

FOOD-BORNE PARASITIC ZONOSSES IN THE PEOPLE'S REPUBLIC OF CHINA

Li Xiaopeng

Guangxi Institute of Parasitic Diseases Control, Nanning, Guangxi, People's Republic of China.

Abstract. The People's Republic of China has a large number of animal parasites transmitted through the ingestion of food products. Approximately 20 species of parasites in animals and man are reported from most of the provinces and autonomous regions of the country. The major food-borne parasitic zoonoses are reported from pigs, cattle, fish, crabs and crayfish, snails, frogs, snakes, and aquatic plants. The most important diseases are toxoplasmosis, taeniasis, cysticercosis, sparganosis, clonorchiasis, fascioliasis, fasciolopsiasis, paragonomiasis, echinostomiasis, trichinosis, gnathostomiasis, and angiostrongyliasis. There is concern that some of these parasitoses may develop into more serious problems because of the increase in free-market commerce and the lack of adequate inspection of food products. Furthermore, many cultures in China enjoy eating raw or inadequately cooked food products. Control programs have been initiated utilizing newer drugs, but there must also be educational programs, as well as an improvement in sanitation.

INTRODUCTION

Food-borne parasitic diseases are a serious problem in China. Many parasites are involved and they are widespread throughout the country. The food-borne parasites consist of 20 species, including two protozoan species, eight flukes or trematodes, five species of tapeworms or cestodes, and five roundworm or nematode species. They are reported from 24 provinces or autonomous regions of the country (Table 1).

MEAT-BORNE

Sarcocystosis

The reports of *Sarcocystis* infections are usually associated with the eating of raw beef. During the past decade 88 human cases of sarcocystosis have been reported, especially in the minority groups in Yunnan Province, Guangxi and Xizang Autonomous Regions. Reported infection rates in Yunnan have been 14 and 27.1% and the species involved was *S. suihominis* (Wang *et al*, 1989); in Guangxi, 11.3% of the Dongzu minority were infected with *S. hominis*. Sarcocystis was reported in 94.4% of the cattle in Guangxi (Cue, 1990).

Toxoplasmosis

Serological surveys for antibodies to *Toxoplasma gondii* were carried out in humans using the indirect hemagglutination test (IHA) in 19 provinces of China. About 80,000 human sera were tested and 5.2% (0.33-11.8%) were considered positive. Sera from 17 species of domesticated animals from 14 provinces were also tested and the prevalence of positive antibody titers was 15.4% in over 39,000 animals tested (Cui *et al*, 1988).

Taeniasis

Taenia saginata is widespread in China with human infection reported from most places. In minority populations in Guizhou and Guangxi Provinces infected rates range from 2-70% (Gu, 1983a; Jing, 1986).

Taenia solium infection is especially high among the minorities in Yunnan, Guizhou, and Guangxi, and is distributed widely in the north-eastern and eastern parts of China. Infection rates reported, however, range only from 1-15.2% (Gu, 1983b). Cysticercosis in humans is somewhat low (0.14%) (Gu, 1983b; Xu, 1986).

Table 1

Food-borne parasitic zoonoses in China.

Food	Diseases	No. provinces endemic	Infection rate	
Beef, pork	Sarcocystosis	3	4-27.%	
	Toxoplasmosis	19	0.3-11.8%	
	Taeniasis	20	2-70%	
	Cysticercosis	20	0.1-0.5%	
	Trichinosis	18	1.6-57%	
Fish	Clonorchiasis	24	1-57%	
	Opisthorchiasis	3	animals	
	Metagonimiasis	In Taiwan	a few	
	Heterophyiasis	2	rarely	
	Echinostomiasis	10	5.0%	
	Diphyllobothriasis	2	rarely	
	Gnathostomiasis	5	10	
	Capillariasis	3	5	
	Marine fish	Anisakiasis	Yellow Sea	83.1%
	Crabs, crayfish	Paragonimiasis	24	4-100% (crabs)
Snails	Angiostrongyliasis	2	6 cases	
Frogs, snakes	Sparganosis	18	313 cases	
Aquatic plants	Fasciolopsiasis	18	4-58%	
	Fascioliasis	10	30 cases	

Trichinosis

During the past 20 years reports of trichinosis have been increasing; epidemics have also occurred. In 1975, an epidemic occurred in Yunnan Province, in which 227 of 247 (91.9%) became infected after eating pork. Fourteen species of animals were also found infected. In Henan Province, 33.3% of 3,630 pigs and 5.2% of 347 rats examined were infected (Wu, 1986).

