	–	–	–
Total	62	11	19	11	12	7	2
	%	17.7	30.6	17.7	19.4	11.3	3.2

* 1989/A = Feb/Mar, B = Jun/Jul, C = Sep/Oct 1989

Table 2

Metacercarial load of 54 female *Liberonautes latidactylus* from the Haindi/Mawua *Paragonimus uterobilateralis* focus in Liberia

Period	*n* crabs	Number of metacercariae per crab					
		1	2 - 5	6 - 9	10 - 50	51 - 99	100 and more
1985	15	6	4	3	1	–	1 (136 Mc)
1988	7	–	1	1	4	–	1 (147 Mc)
1989/A*	10	–	3	2	5	–	–
1989/B*	9	1	3	2	2	1	–
1989/C*	13	2	6	2	2	1	–
Total	54	9	17	10	14	2	2
	%	16.7	31.5	18.5	25.9	3.7	3.7

* 1989/A = Feb/Mar, B = Jun/Jul, C = Sep/Oct 1989

Discussion

Very light infections of a single metacercaria in an individual crab were found to be quite frequent (17.7 % of the male and 16.7 % of the female crabs). Crabs with only one metacercaria stand little chance of infecting a definite host, unless the crab is completely eaten in a raw state. Similarly, crabs with light metacercarial loads (from 2 - 9 metacercariae per crab) will pass on the parasites to a definite host only it the whole crab is devoured. Infected crabs with metacercarial loads in this range were the most frequently encountered (48.3 % of the males and 50 % of the females).

A medium density (10 - 50 metacercariae) of trematode larvae in the crabs from the Haindi/Mawua focus was found in 19.4 % of the male and 25.9 % of the female crabs. Heavy infections (from 51 to 99 metacercariae) were less common, and were observed in 11.3 % of male and 3.7 % of female crabs. Very heavy metacercarial loads (more than 100 metacercariae per crab) were found to be rare, occurring in only 3.2 % and 3.7 % of male and female crabs respectively. The highest number of metacercariae recovered from a single crab during this present study was 358 metacercariae, from a male crab of 52 mm carapace width. There are indications, that heavy metacercarial infections cause such crabs to become sluggish and less able to avoid predators. African children brought up in a rural village may capture (and probably eat raw) such slowly moving crabs when they encounter them on land. In spite of the general benign character of lung fluke disease at low infection rates, such highly infected crabs with a great number of live *Paragonimus* metacercariae may well endow a heavy parasite load and so may constitute a considerable health hazard.

Table 3 compares the present findings from crabs from Bong County with earlier examinations of crabs for metacercariae from Mount Gibi in the Margibi Territory, Montserrado County, Liberia (VOELKER, 1973). In Haindi/Mawua, more crabs (30.2%) with medium and heavy infections (10 - 100 metacercariae per crab) were found than at Mt. Gibi (14.7%). Very heavy infections (more than 100 metacercariae) were similar for both areas (3.4% for Haindi/Mawua, 3.3% for Mt. Gibi), while the light metacercarial loads (1 - 9 metacercariae) were more frequent at Mt. Gibi (81.9%) than in the Haindi/Mawua focus (66.3%); the highest number of metacercariae found in an individual crab from Mt. Gibi was 253 metacercariae.

Table 3

Comparison of the metacercarial load of crabs collected in two endemic paragonimiasis areas in Liberia, viz. the Haindi/Mawua focus and the Mount Gibi focus in Bong County and Montserrado/Margibi County respectively

Locality	*n* crabs	Number of metacercariae per crab				
		1	2 - 5	6 - 10	11 - 99	100 and more
Haindi/Mawua	116	20	36	21	35	4
	%	17.2	31.0	18.1	30.2	3.4
Mt. Gibi	61	19	20	11	9	2
	%	31.1	32.8	18.0	14.7	3.3

The data obtained in this study should therefore be considered in the light of the transmission of the parasite from crab to a mammal host, including man. No case of human paragonimiasis has been reported from the Mt. Gibi area, whereas more than 30 cases of lung fluke infections in children have been recorded from the Haindi/Mawua focus since 1980.

Summary

The frequency and intensity of infection with metacercariae of the lung fluke *Paragonimus uterobilateralis* in the freshwater crab *Liberonautes latidactylus* were studied in the Haindi/Mawua paragonimiasis focus in Liberia, West Africa. More than one-third (33.6%) of 116 infected crabs examined harboured more than 10 metacercariae each. Such infection density assures continued existence of the parasite in the endemic area, with or without involvement of man as host.

Zusammenfassung

Die Häufigkeit von Infektionen mit Metazerkarien des Lungenegels *Paragonimus uterobilateralis* sowie die Befallsstärke in Süßwasserkrabben *Liberonautes latidacty-*

lus wurden in dem Haindi/Mawua Paragonimiasisfokus in Liberia/Westafrika untersucht. Mehr als ein Drittel (33.6 %) der 116 befallenen Krabben beherbergten mehr als je 10 Metazerkarien. Diese hohe Befallsstärke gewährleistet die Erhaltung des Lebenskreislaufes des Parasiten in dem Endemiegebiet, mit oder ohne Einbeziehung des Menschen als Wirt.

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