

*Review Article*

## **FISH AND SHELL FISH BORNE PARASITIC INFECTIONS- A REVIEW**

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**Abstract:** Among the various diseases commonly observed in human beings and animals, parasitic disease plays an important role in causing morbidity in majority of the cases. The endoparasites, particularly helminths are considered important in the well being of animals as well as human beings. The helminths are usually transmitted to the respective host either by direct ingestion of the eggs or larvae in few cases as well as by indirect transmission through intermediate hosts. Fish act as intermediate host for many of the trematodes and for few cestodes and nematodes. Infection of either the human beings or their pet animals is possible by ingestion of undercooked or partly cooked or raw fish containing the larval stages of any of these helminths. This paper deals with a brief overview of the various helminths transmitted via fish and shell fish to human beings and related animal species.

**Keywords:** Helminth parasites, fish, shell fish.

### **Introduction**

Food borne diseases caused by helminth parasites transmitted by fish and shell fish such as clams, oysters, lobsters, crabs, shrimp pose major public health problems, and worldwide the number of people at risk, including those in developed countries is more than half a billion as per World Health Organization (WHO, 2004). Few of these parasites are highly disease causing and human beings get infected as a result of the consumption of raw or undercooked fish infected by the parasites or their developmental stages. The relationship between fish/shell fish and the transmission of food borne parasitic diseases is on the rise over the recent years, more so due to the growth in the international market in fish and fish products as well as the development of aquaculture.

### **Trematodes/Flukes**

Among the various helminths transmitted through fish and shell fish to humans, the trematodes or flukes are responsible for causing major problem. The most important parasites under the trematodes belong to the genera *Clonorchis*, *Opisthorchis*, *Paragonimus*, *Heterophyes*, *Metagonimus* and *Nanophyetes*. Trematodiasis is a serious public health

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*Received Aug 13, 2016 \* Published Oct 2, 2016 \* [www.ijset.net](http://www.ijset.net)*

problem in Asia, specifically in Southeast Asia. The liver flukes especially *Clonorchis sinensis* and *Opisthorchis viverrini* produce hepatobiliary disease. Human infection occurs after ingesting raw, undercooked or under processed freshwater or brackish water fish containing the infective larvae (metacercariae). A large number of freshwater fish belonging to the family Cyprinidae (Carps) are involved in the transmission. A population of around 35 million people globally could be infected by *C.sinensis* including 15 million in China alone (Zhou et al., 2008). After ingestion of the infected fish by an individual, the larvae gets excysted, released and migrate to bile ducts, where they develop as adult worms. Patients infected with only a few parasites are usually asymptomatic. A heavy infection may lead to obstructive jaundice leading to liver cirrhosis and cholangiocarcinoma, (Choi et al., 2004) which is a life threatening condition. *C.sinensis* and *O.viverrini* have been rated as Class I carcinogens by the International Agency for Research on Cancer (WHO, 2011). The infection can be diagnosed by detection of typical eggs in faeces, radiography and ultrasound to detect intraductal echoes and biliary dilatation. Treatment with Praziquantel @ 75mg/kg b w per day for 2–3 days is reported highly effective, early diagnosis and treatment are crucial to prevent long term damage.

Another group of fish borne trematodes that transmit parasitic diseases to man is often called as “minute intestinal flukes”. Globally more than 70 species of intestinal flukes are known to infect humans (Yu and Mott, 1994) mainly belonging to the family Heterophyidae and Echinostomatidae, both are well known families of fish borne parasites, many of which are distributed widely in Asia. Among the Heterophyidae, note worthy genera include *Heterophyes*, *Haplorchis*, *Metagonimus* (Chai et al., 2009). Their life cycle is typical with humans and other animal species as definitive hosts, a variety of snail species as first intermediate hosts and a variety of fresh water, brackish water and marine fishes as secondary hosts. Few of the heterophyids can cause significant pathology, often fatal, in the heart, brain and spinal cord of human beings (Toledo et al., 2006). It is estimated that around 18 million individuals could have been infected globally by these trematodes. Several authors have observed that in certain areas where diseases caused by liver flukes have diminished, intestinal fish borne trematodes are on the rise. Salmon poisoning in human beings is caused by another intestinal fluke –*Nanophyetus salmincola* which occurs in the intestine of humans and other fish eating mammals and birds. This trematode acts as a vector for a fatal rickettsial disease caused by *Neorickettsia helminthoeca*. Fresh water fish such as salmon or trout act as second intermediate hosts in transmitting the rickettsia to man.