FISH-BORNE**Clonorchiasis**

Clonorchis sinensis is reported in 24 provinces of China. It is widespread and is also associated with disease among some people. There are an estimated three million human infections in Guangdong Province, one million in Guangxi Autonomous Region. Seven species of freshwater snails are reported first intermediate hosts; 8% of *Parafossarulus striatulus* and 27.5% of *Alocinma longicornis* were found naturally infected in

Guangdong Province. Over 80 species of freshwater fish (mostly Cyprinidae) are second intermediate hosts, and there are at least 10 species of animals that serve as reservoir hosts. Pigs are important reservoirs with infection rates of 11.7% in Sichuan Province and 35.3% in Henan Province (Cao, 1986).

Metagonimiasis

Metagonimus yokogawai is reported only in human in Taiwan (He, 1986).

Heterophyiasis

Heterophyid sp. infection are reported from humans on Taiwan (Xu, 1979) and in Guangzhou, 58.6% cats are reported infected with both *H. heterophyes* and *C. sinensis* (Xu, 1983). There are probably more human infections but the eggs of heterophyid species cannot be easily differentiated.

Echinostomiasis

Seven species of echinostomes are reported from Taiwan; Guangdong, Guangxi, Yunnan,

Fujian, Hubei, Liaoning, and Sichuan Provinces; and Beijing. *Echinostoma perfoliatum* is reported from 5% of the populations of Fujian and Guangdong Provinces. Natural infections are reported from 9.5% of cats and 39.7% of dogs. Seven species of freshwater fish are reported second intermediate hosts with infection rates as high as 80%.

Diphyllobothriasis

Only three cases of diphyllobothriid infections were reported in China from 1951-1953, and none since then (Xu, 1986).

Gnathostomiasis

There are 10 reported human cases of infection with *Gnathostoma spinigerum* in China, but dog and cat infections are reported from many provinces (Ye, 1983; Tan, 1987). Other species of *Gnathostoma* are reported, especially from Taiwan.

Capillariasis

Capillaria hepatica infections are present in rats and pigs in China (Zhang, 1990). One case of *Capillaria philippinensis* is reported from Taiwan (Chen *et al.*, 1989). Spurious infections of *C. hepatica* are also documented (Jiang, 1983).

Anisakiasis

Sun (1986) examined 33 species of marine fish, squid and cuttlefish from the Yellow Sea and found 83% with *Anisakis* type I third-stage larvae.

CRUSTACEAN-BORNE

Paragonimiasis

There are 29 species of *Paragonimus* described from 24 provinces and municipalities of China. Lung infections with *P. westermani* are the most common in the northeast, while cutaneous infections with *P. skrjabini* are reported in the south and eastern parts of the country. Twenty-two species of snails with infection rates of 0.02-4.17% are reported from some areas; *Semisulcospira libertina* is the most important. Crabs (*Eriocheir* spp. and *Potamon*) and crayfish (*Cambaroides* spp.) are second intermediate hosts. Various carnivorous mammals (canines and felines) serve as natural definitive hosts (Chen, 1983).

SNAIL-BORNE

Angiostrongyliasis

Angiostrongylus cantonensis was first reported in rats in China and the first human infection was from Taiwan. Taiwan has reported many human cases over the years, but there are few reports from the China mainland. One case was reported from Guangzhou (Xu, 1979), and there is one report of recovery of the parasite from cerebrospinal fluid (He, 1984). *Rattus* species are natural definitive hosts and *Achatina fulica* and *Vaginulus yuxisii* are intermediate hosts. *Angiostrongylus cantonensis* infection rates in these molluscs are 37.2% and 23.1%, respectively (Liang, 1989).

Echinostomiasis

Several species of *Echinostoma* are acquired by eating raw snails.

AMPHIBIAN AND REPTILE-BORNE

Sparganosis

There are over 300 cases of sparganosis reported from China; most have been due to infection with *Spirometra mansoni* and reported from Jilin, Sichuan, Yunnan, Guizhou, Henan, Hubei, Guangdong, Guangxi, and Fujian Provinces and several Autonomous Regions. The frog, *Rana tigrina rugurosa*, is the most important source, with spargana being found in 61-91.2% of the frogs examined. Snakes are also important second intermediate hosts (Chen, 1983; Wang, 1983; Sheng, 1988).

PLANT-BORNE

Fasciolopsiasis

Human infection with *Fasciolopsis buski* in 18 provinces ranges from 4.6-57.7%. There are four species of snails that serve as intermediate hosts; *Segmentina hemisphaerula* and *Hippeutis cantori* are the most important. The main sources of infection are water caltrop, water chestnut, water bamboo, and lotus roots (Gao, 1983). Pig is a major natural reservoir host.

CONTROL OF FOOD-BORNE PARASITES

Many of the food-borne parasitoses, once highly endemic throughout China, are now decreasing

because of treatment and control programs. In north China, clonorchiasis was once as high as 12%, but subsequently has decreased to 3.8%.

