

EPIDEMIOLOGY AND CONTROL OF CLONORCHIASIS SINENSIS IN CHINA

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INTRODUCTION

Clonorchiasis sinensis is a food-borne parasitic zoonosis caused by *Clonorchis sinensis* which infects fish-eating mammals including humans, dogs, cats and pigs. The disease is prevalent in East Asian and Southeast Asian countries. Boott in 1903 first proved the presence of the disease in China. In 1930s doctors from Europe and America, and Japanese carried out the occasional survey in coastal cities of southeast and northern cities of northeast China respectively. The infective rates ranged from 0.2% to 53.7%. After 1940s Chinese scholars contributed further studies on epidemic investigation and conducted extensive surveys in almost all counties or cities after liberation, especially in the last 30 years. The disease has been reported to be endemic in 24 provinces and municipalities of China, namely, Guangdong, Guangxi, Taiwan, Hainan, Fujian, Zhejiang, Jiangsu, Anhui, Jiangxi, Hubei, Hunan, Sichuan, Guizhou, Yunnan, Henan, Shandong, Shanxi, Hebei, Liaoning, Jilin, Heilongjiang, Beijing, Tianjin and Shanghai (Zuo *et al*, 1999). Among these two provinces of Guangdong and Guangxi in the south, especially in Zhujiang delta are listed as major endemic areas; Hong Kong, Taiwan,

Heilongjiang, Liaoning and Jilin are of minor significance. Moreover, the infection rates among inhabitants in Jiangxi, Hubei, Hunan Provinces of the central-south China increased as the climate and environment are favorable for the first, secondary intermediate and reservoir host of *C. sinensis*. The epidemiology and control of clonorchiasis in China are reviewed in this paper.

EPIDEMIOLOGICAL INVESTIGATION

Infection situation of the intermediate host

The freshwater snail which is the first intermediate host belong to 8 species in 6 genera: *Parafossalurus striatulus*, *Alocinma longicornis* and *Bithynia fuchsianus* were the most heavily infected species. The fluke has low selectivity to secondary intermediate host. The freshwater fish or shrimp may be infected (Qou, 1998). The intensity and prevalence of infection in *Pseudorasbora parva* was high (Table 1). Moreover, the infection rate of young fish seems to be on the rise in recent years. Among these *Parabramis* sp and *Hypophthalmichthys* sp are over 80% infected.

Table 1
Incidence of infection of intermediate host of *C. sinensis* in China.

Intermediate host	Number examined	Number infected	Positive rate
Snails	1,500	336	67.2
<i>Parafossalurus striatulu</i>	1,310	33	2.5
<i>Alocinma longicornis</i>	950	19	2.0
Shrimps	52	15	28.8
<i>Pseudorasbora parva</i>	307	124	40.4
<i>Helniculter leucisculus</i>	201	12	6.0
<i>Misgurnus ulicaudatus</i>	209	63	30.1
<i>Carassius auratus</i>	234	37	15.8
<i>Abbottina sinensis</i>	30	8	26.7
<i>Hypophthalmichthys molitrix</i>	29	5	17.2
<i>H. nobilis</i>	33	6	18.2
<i>Pseudobagrus fulvidraco</i>	8	4	50.0

Table 2
The incidence of *C. sinensis* infections in reservoir host.

Reservoir host	Number examined	Number infected	Positive rate (%)
Pig	85	17	20.2
Cat	45	19	42.2
Dog	18	5	27.8
Buffalo	12	0	0
Cattle	7	0	0
Mice	10	0	0

Table 3
Incidence of *C. sinensis* infection in human population of different areas.

Area	No. plot	No. of people examined			No. of people infected (%)			Year of report (author)
		Male	Female	Total	Male	Female	Total	
Liaoning	27	7,781	6,609	14,390	39 (0.50)	21 (0.32)	60 (0.42)	1998 (Xu <i>et al</i>)
Jilin	1	463	447	910	72 (15.6)	9 (2.0)	81 (8.9)	1998 (Wang <i>et al</i>)
Hubei	20	3,641	3,215	6,856	267 (7.33)	131 (4.0)	398 (5.81)	1996 (Cheng <i>et al</i>)
Shandong	1	4,018	3,794	7,812	165 (4.11)	98 (2.58)	263 (3.27)	1998 (Qou)
Guangdong	5	514	546	1,060	127 (24.71)	57 (10.44)	184 (17.36)	1999 (Huang <i>et al</i>)
Total	59	16,417	14,611	31,028	670 (4.08)	316 (2.16)	986 (3.18)	

Infection situation of reservoir host

The reservoir host of *C. sinensis* is domestic and wild animals such as cats, dogs, pigs, wild cat, marten, rabbit, buffalos, camels and others. Among these, pigs, cats and dogs were infected at rates of 3.8%, 48.2% and 18.2% respectively (Table 2).

Incidence of human infection

According to recent reports from five provinces (Liaoning, Jilin, Hubei, Shandong and Guangdong), the mean prevalence of the human population was 3.18%, being 17.36% and 8.9% for Guangdong (South China) and Jilin (Northeast China) respectively. The disease was mainly found in adults and Korean ethnic groups. The incidence in males was higher (4.08%) than that in women (2.16%) (Table 3).

ANALYSIS OF THE PRESENT ENDEMIC SITUATION

Mode of infection

Infections have been attributed to eating raw or undercooked fish and shrimps. The infection mode varies with different areas. In Liaoning Province, the disease was mainly adults or Korean ethnic groups. Human infection was found to be related to eating raw fish or the habit of eating raw fish together with wine.

