www.digitalagrinews.com

ISSN: 3107 - 9903

HIDDEN PARASITES IN FISH: RISKS TO HUMANS AND ANIMALS

EDITION: VOLUME 02, ISSUE 05 , - May 2026

DR. NABANITA GANGULY[1], DR. JEEMI A PATEL[1] , DR. BHUPENDRAKUMAR J THAKRE[2]

Hidden Parasites in Fish: Risks to Humans and Animals

Dr. Nabanita Ganguly[1], Dr. Jeemi A Patel[1], Dr. Bhupendrakumar J Thakre[2]

[1]*Assistant Professor, Department of Veterinary Parasitology*
[1]*Associate Professor, Department of Veterinary Parasitology*
[2]*College of Veterinary Science and Animal Husbandry Kamdhenu University, Himmatnagar-383010*

ISSN No.: 3107-9903
Frequency: Monthly
Month: May
Volume- 2, Issue- 5

In terms of any communication correspondence is pertained to: *nabanitaganguly@kamdhenuuni.edu.in*

Introduction

Food-borne parasitic diseases (FBPB) can affect both humans and animals and may cause serious health problems. Earlier, these diseases were mainly found in developing countries because of poor hygiene, unsafe drinking water, and improper handling of food products. However, with increasing globalization, changing food habits, expansion of international food trade, consuming raw or undercooked fish and contaminated food products these infections are now becoming a worldwide concern. Lack of sanitation and awareness further supports the spread of these diseases (Tumbarski *et al.,*2020). According to the Food and Agriculture Organization, aquaculture is the fastest-growing food production sector globally and with the increasing production and consumption of fish, fish-borne zoonotic diseases are also rising worldwide. The World Health Organization estimates that nearly half a billion people are infected with fish-borne trematodes. This article highlights the major fish-borne parasitic diseases affecting humans and animals worldwide and explains their public health importance which are mainly spread through the consumption of raw or undercooked fish and are becoming an emerging food-borne health concern. Therefore, proper cooking of food, maintenance of hygiene, and public awareness are essential to protect both animal and human health from food-borne parasitic infections (McConnell JFP, 1875).

Fish-derived zoonotic parasites are commonly encountered in freshwater, brackish, and marine ecosystems. Several parasitic helminths, including Liver flukes (*Clonorchis, Opisthorchis, Metorchis*), Intestinal flukes (*Heterophyes, Metagonimus*), *Echinostoma, Paragonimus, Diphyllobothrium, and Anisakis spp.*, Protozoa like *Entamoeba, Giardia, Balantidium, Cryptosporidium* etc. are transmitted through the consumption of raw or inadequately cooked fish containing infective larval stages. Traditionally, these fish-borne zoonotic infections have predominantly affected populations in low- and middle-income countries, where poor sanitation, inadequate food safety measures, traditional dietary practices, and limited public awareness contribute significantly to disease transmission and persistence.

Clonorchiasis

Clonorchis sinensis, commonly known as the Chinese liver fluke, is a fish-borne zoonotic trematode that infects humans and fish-eating animals. It inhabits the bile ducts of the liver and causes clonorchiasis, mainly through the consumption of raw or undercooked freshwater fish. The disease is commonly reported in Asian countries. C. *sinensis* was first found in 1874 in a male Chinese in Calcutta, India, by J. F. P. McConnell.

Life Cycle

Clonorchis sinensis has a complex life cycle involving humans and fish-eating mammals as definitive hosts, while freshwater snails and fish serve as intermediate hosts. Eggs containing miracidia are passed in the faeces of infected hosts and are ingested by freshwater snails, where they develop into sporocysts, rediae, and cercariae through asexual reproduction. After approximately three months, cercariae are released from the snails and penetrate freshwater fish, where they encyst in muscles or subcutaneous tissues as metacercariae. Humans become infected by consuming raw or undercooked infected fish. The metacercariae excyst in the intestine, migrate to the bile ducts, and mature into adult flukes. Egg production begins about four weeks later, and an adult fluke may produce approximately 3,000–4,000 eggs per day (Kim *et al.*, 2011).

Clinical Symptoms

Many mild infections remain

asymptomatic, while heavy infections may produce abdominal pain, indigestion, diarrhoea, fever, jaundice, hepatomegaly, inflammation of bile ducts, Gall bladder disorders etc.

