CHAPTER 1

INTRODUCTION

Fish-borne trematode infections represent an important medical problem, especially those of liver fluke and intestinal fluke infections which are widely spread in many parts of the world. *Haplorchis taichui* is a minute intestinal fluke and causes an epidemic disease in many areas. The adult of *H. taichui* is able to develop in the small intestine of birds and mammals, including humans (Faust and Nishigori, 1926; Yamaguti, 1958; Cheng, 1964; Belding, 1965). Human infections by this parasite had been reported in Bangladesh, China, Egypt, Iran, Laos, Taiwan, Thailand, and the Philippines (Africa *et al.*, 1935; Kuntz *et al.*, 1958; Kuntz, 1960; WHO, 1995; Ooi *et al.*, 2002; Belizario *et al.*, 2004). The parasite's mode of transmission is closely linked to human behavioral patterns and specifically to methods of food preparation in the epidemic countries. *H. taichui* is acquired by eating raw or insufficiently cooked fish, for example in the form of "*koipla*" or "*lappla*" (raw fish in spicy sauce) and "*plara*" or "*plasom*" (salted semi-fermented fish). The local Thai dish, *lappla* is a major source of fish-borne trematode infections in northern Thailand (Radomyos *et al.*, 1998; Sukontason *et al.*, 1998).

Humans acquired infections from eating raw or undercooked freshwater fish containing metacercariae (infective stage) of *H. taichui*. Cyprinoid fish are an important second intermediate host of this fluke. Many kinds are important human food sources (Kliks and Tantachamrun, 1974; Srisawangwong, *et al.*, 1997b; Sukontason *et al.*, 1999). In north and north-eastern Thailand there are many reports of *H. taichui* infection in humans (Manning *et al.*, 1971; Kliks and Tantachamrun, 1974;

Tantachamrun and Kliks, 1978; Radomyos *et al.*, 1994; 1998). The epidemiologic status of this fluke is determined by the presence of the snail (first intermediate host) and the freshwater fish (second intermediate host) and the eating habit of people. In addition, unsanitary latrines of rural people on farms or paddy fields present problems since poor sanitation and unsanitary personal hygiene can increase the risk of food-borne trematode infections.

In Thailand, there have been few published studies on the life history of *H. taichui*. The snail host, *Melanoides tuberculata* is the first intermediate host of this fluke (Kliks and Tantachumrun, 1974). Freshwater fish belonging to the family Cyprinidae are the major second intermediate hosts of *H. taichui*. Many species of cyprinoid fish are commonly found infected with *H. taichui* (Srisawanwong *et al.*, 1997b; Sukontason *et al.*, 1999; Wongsawad *et al.*, 2000). Most importantly, the second intermediate hosts of this trematode have metacercariae which infected definitive hosts, including humans. *H. taichui* is commonly found together with *Opisthorchis viverrini*, a liver fluke, and the eggs of both species are similar and difficult to distinguish. *H. taichui* infections have also been reported in the same opisthorchiasis epidemic areas in north and northeast Thailand (Radomyos *et al.*, 1994; 1998; Pungpak *et al.*, 1998).

After a control program by the Thai Ministry of Public Health to prevent food-borne parasitic zoonoses and treatment for opisthorchiasis in 1984, the prevalence of opisthorchiasis in Thailand has continuously declined (Ramasoota, 1991; Jongsuksantikul *et al.*, 1992; Radomyos, *et al.*, 1998). In contrast, *H. taichui* is still predominantly found in high prevalences (Srisawangwong *et al.*, 1997b; Radomyos *et al.*, 1998; Sukontason *et al.*, 1999). The diagnosis can be made by clinical symtoms

in areas where infections occured and is confirmed by detecting the eggs in human stools. Since the eggs of *H. taichui* are very similar to those of *O. viverrini*, it can cause inaccurate reporting of the epidemiological status of both flukes. Accurated species identification is an essential measure to prevent and control these fluke infections.

For the pathogenicity, some papers have been reported on heterophyid flukes. Adult worms live in the crypts of the small intestine. The worms can cause mucosal ulceration, haemorrhages, fusion and blunting of villi, and chronic inflammation of the submucosa (Sukontason *et al.*, 2005). Occasionally, the eggs of this fluke become deposited in the spinal cord or heart of man. Cases have been reported in *Haplorchis* species in the Philippines (Africa *et al.*, 1937a; 1937b). The drugs used for treatment of heterophyid flukes are niclosamide (Khalil and Rifaat, 1964; Rim 1975; Beaver *et al.*, 1984; Sukontason *et al.*, 2000b), praziquantel (Pungpuk *et al.*, 1998; Radomyos *et al.*, 1998; Chai and Lee, 2002; Chai *et al.*, 2005), and albendazole (Waikagul *et al.*, 2003).

Food-borne intestinal fluke infections are directly related to public health. Educational efforts should be made to inform people in endemic areas about the life cycle and the mode of transmission of the parasites to prevent infection. This study will present the prevalence of *H. taichui* metacercariae infection in cyprinoid fish which are important food to the local people in Chiang Mai Province. Also included is a study of its life history using various hosts in laboratory conditions. A scanning electron microscope (SEM) was used to compare the ultrastructural surface of the infective and adult stages. In addition, the effect of anthelmintic treatment on the tegument is examined using various concentrations of niclosamide solution using a scanning electron microscope (SEM) and a transmission electron microscope (TEM).

RESEARCH OBJECTIVES

1. To study the prevalence of *H. taichui* infections in cyprinoid fish from natural water resources in Chiang Mai province.
2. To investigate the life history of *H. taichui* in the laboratory using various hosts.
3. To study the surface ultrastructure of *H. taichui* infective stage and adult.
4. To observe the tegumental changes of adult *H. taichui* after treatment with an anthelmintic drug by electron microscopy.