In Jilin Province the Korean ethnic group still keep the ancient habit of eating raw fish, 30% of which had metacercaria. Among the Koreans, about one tenth of the people were infected. The human infection in Hubei Province was associated with holding fish between one's teeth when fishing or eating small raw fishes. Cooking utensils such as knives and chopping board are often contaminated. Human infection has been attributed to feeding undercooked roast fish or pan fish in Shandong Province and to eating raw fish dishes in Guangdong Province.

The reservoir hosts, cat and dog, become infected by either feeding on raw fish or fish waste, sewage from contaminated knives and chopping boards, or going to rivers, ponds or ditches and feeding on raw fish found on the ground. The occurrence of pig clonorchiasis in Neimengu Autonomous Region was caused by feeding pigs with raw fish or shrimp waste from restaurants (Liu *et al*, 1999).

Epidemic tendency

The prevalence of *C. sinensis* in China differs in various areas. According to a recent survey, the infection rate of citizens in Liaoning Province is declining (0.24%). There are two reasons responsible for this: Firstly, with the improvement of living standards people changed their habits of eating raw

small fish into raw large culture fish, while the latter did not contain metacercaria of *C. sinensis*. Secondly, because of industrial pollution some wild fishes in the river pick up kerosene or other substances. This discourages people from eating wild fish and reduced chances of infection. In contrast, the infection rate of citizens in Guangdong Province remains very high (17.4%), especially among urban inhabitants that show a tendency to increase. The main reason is that the people changed their gourmet requirement, and considered eating raw meat as a fashionable trend with the improving living standards of the people (Li, 1999). Therefore, food-borne parasitic zoonoses increased, clonorchiasis extended from the countryside to the city and from targeting peasants to targeting urban population, a new epidemic tendency of clonorchiasis in China.

Comprehensive analysis of prevailing factors

China lies in the tropic and sub-tropic zone with a temperate climate, sufficient rainfall, numerous rivers and ponds, and plentiful fresh water fish and snails. Moreover, many inhabitants of various areas have the custom of consuming raw or undercooked fish (Fang *et al*, 1996). All these provide favorable conditions for the prevalence of clonorchiasis. Wei *et al* (1997) conducted a comprehensive evaluation of the natural, social and biological factors on the prevalence of clonorchiasis. Mean rainfall, mean temperature per year and water content; collective examination and treatment of inhabitants, attitude towards prevention and treatment, and hygienic knowledge; and prevalence of human infection, types of infectious agents and infection rate of fish were listed as the natural, social and biological factors respectively. Among these, collective examination and treatment of inhabitants were the most important factors.

CONTROL COUNTERMEASURES

Principle of prevention and control

Clonorchiasis is a food-borne parasitic zoonosis. Humans and other mammals become infected by eating raw or undercooked fish. The control measure is theoretically very simple, but it is not too easy to completely change traditional habits and customs of inhabitants. So, controlling the disease should adopt the principle of "individual guidance in the light of local condition." According to different mode of human infection, the endemic zone may be divided into known infection type and unknown infection type. The inhabitants of Guangdong Province and Yanbian Autonomous Region of Jilin Province were infected mainly by eating raw fish, and listed as known infection

type. While the inhabitants of Hubei and Henan Provinces were infected mainly by eating undercooked fish, listed as unknown infection type. Principal measure as chemotherapy to control infectious agent, and in addition to education on dietary habits should be adopted.

Measures of prevention and control

Chemotherapy: Chemotherapeutic measures may be conducted under three situations. Firstly, medical and hygienic units at different levels in the endemic areas set up the routine test for the diagnosis of clonorchiasis and prompt care. Secondly, general survey of the disease should be carried out in the endemic zone by installments and the patient examined. Thirdly, all inhabitants in highly endemic zone should receive preventive medicine. Meanwhile, chemotherapeutic measures should be conducted on important reservoir hosts such as cats, dogs and pigs.

Educational programs: The full use of television, radio broadcasts, propaganda booklets, question and answer sessions to inform the inhabitants the infection mode, transmission route and danger of the disease should be exploited. The inhabitants should establish the sense of health self-protection conscientiously, correct bad habits and avoid eating raw or undercooked fish or shrimps, use separate chopping board for raw and cooked dishes to reduce or prevent the infection of metacercaria.

Decontamination of fish pond: After all culture fishes are removed in May or April each year, and when the water level of ponds rises highest, the first or second intermediate host can be killed with infusion of sodium pentachlorophenol at the level of 15 ppm.

Observation of pilot areas

After two pilot villages in Jiangxi Province adopted "chemical medication and excrement management" or "decontamination of fish pond and fecal examination plus chemotherapy of infected patient," the incidence in human was controlled, but *Parafossalurus striatulus* infection remained high from beginning to the end. This was due to not adopting effective synchronous chemotherapy of man and domestic animal. The pilot village in Guangdong Province conducted hygienic publicity and education (not to raise fish with fresh excrement and not to eat raw fish) and fecal examination of inhabitants, treatment with praziquantel at 100 mg per kg for two days of egg-positive person. After examination and treatment for two years, the infection rate of rural inhabitants decreased from 65.5% to 19.4%, but they still have a habit of feeding fish with fresh excrement and eating raw fish.

Therefore, the control of clonorchiasis requires increased intensity in education, change of dietary habits to prevent repeated infection or new infection. In the endemic district repeated examination and treatment need to be carried out to further augment the effect of disease control and prevention.

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