

METACERCARIAE IN FISHES OF SUN MOON LAKE WHICH IS AN ENDEMIC AREA FOR *CLONORCHIS SINENSIS* IN TAIWAN

Hong Kean Ooi¹, Ching-I Chen¹, San-Ching Lin¹, Kwong-Chung Tung¹, Jiunn-Shiow Wang¹,
and Masao Kamiya²

¹Department of Veterinary Medicine, National Chung Hsing University, Taichung, Taiwan;

²Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University, Sapporo, Japan

Abstract. The Sun Moon lake in Central Taiwan is a known endemic area for clonorchiasis. Of the 45 fresh water fish, *Hemiculter leucisculus*, from the lake that were examined by artificial gastric juice digestion in October 1995, all were found to harbor metacercariae in their muscle. The number of metacercariae isolated from each fish ranged from 2 to 2,185, with an average of 254. A total of 11,443 metacercariae was collected from the 45 fish. Of the 4,223 metacercariae that were examined under light microscope, 4,064 (96.23%) were found to belong to *Haplorchis taichui*, 90 (2.13%) to *H. pumilio*, 2 (0.05%) to *C. sinensis* and 67 (1.59%) to unknown species due to the metacercariae being not yet developed or immature. The 2 *C. sinensis* metacercariae were obtained from 2 out of 45 fish examined. Our results contrast with reports of a decade ago which stated that all the fish of the Sun Moon lake examined were positive for *C. sinensis*. Possible reasons for the decrease of *C. sinensis* metacercariae are the disappearance of pig farms around the lake, increased awareness of the trematode by the lakeside inhabitants and probably the exclusive use of mammals as its definitive host by *C. sinensis*. In contrast, besides mammals, *Haplorchis* spp also use birds as their definitive hosts.

INTRODUCTION

The Sun Moon lake in Central Taiwan is the largest lake on the island and is a known endemic area for clonorchiasis (Chen, 1991). The lake is inhabited by a lot of freshwater snails and small fish. The last survey for *Clonorchis sinensis* in that area was done about a decade ago and we felt that another survey for the trematode around this time is justified, because of the rapid development in many areas of Taiwan where in certain cases, some parasites had "ceased to exist". In many areas, marshlands had been transformed to housing estates or industrial parks, resulting in the eradication of the snail intermediate host and the breaking of the parasite life-cycle. Thus, constant monitoring of a parasite in an endemic area is necessary to update the current epidemiological information.

Our objective in this study is to determine if there is any change in the prevalence of *C. sinensis* in the fish which inhabit the Sun Moon lake. The fish was

selected as the subject of our study because it is the second intermediate host and serve as the direct source of infection for humans.

MATERIALS AND METHODS

In October 1995, 45 freshwater fish, *Hemiculter leucisculus*, from the Sun Moon lake were examined for metacercariae in their flesh by pepsin-HCl digestion. The size of the fishes ranged from 11.25 to 69.33 g, with an average of 38 g. Briefly, the fishes were caught with a fishing net, weighed, and their flesh cut with scissors after descaling. The flesh was then digested using a magnetic stirrer at 37°C for about 2 hours in 0.5% pepsin and concentrated hydrochloric acid added to bring the pH down to less than 2. Approximately 10-15 ml of the pepsin solution was added to each gram of the flesh.

The metacercariae were identified under light microscope with the criteria of having a conspicuous ventral sucker for *C. sinensis*, shorter prepharynx length, comparatively lesser transparency and generally larger size for *H. taichui* than for *H. pumilio*. Both *H. taichui* and *H. pumilio* have hooklets at their comparatively small ventral sucker. These hooklets are not seen in *C. sinensis* metacercariae (Cheng, 1988; Scholz *et al.*, 1991)

Correspondence : Dr Hong-Kaen Ooi, Department of Veterinary Medicine, National Chung Hsing University, 250 Kuo Kuang Road, Taichung, Taiwan.

Tel: 886-4-286-0013; Fax: 886-4-286-2037; E-mail: 211HKOOI@vax9K.nchu.edu.tw

RESULTS

Of the 45 fish examined, all were found to harbor metacercariae in their muscle. Preliminary microscopic examination of squash preparation of muscle showed that majority of the metacercariae were found in the tail region of the fish. The number of metacercariae isolated from each fish ranged from 2 to 2,185, with an average of 254. A total of 11,443 metacercariae was collected from the 45 fishes. Of the 4,223 metacercariae that were examined under light microscope, 4,064 (96.23%) were found to belong to *Haplorchis taichui*, 90 (2.13%) to *H. pumilio*, 2 (0.05%) to *C. sinensis* and 67 (1.59%) to unknown species due to metacercariae being not yet developed or immature. The *C. sinensis* metacercariae were obtained from 2 out of 45 fish examined.

