FOOD-BORNE PARASITIC ZOONOSES IN THE PHILIPPINES

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Abstract. A number of food-borne parasitic zoonoses have been recorded in the Philippines and include echinostomiasis, artyfechinostomosis, fascioliasis, heterophydiasis, carneophallosis, clonorchiasis, paragonimiasis, taeniasis, echinococcosis/hydatidosis, diphyllobothriosis/spirometrosis and sparganosis, intestinal capillariasis, gnathostomiasis, angiostrongylosis, toxoplasmosis and sarcosporidiosis.

Some are now rarely observed while others continue to be public health problems. Many are endemic in certain areas of the Philippines because of the habit of consuming raw or partly cooked fish, snails, crustaceans, and meat. Artyfechinostomosis caused by *Artyfechinostomum malayanum* is a recently recognized problem in the Philippines and is reported in man and pigs. Human infection results from ingesting raw or partly cooked the freshwater snail, *Bullastra cumingiana* which serves as second intermediate host.

More information on the epidemiology, transmission including the animal hosts involved locally are still needed for some of these problems. Human infection with many of these diseases can be prevented by changing the food habits, but this requires aggressive health education campaigns.

INTRODUCTION

Recent biomedical surveys conducted in the Philippines indicate that parasitic diseases still remain as important health problems in the country (Cross and Basaca-Sevilla, 1984) and these are aggravated by problems of poverty, malnutrition and a declining economy. Parasitic zoonoses are among these health problems exacting their tool to both man and animals.

The Philippines still holds the record with the fastest growing human population in Southeast Asia with an annual growth rate of 2.7% (Makati Business Club, 1989). The current population is nearly 62 million and if not checked, is projected in the year 2000 to become 75 million. On the other hand, food animal production has not increased and hence cannot supply the demand of the increasing human population. Recent statistics reveal a slow growth for food animal production. About two thirds of the human population live in the rural areas and a much larger proportion of the food animal population is raised in backyards or small farmer holder systems compared to the number raised in large commercial farms. This ecologic profile of human and animal population distribution makes a large proportion of both populations at risk.

This paper presents the status of food-borne parasitic zoonoses occurring in the Philippines. Only those parasites reported in both animals and man are discussed. Those species, while recorded in local animals and known to infect man, but with no local record of human infection, are excluded.

TREMATODE INFECTIONS

Echinostomiasis (Echinostomosis)

Echinostoma ilocanum is widespread in the Philippines with prevalence of 3% but is highest among Ilocanos in Northern Luzon where it averaged 11% and reached as high as 44% (Cross and Basaca-Sevilla, 1986).

Rattus spp. were recorded as important animal hosts and dogs and cats may be equally important. No data however are available on the prevalence of natural infection especially on the last two

hosts. Successful experimental infection have been achieved by feeding metacercariae to a variety of laboratory animal species but rats, mice and hamsters are the most susceptible hosts (Cross and Basaca-Sevilla, 1986).

Locally, the freshwater planorbid snail, *Gyraulus phrasadi* serves as the first intermediate host and the second intermediate hosts include a variety of freshwater snails including *G. phrasadi* and *Pila luzonica* (Tubangui, 1947). The latter species is eaten by Filipinos, thus it is considered the primary source of infection.

Artyfechinostomosis

Artyfechinostomum malayanum is the cause of this condition. It has been reported in literature also as *Echinostoma malayanum* and its synonyms, *Artyfechinostomum sufrartyfex* and *Cathaemasia cabrerai.* Its allocation to the genus *Artyfechinostomum* is discussed by Premvati and Pande (1974) and Eduardo (1989).

Although this species has been reported in other Asian countries, its occurrence in the Philippines has recently been recorded in man (Jueco and Monzon, 1984; Cabrera *et al,* 1986) and pig (Eduardo, 1989). Human infections with this species have been reported from Isabela and Tarlac provinces in Luzon (Monzon and Kitikoon, 1989). Pigs from the provinces of Pangasinan and Bulacan in Luzon were found naturally infected with this species (Eduardo, 1989).

The snail, *Bullastra cumingiana* is the second intermediate host and the source of human infection in the Philippines. All cases in Isabela had a history of eating this snail raw (Cabrera *et al,* 1986). *B. cumingiana* collected from two distant places namely, San Pablo, Laguna in Southern Luzon and Echague, Isabela in Northern Luzon were found naturally infected with metacercariae which when fed to rats and hamster yielded adult *A. malayanum* (Monzon and Kitikoon, 1989).