Global Distribution

Globally, approximately 7–10 million people are infected with *Clonorchis sinensis*. The infection is more prevalent in countries where consumption of raw or undercooked fish is common, particularly in parts of Asia such as South Korea, China, Taiwan, northern Vietnam, Japan, and the far-east region of Russia. A countrywide survey reported the prevalence of C. *sinensis* infection to be approximately 0.4% among nearly 1.5 million individuals (Xu *et al.*, 1995).

Opisthorchis

Opisthorchis viverrini is a fish-borne zoonotic liver fluke (trematode parasite) commonly found in Southeast Asia, especially in Thailand, Laos, Cambodia, and parts of Vietnam. Humans and fish-eating mammals become infected by consuming raw or undercooked freshwater fish containing infective larvae (metacercariae). The adult flukes inhabit the bile ducts of the liver and may cause chronic hepatobiliary disease and cholangiocarcinoma (Sripa *et al.*, 2018).

Life Cycle:

Adult flukes reside in the bile ducts of humans, dogs, cats, and other fish-eating mammals, where they produce eggs that are passed in the feces into freshwater. The eggs are ingested by freshwater snails of the genus *Bithynia*, which serve as the first intermediate host. Inside the snail, the parasite develops through miracidium, sporocyst, redia, and cercaria stages. The free-swimming cercariae leave the snail and penetrate freshwater cyprinid fish, the second intermediate host, where they encyst in the muscles as metacercariae, the infective stage. Humans and other definitive hosts become infected by consuming raw or undercooked infected fish. After ingestion, the metacercariae excyst in the duodenum, migrate to the bile ducts of the liver, and mature into adult flukes.

Clinical symptoms:

Indigestion, stomach pain, diarrhoea, and constipation are common symptoms. Abdominal pain, nausea, and diarrhea might develop in severe cases. Fever, facial puffiness, enlarged lymph glands, aching joints, and rash are also symptoms of O. *viverrini infections*.

Metorchis

Metorchis conjunctus, the canadian liver fluke, is a parasite that causes metorchiasis through the ingestion of infected fish containing metacercariae. The life cycle involves Amnicola limosus as the first intermediate host and freshwater fish, including northern pike, as the second intermediate host. Humans may pass eggs of M. conjunctus in their stools, although infections are often asymptomatic (Kiyan *et al.*, 2018).

Heterophyes

Heterophyes heterophyes is a minute fish-borne zoonotic trematode that infects humans and fish-eating animals. Infection occurs through the consumption of raw or undercooked fish containing metacercariae. It is an important cause of heterophyidiasis in endemic regions, particularly around the Nile Delta (Bardhan *et al.*, 2002).

Life Cycle:

The life cycle of H. *heterophyes* involves snails as the first intermediate host and fish, especially mullets (*Mugil cephalus*), as the second intermediate host. Eggs passed in feces hatch in water and infect aquatic snails, where the parasite develops into cercariae. Cercariae leave the snail and penetrate fish, encysting as metacercariae in the muscles or scales. Humans and fish-eating mammals become infected after consuming raw or undercooked infected fish. Adult flukes develop in the small intestine and begin producing eggs that are passed in feces.

Clinical Signs

Common clinical signs of infection with *Heterophyes heterophyes* include diarrhoea, abdominal discomfort, colicky pain, indigestion, chronic enteritis, mucosal ulceration, and eosinophilia, while migration of parasite eggs to the heart may occasionally cause severe cardiac damage.

Metagonimus

Metagonimus has a broad fish host specificity, with sweetfish *(Plecoglossus altivelis)* serving as the major fish host. Humans acquire infection by consuming raw or undercooked infected fish. Adult flukes attach to the mucosa of the small intestine, causing metagonimiasis characterized by villous atrophy and mucosal hyperplasia (Uppal & Wadhwa).

Life Cycle:

The life cycle of *Metagonimus spp*. involves two intermediate hosts and one definitive host. Adult flukes live in the small intestine of humans and fish-eating mammals, where eggs are passed in feces into freshwater. The eggs are ingested by freshwater snails, the first intermediate host, in which the parasite develops through sporocyst, redia, and cercaria stages. Free-swimming cercariae leave the snail and penetrate freshwater fish, especially sweetfish *(Plecoglossus altivelis),* where they encyst as metacercariae in the tissues. Humans and other definitive hosts become infected by consuming raw or undercooked infected fish. After ingestion, metacercariae excyst in the small intestine and mature into adult flukes, completing the life cycle.