Paragonimiasis is caused by infection with the lung fluke, *Paragonimus westermani* is the most common species in Asia and is the major source of human infection. Infective larvae (metacercariae) reside encysted in freshwater crabs which may be ingested. The migrating larvae penetrate the peritoneal cavity and via diaphragm reach the pleural cavity. Abdominal symptoms may be observed during the migratory phase. Finally, the parasites migrate into the lung parenchyma, where they attain maturity and become solid worm cysts. Clinical manifestations include fever, chest pain and chronic cough with hemoptysis. Radiographic findings reveal infiltrative, nodular and cavitating lesions. Diagnosis is confirmed by either detection of eggs in sputum or stool or gastric aspirate specimens or by serological tests. Rarely, cases of extrapulmonary paragonimiasis have occurred. Cutaneous and cerebral paragonimiasis are the classic known forms of ectopic infection. Patients can be treated with Praziquantel at a dose of 75mg/kg b w per day for 3 days. Before the medication, pleural effusion should be extensively drained off.

### **Cestodes/Tapeworms**

Diphyllobothriasis is an intestinal infection caused by the fish tapeworm, *Diphyllobothrium latum*. The infective larvae (pleurocercoid) is seen in the muscles of trout, salmon, pike and sea bass. After being ingested, the pleurocercoids attach to the mucosa of small intestine where they become adult worms of 5-10m in length. The worm's posterior end often protrudes from the anus of the patient to cause an alarming surprise. Although the disease is known to cause reduced serum levels of Vitamin B 12 and subsequent pernicious anaemia. Diagnosis is based on finding the eggs or segments in faeces. Praziquantel at a dose of 10-20mg per kg b.w for 3 days is reported effective. Recent estimates indicate that approximately 20million individuals could be affected by the disease (Scholtz *et al.*, 2009).

### **Nematodes/Roundworms**

Anisakiasis refers to infection with larval stages of nematodes of the genera *Anisakis* and *Pseudoterranova*. *Anisakis simplex* is the most prevalent pathogenic species (Torres *et al.*, 2007). The life cycle of the anisakid nematode is complex involving small crustaceans as the first intermediate host, fishes and cephalopods as the second host and marine mammals as the final or definitive host. Humans are considered as accidental hosts of the parasite following consumption of the fish. It is a serious zoonotic disease caused by the consumption of raw or undercooked fish dishes containing the larvae of the parasite (Carlos *et al.*, 2013). The larvae usually penetrate the gastric wall causing acute abdominal pain, nausea, vomiting and diarrhea within few minutes to several hours resulting in gastric

anisakiasis. Immediate diagnosis can be confirmed by direct detection and extirpation of the parasite by upper gastrointestinal endoscopic examination. Some patients may develop syndromes of allergy following ingestion of a fish containing dead larvae (Yukifumi Nawa *et al.*, 2005). *Anisakis* larvae occasionally penetrate into the peritoneal cavity or other visceral organs causing extragastrointestinal anisakiasis and cause eosinophilic granuloma, which is often being suspected as neoplasia (Yoshimura, 1990).

Gnathostomiasis is a fish borne illness caused by the genera *Gnathostoma*, with several species pathogenic to man. Of the 12 distinctive *Gnathostoma* species, *Gnathostoma spinigerum* is widely prevalent in Asia and considered as only species with human pathogenicity. The life cycle is complex with crustaceans and fishes acting as first and second hosts, piscivorous birds as paratenic hosts, with wild and domestic animals acting as final hosts. Man is considered as an accidental host, showing symptoms of wide clinical picture which may be external or internal, with larva migrans is one of the known symptoms (Waikagul and Diaz Camacho, 2007). Non specific prodromal symptoms like malaise, fever, urticaria and nausea may be observed shortly after ingestion of the larvae. Eosinophilia occurs by the time a skin lesion begins to develop. Occasional instance where the larvae of *Gnathostoma* migrate into vital organs results in a serious, sometimes fatal illness. Involvement of the CNS may present as meningoencephalitis, cranial nerve palsy, myelitis, radiculitis or subarachnoidal bleeding. Diagnosis is based on clinical picture, eosinophilia in the peripheral blood or the CSF, serological tests and on histology. Treatment with albendazole at a dose of 400mg daily or twice daily for 21 days has been effective against cutaneous gnathostomiasis (Kravichian *et al.*, 1992).

### **Prevention and control**

Traditional methods for control of zoonotic fish borne parasitic diseases, especially where the diseases are endemic, are mainly based on identification and treatment of affected persons, consumer education campaigns and by preventive mass medication. The US Food and Drug Administration recommends preserving fish for raw consumption by storing at less than -35C for 15 hrs or at less than -20C for 7 days. Similarly, according to European Union – Hazard Analysis and Critical Control Points (HACCP), marine fish for raw consumption should be frozen at less than -20C for more than 20hrs. Cooking, hot smoking and pasteurization may help to kill the parasite stages in the muscles or tissues of the fish/shell fish. The majority of human cases of fish borne parasitic infections can be easily treated by anthelmintic drugs after accurate and early diagnosis is made.

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