Fascioliasis (Fasciolosis)

Two species, *Fasciola gigantica* and *F. hepatica* have been reported in animals in the Philippines. The prevalence of *Fasciola* infection in domestic ruminants is high. In endemic areas, it may reach to as high as 95%. Control programs instituted on a nationwide scale in 1979-1981 reduced the infection rate in some areas. Lameta and Manuel (1981) found a prevalence of 3.6% in cattle and 38% in water buffaloes (carabaos). The snail intermediate hosts in this country are *Lymnaea philippinensis* and *L. auricularia rubiginosa* which are likewise distributed throughout the islands.

Only two cases of human infection with *Fasciola* have been recorded in the Philippines (Kuntz, 1963; Arambulo, 1971).

Heterophyidiasis (Heterophyidiosis)

In the Philippines, several species of the trematode family Heterophyidae have been recorded from carnivores and birds and the majority of which are known to be transmissible to man (Velasquez, 1973, 1975). Only four species: *Haplorchis taichui, H. yokogawai, Procerovum calderoni* and *Stellanthchasmus pseudocirrata* have actually been recorded in humans and associated with lesions in the heart, brain and spinal cord. Unspecified heterophyid infections of man detected through fecal examination have also been reported (Kuntz, 1963; Cross and Basaca-Sevilla, 1984).

There are no data available yet on the prevalence of infection in animals. In human, less than one percent of 30,000 stool samples examined from various places in the country was found positive for heterophyid ova (Cross and Basaca-Sevilla, 1984).

A variety of food fishes, both freshwater and marine have been found harboring metacercariae of heterophyid species (Velasquez, 1973). Infection therefore occurs through ingestion of raw or partly cooked fish containing metacercaria.

Carneophallosis

Carneophallus brevicaeca (Syn. : *Heterophyes brevicaeca; Spelotrema brevicaeca*) is the causative agent. This species was previously assigned to the family Heterophyidae but its life cycle pattern revealed that it belongs to the family Microphallidae (Velasquez, 1975).

In the Philippines, it has been reported in man associated with lesions in the heart and spinal cord; in bird, *Sterna albifrons sinensis* (Tubangui, 1947) and fish, *Glossogobius giurus* (Velasquez, 1975). The shrimp, *Macrobrachium* sp. has been found to harbor metacercariae of this species

which yielded adults when fed to experimental rats (Velasquez, 1975). Infection occurs through ingestion of raw or partly cooked shrimps.

Clonorchiasis (Clonorchiosis)

Clonorchis sinensis has been reported in man in the Philippines (Tubangui, 1947). In a survey of 30,000 Filipinos by Cross and Basaca-Sevilla (1984), ova similar to those of *Opisthorchis* or *Clonorchis sinensis* were detected in 135 stool samples.

It is a known fact that this parasite requires snails and a variety of freshwater fishes as intermediate hosts but the species involved in the Philippines are not yet known.

Paragonimiasis (Paragonimosis)

After a taxonomic study on the lung fluke occurring in the Philippines, Miyazaki (1981) concluded that there is only one species of *Paragonimus* in this country and this is *P. westermani filipinus.*

Paragonimus infection is endemic in certain areas in the Philippines. In endemic areas, the prevalence may reach 4.6-12.5% (Cabrera and Fevidal, 1974).

Examination of animals showed that wild rats *(Rattus norvegicus)* may play an important role in maintaining the cycle in nature. Prevalence may reach 9.4-11.1% in these animals (Cabrera, 1977).

The snail, *Brotea asperata* and the mountain crab, *Sundathelphusa philippina* are the first and second intermediate hosts, respectively. Infection is through consumption of infected crabs, raw or partly cooked.

CESTODE INFECTIONS

Taeniasis (Taeniosis)

Both *Taenia saginata* and *T. solium* occur in the Philippines. Various surveys showed *Taenia* prevalence of less than one percent (Arambulo *et al,* 1976). *T. saginata* is more common. Of 1,000 parasitologic examinations annually at the Philippine General Hospital, one *T. solium* and six *T. saginata* are seen every two years. In *T. saginata* endemic foci in Leyte, Cabrera (1973) reported a prevalence of 10.26% for this species.

Seven cases of human cysticercosis have been reported in the Philippines. All were diagnosed as either that of *T. solium* or highly suggestive of this species (Arambulo *et al,* 1976; Quimosing *et al,* 1984).