Clinical Signs

Common clinical signs of *Metagonimus* infection include fatigue, epigastric discomfort, diarrhoea, anorexia, abdominal pain, malabsorption, and weight loss, while severe infections may lead to tissue granuloma formation, convulsions, and neurological impairments due to ectopic egg deposition.

Echinostoma

Echinostomiasis is a food-borne parasitic infection acquired by consuming raw or undercooked fish and other aquatic foods containing metacercariae. Smelts and loaches are important sources of infection, particularly in Arctic regions. Clinical signs include abdominal pain, diarrhoea, anorexia, duodenal mucosal bleeding, and ulceration caused by the spines of the adult flukes. Praziquantel and Albendazole are commonly used for treatment (Silachamroon *et al.*, 2020).

Paragonimus

Paragonimiasis, commonly known as “lung fluke disease,” is caused by several species of the genus *Paragonimus*, including P. *westermani*, P. *africanus*, P. *mexicanus*, P. *heterotremus*, and P. *philippinensis*. It is an important zoonotic food-borne trematode infection widely distributed in many parts of Asia, Africa, and the Americas (Silachamroon *et al.,* 2020).

Life Cycle:

The life cycle of *Paragonimus* spp. involves snails as the first intermediate host and freshwater crabs or crayfish as the second intermediate host. Eggs passed in sputum or feces reach water and hatch into miracidia, which infect freshwater snails. Cercariae released from snails penetrate crabs, crayfish, and occasionally fish, where they encyst as metacercariae. Humans become infected by eating raw, pickled, smoked, salted, marinated, dried, or partially cooked infected crabs, crayfish, or fish. After ingestion, metacercariae migrate through the intestinal wall, diaphragm, and pleura to the lungs, where adult flukes develop.

Clinical Signs

Common signs include chronic cough blood-stained sputum

(haemoptysis), chest pain dyspnoea, fever, pleural effusion, pneumothorax. The disease often resembles pulmonary tuberculosis and may remain asymptomatic in mild cases.

Diphyllobothrium

Diphyllobothrium latum is the most significant fish-borne zoonotic cestode responsible for human infection worldwide. It occurs mainly in regions where raw, undercooked, or marinated fish is commonly consumed. Both freshwater and marine fish, act as intermediate hosts, while freshwater fish serve as the main epidemiological reservoir.

Life cycle:

The life cycle of *Diphyllobothrium* latum involves two intermediate hosts and humans or fish-eating mammals as definitive hosts. Eggs are passed in feces into freshwater, where they hatch into coracidium. These are ingested by freshwater copepods (first intermediate host) and develop into procercoid larvae. When infected copepods are eaten by freshwater fish, the larvae develop into plerocercoid larvae, which are the infective stage for humans. Humans acquire infection by consuming raw or undercooked fish containing plerocercoids. In the human intestine, the larvae develop into adult tapeworms, which attach to the intestinal mucosa and produce eggs, completing the cycle.

Clinical Signs

Diphyllobothriasis mainly causes gastrointestinal and systemic manifestations, including abdominal pain, diarrhea or constipation, intestinal obstruction, sub-acute appendicitis, cholecystitis, and cholangitis. Hematological effects are prominent and include megaloblastic anaemia, vitamin B12 deficiency, pancytopenia, eosinophilia, and pernicious anaemia. Severe cases may also involve neurological, ocular, and allergic symptoms such as paraesthesia, optic neuritis, dyspnea, and hypersensitivity reactions.

Epidemiology and Control

The disease is strongly associated with dietary habits involving raw fish consumption. Environmental changes, global travel, fish trade, and shifting food practices contribute to its spread. Control measures include proper cooking of fish, improved food hygiene, public awareness, and monitoring of fish products in markets.

Gnathostoma

Gnathostomiasis is an emerging fish-borne zoonotic disease caused by nematodes of the genus Gnathostoma. It is increasingly reported worldwide beyond traditional endemic areas of Southeast Asia and South America due to travel and imported food. Important species include G. *spinigerum*, G. *hispidum*, G. *doloresi*, and G. *nipponicum*. Humans are accidental hosts, while piscivorous animals are the definitive hosts. Infection occurs through consumption of raw or undercooked infected fish or aquatic animals containing larvae. Clinical signs include migratory cutaneous swelling, gastrointestinal pain and obstruction, pulmonary, ocular, and severe neurological disease such as eosinophilic meningitis. Treatment includes Albendazole and Praziquantel.