DISCUSSION

Although our primary objective was to investigate the prevalence of *C. sinensis* in the fish of Sun Moon lake, we found that the majority of the metacercariae examined were those of *Haplorchis* spp. *Haplorchis* spp are also known to infect man but with less severe clinical symptoms than *C. sinensis* (Radomyos *et al*, 1983). *Haplorchis* spp have been reported to occur not only in fish-eating birds such as night heron and egret, but also in cat, dog and pig (Varghese *et al*, 1971).

Between 1984 to 1987, Cheng (1988), reported that of the 36,376 metacercariae from 10 *H. leucisculus* caught in the Sun Moon lake, 27,869 (76.6%) were those of *C. sinensis* and *Haplorchis* spp constituted only 6,835 (18.8%). Wang *et al* (1980) also reported that of 120 fish from the Sun Moon lake that were examined, all were positive for *C. sinensis*. Thus, our results contrasted with those previous reports which found a comparatively high prevalence of *C. sinensis* in *H. leucisculus* in Sun Moon lake.

It was reported about one and a half decade ago that one-third of the pig farms on the bank of the Sun Moon lake were rearing pigs that were infected with *C. sinensis* and their dropping had found a way into the lake (Wang *et al*, 1980). This might have contributed to the high prevalence of *C. sinensis* in the fish. Moreover, Wang *et al* (1980), also reported that of the 289 students and staff of two lakeside schools who were examined by intradermal test for *C. sinensis* infection, 39 (13.5%) were found to be positive. Some possible reasons for the decrease of *C. sinensis* metacercariae in the fish are the disappearance of pig farms around

the lake, increased awareness of the trematode by the lakeside inhabitants and the primary use of mammals as its definitive host by *C. sinensis*. In contrast, besides mammals, *Haplorchis* spp also use birds as their definitive hosts (Yamaguti, 1958).

One possible factor for the increase in the prevalence of *Haplorchis* spp in the fish of Sun Moon lake may be due to the designation of an area in the lake as a sanctuary for water-fowls. Our present result is based only on a single sampling of the fish in winter. We are presently monitoring the prevalence of the metacercariae in the fishes on a bimonthly basis to see if there is any seasonal changes in their infectivity rate, especially those of *C. sinensis*. A parasitological survey of the helminths fauna of waterfowls inhabiting the lake may also be warranted.

REFERENCES

- Chen ER. Clonorchiasis in Taiwan. In: Cross JH, ed, Emerging Problems in Food-borne parasitic zoonosis: Impact on Agriculture and Public Health, published by SEAMEO Regional Tropical Medicine and Public Health Project, Bangkok, Thailand 1991: pp 184-5.
- Cheng CW. Studies on genus *Haplorchis* trematode in Taiwan. *Hirotsuki Med J* 1988; 40: 130-54 (Jpn with English summary).
- Radomyos P, Bunnag D, Harinasuta T. *Haplorchis pumilio* (Looss) infection in man in Northeastern Thailand. *Southeast Asian J Trop Med Public Health* 1983; 14: 223-7.
- Scholz T, Ditrich O, Giboda M. Differential diagnosis of Opisthorchiid and Heterophyid metacercariae (Trematoda) infecting flesh of cyprinid fish from Nam Ngum dam lake in Laos. In: Cross JH, ed. Emerging Problems in Food-borne parasitic Zoonosis: Impact on Agriculture and Public Health, published by SEAMEO Regional Tropical Medicine and Public Health Project, Bangkok, Thailand 1991: pp 171-3.
- Varghese CG, Pillai KM, Thomas PC, Peter CT. On the occurrence of *Haplorchis taichui* (Nishigori, 1924) Witenberg, 1930 (Trematoda: Heterophyidae) in Domestic pigs (*Sus scrofa domestica*). *Jpn J Parasitol* 1971; 20: 406-9.
- Wang JS, Tung PC, Cheng HW, *et al*. Studies on the control of zoonotic clonorchiasis. I. An epidemiological survey in several areas of Taiwan. *Nat Sci Council Monthly ROC* 1980; 8: 113-22 (Chinese with English summary)
- Yamaguti S. Systema helminthum. Vol 1. The digenetic trematodes of vertebrates. New York: Interscience Publ, 1958: pp 1-979.