Cysticercus infections in pigs have decreased from 6.4 to 0.6%, and from 10 to 0.3% in Jilin and Hubei Provinces. Fasciolopsiasis control measures reduced human infections from 75% to 0.24%, and by treating humans with paragonimiasis, the crab infection rates decreased from 37.3% to 0.3%.

COMMENTS

China has a long history of being plagued by parasitic diseases. Schistosomiasis, malaria, leishmaniasis and filariasis are or have been widespread and, although efforts to control these have been successful, they are still endemic in many places. The emphasis on parasitic disease control has been on these four diseases with little effort to control other parasitoses. Food-borne parasitic diseases are not as serious, but they can cause a great deal of pathology. It is of concern, however, that they are increasing in prevalence. With the improvement in life style of some Chinese, many population groups are eating more meat. Often the meat is not inspected for parasites and consequently parasitoses, such as trichinosis, taeniasis, and cysticercosis are increasing. Some gains have been made in reducing clonorchiasis and paragonimiasis by treatment campaigns. People, however, still like to eat fish and crabs raw or inadequately cooked. Therefore, educational campaigns must also be part of any control program.

Another important factor is the evolution of the free market and the lack of supervised food inspection. This could lead to the increase of many parasitic zoonotic diseases. This is of special concern where populations eat raw food. Cultural habits of eating raw foods must change before the diseases can be eliminated from humans.

In the future, programs should be formulated to control food-borne parasitoses. A comprehensive study should be carried out country-wide to assess the problem. Treatment programs should be initiated for both humans and domestic animal reservoirs and mass educational campaigns conducted. New methods of diagnosis should be found using the latest technological methods and surveillance continued to insure control and eradication.

The standard of living and life style is changing in China and along with this must come an improvement in sanitation and control of infections and parasitic diseases.

REFERENCES

- Cao WC. Clonorchiasis. *Epidemiol* 1986; 245.
- Chen C. Paragonimiasis. *Human Parasitol* 1983; 430-50.
- Chen CY, Hsien WC, Lin JT. Intestinal capillariasis. Report of a case. *J Formosan Med Assoc* 1989; 88 : 617-2.
- Chen GG. Natural infection of *Sparganum* in *Rana rugurosa* in Fuzhou Fujian Province 1983; 1 : 36.
- Cue YX. Sarcocystosis in Guangxi Province. *Chin Zoon J* 1990; 6 : 60-1.
- Cui JZ. Seroepidemiological investigation on toxoplasmosis in humans and domestic animals in 19 provinces of China during 1983-1986 *Chin Public Health Suppl* 1988; 54 pp.
- Gao LS. Fasciolopsiasis. *Human Parasitol* 1983; 369-84.
- Gu YM. Taeniasis saginata. *Human Parasitol* 1983a; 492-504.
- Gu YM. Taeniasis solium. *Human Parasitol* 1983b; 505-10.
- He LY. Metagonimiasis yokogawi. *Trop Med* 1986; 982-3.
- He JZ. The first recovery of *Angiostrongylus* from spinal fluid in Mainland China. *Acta Guangzhou Med Coll* 1984; 1-4.
- Jiang CX. Capillariasis. *Human Parasitol* 1983; 600-9.
- Jing DX. Taeniasis saginata. *Trop Med* 1986; 987-93.
- Liang HK. Investigations of *Angiostrongylus cantonensis* in areas of Guangdong Province. *Chin J Parasitol Dis Contr* 1989; 2 : 204-5.
- Sheng JD. The natural infection of sparganum in frogs and toads in suburbs of Guangzhou. *J Parasitol Parasit Dis* 1988; 6 : 120.
- Sun SZ. Preliminary investigation on *Anisakis* larvae infestation in marine fish. *J Parasitol Parasit Dis* 1986; 4 : 181-5.
- Tan ZZ. Gnathostomatoidea. In: *Nematology of Human and Animals* 1987; 392-413.
- Wang JS. Sparganosis. *Human Parasitol* 1983; 551-5.
- Wang ZX, Huang HM, Lian LC. Preliminary investigation on Sarcosporidiosis hominis in Gengma, Yunnan. *J Parasitol Parasit Dis* 1989; 7 : 234.

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Wu AH. An investigation on trichinosis in Deng-xian County, Henan. *J Parasitol Parasit Dis* 1986; 4 : 66.

Xu BK. The status of rare human parasites in China. *J Chin Med* 1979; 59 : 286-96.

Xu BK. *Heterophyes*. *Human Parasitol* 1983; 472-82.

Xu BK. Diphyllbothriasis. *Trop Med* 1986; 1015-6.

Ye SM. Gnathostomiasis. *Human Parasitol* 1983; 704-71.

Zhang HX. A pig infected with *Capillaria hepatica*. *Chin Zoon J* 1990; 6 : 26.