Protozoans

The growing incidence of *Giardia*, *Balantidium*, *Cryptosporidium* in fish and other marine animals is a recent phenomenon associated with growing urbanization and increased human activities. They may have been acquired via contamination of coastal waters by sewage, run off and agricultural and biomedical wastes.

Amoebiasis

Amoebiasis is an intestinal protozoan infection caused by *Entamoeba histolytica*, leading to amoebic dysentery with significant global health impact, especially in regions with poor sanitation. Although primarily transmitted through contaminated food and water containing cysts, it has also been linked to fish-borne outbreaks in some areas due to sewage-contaminated aquaculture and consumption of raw fish. Clinical signs include dysentery, bloody diarrhoea, vomiting, dehydration, and abdominal pain. It has an estimated worldwide prevalence of 500 million people killing over 55,000 people every year (Ryan *et al.,* 2018).

Balantidium

Balantidiasis is a rare emerging zoonotic protozoal infection caused by *Balantidium* coli. It is mainly associated with pigs and is transmitted to humans through contaminated food and water, and possibly in some reports through fish-related contamination. Many infections remain asymptomatic as these parasites produce a proteolytic enzyme that digests the epithelium forming ulcers (Leiro *et al.*, 2012) but pathogenic cases may cause dysentery-like illness due to mucosal ulceration in the colon. Severe infection can lead to abdominal pain, diarrhoea, colonic ulceration, necrosis, and even bowel perforation.

Giardia

Giardiasis is an intestinal protozoal infection caused by *Giardia duodenalis* and is one of the most common causes of diarrhoea in humans worldwide. It spreads mainly through contaminated water and food, and has also been associated with fish from polluted aquatic environments such as tilapia and mullets. Infection occurs after ingestion of cysts. Clinical signs include foul-smelling diarrhoea, abdominal cramps, bloating, nausea, fatigue, and weight loss, which may persist for several weeks.

Giardiasis is one of the most common gastrointestinal protozoal infections worldwide, affecting about 2% of adults and 8% of children in developed countries. Children between 0–4 years of age are most commonly affected, and among children under 10 years, giardiasis is a major cause of epidemic diarrhoea, with prevalence rates reaching 15–20% in some regions (Ganguly *et al.,* 2025).

Cryptosporidium

Cryptosporidiosis is a gastrointestinal protozoan infection caused by *Cryptosporidium* spp. It is an opportunistic pathogen that can infect humans and animals through ingestion of oocysts present in contaminated water, food, or through improper handling of fish and aquatic products. Species such as C. *parvum* and C. *hominis* have been detected in aquatic environments and occasionally in fish-associated samples. The infection mainly affects the intestinal tract and causes watery diarrhoea, abdominal cramps, nausea, and dehydration, with more severe disease seen in immunocompromised individuals.

Emerging fish-borne parasitic zoonoses

Some of the emerging fish-borne parasitic zoonoses are *Heterophyes, Gnathostoma, Entamoeba, Balantidium* infection. Both marine mammals and birds act as reservoir for many potentially zoonotic protozoans infections (*Giardia,*

Cryptosporidium, and Entamoeba).

Strategies for prevention and control

Over the last few decades, the global pattern of parasitic diseases has changed significantly. Infections caused by soil-transmitted nematodes (such as roundworms, hookworms, and whipworms) have generally decreased in many regions. In contrast, food-borne parasitic zoonoses especially those transmitted through fish and other aquatic foods are becoming more important. These infections are strongly linked to cultural dietary habits such as eating raw, undercooked, pickled, or fermented fish, as well as changes in food supply chains, aquaculture practices, and international travel and trade. The major challenge today lies in control and prevention at the community level. Many affected populations live in poor, rural, or remote areas where access to clean water, safe food practices, and healthcare services is limited. Lack of awareness about the risks of eating raw fish and poor sanitation further increases transmission. As a result, modern helminth control programmes need to focus more on practical implementation such as health education, food safety practices, improved sanitation, surveillance, and ensuring access to diagnosis and treatment rather than only relying on drugs.