Cysticercosis is more common in swine than either in cattle or water buffalo. Arambulo *et al* (1976) reported the overall prevalence of cysticercosis in slaughtered animals for a five-year period (1970-1974) as follows: swine 1.67%, cattle 0.02% and water buffalo 0.03%.

Arambulo *et al* (1976) after animal experimentation, maintained that they were dealing with a Philippine species of *T. saginata* whose life cycle did not follow the classical cycle of man-bovidae for *T. saginata.*

Echinococcosis and hydatidosis

While echinoccocosis and hydatidosis are common in other parts of Asia, there are only occasional reports in the Philippines. *Echinococcus* cyst was recorded in the heart of cattle from Los Baños, Laguna and in the lungs of a water buffalo autopsied in Manila and there is only one record of *E. granulosus* infection in the dog in this country (Tubangui, 1947). Two local cases of human hydatidosis in the lungs have been reported (de Leon and Leiva, 1925; Lavadia *et al,* 1960).

Diphyllobothriosis/spirometrosis and sparganosis

Diphyllobothrium and *Spirometra* species and their spargana have been reported in animals in the Philippines. Sparganum is widespread in tadpoles and frogs (Jueco, 1982).

Stool survey showed diphyllobothrid ova in less than one percent of 30,000 persons examined in various places in the Philippines (Cross and Basaca-Sevilla, 1984).

Up to 1962, four human cases of sparganosis have been reported locally and no other cases have been reported since then. There was no history of having eaten fresh meat of frogs, reptiles and birds nor were they used as poultices; therefore, the mode of transmission was attributed to the drinking water being infected with cyclops (Jueco, 1982).

NEMATODE INFECTIONS

Gnathostomiasis (Gnathostomosis)

The genus *Gnathostoma* is represented in the Philippines by three species namely, *G. spinigerum, G. hispidium* and *G. doloresi.* All three have been recorded in other Asian countries but only *G. spinigerum* has been reported in man locally.

G. spinigerum has been reported locally in dogs, cats, flying lemur and palm civet. Copepods and freshwater fish serve as first- and second-intermediate hosts, respectively. Only two cases of human gnathostomiasis have been reported locally (Arambulo, 1971).

Both *G. hispidium* and *G. doloresi* have been recorded in pigs in the Philippines but no human cases have been reported.

Intestinal capillariasis (Capillariosis)

Intestinal capillariasis of man is caused by *Capillaria philippinensis.* In the Philippines, it is endemic in some coastal areas of Northern Luzon in the provinces of Ilocos Norte, Cagayan, Isabela, Ilocos Sur, La Union, Pangasinan and Zambales; and Agusan del Norte in Northeastern Mindanao. Since 1967, over 2,000 human cases have been documented (Cross and Bhaibulaya, 1983).

Although the cycle of *C. philippinensis* in nature has not been fully determined, experimental evidences point to fresh and brackishwater fishes as the source of infection. Development of the parasite to the infected larva has been demonstrated experimental in fishes found in endemic areas in Northern Luzon (Cross and Bhaibulaya, 1983). Autoinfection is a part of the cycle in mammals. Human infection may result from consumption of raw fish infected with larvae. The suggestion that fish-eating birds could be important reservoir host and may also be responsible in disseminating infection along their migratory path, may well be true. Experimental studies showed susceptibility of some birds to infection with the parasite. In the Philippines, a bird, *Ixobrychus* sp. (bittern) has been found to harbor a male specimen of the parasite. Cross and Bhaibulaya (1983) argued that if indeed fish-eating birds or mammals are the natural reservoir hosts in sylvatic areas, then other species of fish may be more commonly infected.

Angiostrongyliasis (Angiostrongylosis)

Angiostrongylus cantonensis is the only species of the genus reported in the Philippines. Several species of rats have been found naturally infected with the parasite with incidence ranging 3-10% (Arambulo, 1971; Cross, 1982). Some species of land snails and garden slugs were found harboring larvae of the parasite (Cross, 1982).

Ten human cases, all non-fatal, presumbly due to larvae of *A. cantonensis* have been reported locally (Garcia, 1979; Cross, 1982).

PROTOZOAN INFECTIONS

Toxoplasmosis

According to Cross and Basaca-Sevilla (1984), toxoplasmosis is not an important disease in the Philippines. Their surveys in man showed only 2.4% sero-positive.

In pigs, however, *Toxoplasma gondii* has been serologically detected and subsequently isolated. Surveys showed prevalence of 19% (Manual, 1981; Marbella, 1983). In rats, out of 344 examined, 8.1% had positive titers for *Toxoplasma* antibodies (Jueco and Garcia, 1980).