The U.S. Food and Drug Administration recommends that fish intended for raw consumption should be frozen at temperatures below −35°C for at least 15 hours or below −20°C for 7 days to kill parasites. Similarly, the European Union's Hazard Analysis and Critical Control Points guidelines require marine fish meant for raw consumption to be frozen at −20°C or lower for more than 24 hours to ensure parasite inactivation and improve food safety.

Conclusion

Fish-borne zoonotic infections occur mainly by eating raw or undercooked contaminated aquatic foods. Globally, more than 50 helminth species from fish and other aquatic animals can infect humans, and some cause serious disease. The rise in fish-borne zoonotic diseases is mainly driven by increased use of aquatic environments, changing food habits such as consumption of raw seafood (e.g., sushi and sashimi), reduced timing of cooking of fish products. global trade of contaminated fish, international travel and migration, and spread of parasites through migratory birds and contaminated water bodies.

Control of fish-borne zoonotic parasites is challenging due to complex interactions among parasites, aquatic hosts, and environmental factors. Prevention mainly relies on maintaining good hygiene, improving awareness among consumers, producers, and handlers, and promoting safe food practices such as consuming properly cooked fish and using clean drinking water. Proper handling, processing, storage, and trade of fish products are also essential to reduce transmission. However, a lack of updated surveillance data in many regions makes control difficult. Therefore, regular monitoring of endemic areas is needed to assess infection status in both fish and humans. Environmental, ecological, and climatic changes are further contributing to the emergence and spread of these infections, making them an important public health concern.

References

1. Tumbarski, Y. (2020). Foodborne zoonotic agents and their food bioterrorism potential: a review. *Bulgarian Journal of Veterinary Medicine.*; 23 (2): 147-159.

2. McConnell, J. F. P. (1875). Remarks on the anatomy and pathological relations of a new species of liver-fluke. *Lancet* 106: 271–274.

3. Kim, J. H., Choi, M. H., Bae, Y. M., Oh, J. K., Lim, M. K., Hong, S. T. (2011). Correlation between discharged worms and faecal egg counts in human clonorchiasis. *Public Library of Science Neglected Tropical Diseases* 5:e1339.

4. Bardhan, A. (2022). Fish-borne parasites proficient in zoonotic diseases: a mini review. *Insights in Veterinary Science*. 6: 005-012.

5. Xu, L., Jiang, Z, Yu, S., Xu, S., Huang, D., Yang, S., Zhao, G., Gan, Y., Kang, Q. & Yu, D. (1995). Nationwide survey of the distribution of human parasites in China-infection with parasite species in human population. *Chinese Journal of Parasitology and Parasitic Diseases*. 13 (1): 1-7.

6. Ryan, U., Hijjawi, N. & Xiao, L. (2018). Foodborne cryptosporidiosis. *International Journal for Parasitology*.; 48: 1-2.

7. Leiro, J. M., Piazzon, C., Domínguez, B., Mallo, N. & Lamas, J. (2012). Evaluation of some physical and chemical treatments for inactivating microsporidian

spores isolated from fish. *International Journal of Food Microbiology*, 156: 152-160.

8. Ganguly, N., Thakre, B. J. (2025). Giardiasis in Human. Digital Agri News, 1 (5): 2-7.

9. Sripa, B., Tangkawattana, S. & Brindley, P. J. (2018). Update on pathogenesis of opisthorchiasis and cholangiocarcinoma. *Advances in Parasitology*, 12: 97-113.

10. Kiyan, V. S., Bulashev, A. K., Katokhin, A. V. (2018). *Opisthorchis felineus* and *Metorchis bilis* metacercariae in cyprinid fish Leuciscusidus in Nura- Sarysu River, Kazakhstan. Korean Journal of Parasitology. 56 (3): 267-274.

11. Bardhan, A. (2022). Fish-borne parasites proficient in zoonotic diseases: a mini review. Insights Vet Sci.; 6: 005-012.

12. Silachamroon, U. & Wattanagoon, Y. (2020). Paragonimiasis. Hunter's Tropical Medicine and Emerging Infectious Diseases, Edn 10; 928-931.

13. Uppal, B. & Wadhwa, V. (2005). Rare case of *Metagonimus yokogawai*.. *Indian Journal of Medical Microbiology*, 23 (1):61-62