Sarcosporidiosis (Sarcocystosis)

There is very little information on sarcosporidiosis in the Philippines. The exact species of *Sarcocystis* present have not yet been established. Water buffaloes, however, have been found to be frequently affected with sarcocyst. Arambulo *et al* (1972) noted 4.9% out of 1,148 water buffalo carcasses positive for sarcosporidia based on visual inspection at post mortem. Manual *et al* (1983) found 63.5% of water buffaloes examined positive for macroscopic and microscopic sarcocysts. There is no report of any human case of sarcosporidiosis in the Philippines.

DISTRIBUTION, FOOD HABITS, TRANSMISSION AND PREVENTION

It is difficult to ascertain the exact distribution of the parasites in the Philippines. While human infections have been recorded in certain areas, there is a dearth of information on animal infec-

tions or vice versa. It is apparent, however, that these diseases are endemic in parts of the country where eating habits of the people favor infection with the parasite.

The Ilocanos of Northern Luzon are noted for their *"kilawen"*, a term given to any preparation of raw meat, fish, snail, shrimp or crab, etc usually with salt, vinegar and sometimes spices. Human cases of echinostomiasis, artyfechinostomosis, and intestinal capillariasis have been mainly from this part of the country. In Isabela where human cases of artyfechinostomosis have been reported, *Bullastra cumingiana,* locally known as *"birabid"* is eaten raw. It is prepared by shaking the snail in salt to remove mucus, then salt, ginger, onion, vinegar, pepper and other spices are added (Cabrera *et al,* 1986). On the other hand, in San Pablo, Laguna in Southern Luzon, where the same snail has been found to have an even higher percentage of infection than in Isabela, no cases of human infection has occurred as this snail is not eaten. It is detested due to its slimy texture and even the local term, *"susong linta"* meaning leechy snail is unpleasant to eat (Monzon and Kitikoon, 1989).

Although *Pila luzonica* ("kuhol", "bisukol") and *Sundathelphusa philippina* ("talangka"), the intermediate hosts of *E. ilocanum* and *P. westermani filipinus,* respectively, are eaten all over the country, echinostomiasis and paragonimiasis are endemic only in certain areas. In Northern Luzon, echinostomiasis has the highest prevalence among the Ilocanos as the snail host is eaten sometimes raw or partly cooked. Similarly, paragonimiasis is endemic in Sorsogon, Leyte and Samar where inhabitants are known to consume the crab host raw. A preparation of fresh crab juice known as *"kinagang"* is considered a local delicacy. Cabrera and Fevidal (1974) noted that infection is more frequent in males than in females but this difference was attributed to certain customs and habits. Males in these areas eat crabs raw during drinking sessions with the local sugarcane wine *("basi")* especially during festivities. The same is true for intestinal capillariasis where one of the fish hosts, *Hypseleotris bipartita,* especially the gravid female, is preferably eaten raw in Northern Luzon (Cross and Bhaibulaya, 1983).

Human infection with a number of these zoonoses could be prevented by simply giving up the habit of eating raw food of animal origin. However, as the saying goes, old habits may not easily by given up. Cross and Bhaibulaya (1983) also pointed out that, it would be difficult in practice as some people in these areas, though properly informed about this transmission, still value their food habits and maintain that "cooking destroys the flavor they relish as well as the nutritive value of the food". Nevertheless, with a more aggressive health education campaign together with programs directed to the improvement of the living condition of the inhabitants in these areas, preventive measures against many of these zoonotic diseases could be achieved successfully.

IMPACT ON PHILIPPINES AGRICULTURE

To present an accurate assessment of the impact of food-borne parasitic zoonoses on Philippine agriculture is difficult as no quantitative data are available. It is evident however that these diseases are prevalent in rural areas where two-thirds of the population depend on agriculture, fishery and forestry for livelihood. It is the agricultural/rural sector that produces one-third of all goods and services produced by the economy, also employs half of the country's workers and earns 36% of the country's export income (Department of Agriculture, 1989). It can be said that an unhealthy working population can only mean low or reduced productivity and unwholesome meat such as in cases of cysticercosis and sarcosporidiosis can only lead to further reduction due to carcass condemnation of what is already an insufficient meat supply. In a country where poverty is widespread in rural areas like the Philippines, these diseases, though in some cases having low prevalence when compared with other Asian countries, can only worsen what is already a bad situation.

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