



A Monthly e Magazine
ISSN:2583-2212

April 2024 Vol.4(4), 1584- 1586

Popular Article

Zoonotic diseases of fishes: The hidden danger lurking in your food

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<https://doi.org/10.5281/zenodo.11109589>

Zoonotic diseases are those that are spread between humans and animals. In recent years, with the increase in world population and consumption of seafood, the demand for seafood has increased drastically. They can serve as a good source of protein but their consumption is not risk-free as they can transmit various aquatic pathogens to humans. The important causes of zoonoses include bacteria, parasites, viruses and fungi. The zoonotic diseases of bacterial origin can be divided into two main groups: 1. Gram-positive bacteria include *Mycobacterium* spp, *Streptococcus* spp, *Erysipelothrix* spp, *Listeria* spp, *Clostridium botulinum*, *Francisella tularensis*; 2. Gram-negative bacteria include *Vibrio* spp, *Pseudomonas* spp, *Aeromonas* spp, Enterobacteriaceae family (*E. coli*, *Salmonella* spp, *Klebsiella* spp), and *Campylobacter* spp. The zoonotic parasitic agents of fish include *Opisthorchis* spp (trematode), *Diphyllobothrium latum* (cestode), *Anisakis* spp, (nematode) as well as *Cryptosporidium* spp (protozoa). Two groups of fish-associated fungi causing basidiobolomycosis and sporotrichosis also pose zoonotic risks for humans. Fish viruses of zoonotic importance include *Koi herpes virus*, and *Betanodavirus*. A majority of these pathogens are transmitted to human beings via consumption of improperly cooked or raw fish/fish products and swallowing water and other matter contaminated with infected fish faeces/mucus.

Infections caused by *Mycobacterium sp* in humans cause granulomatous lesions on the skin, deep tissue infections such as tendon, bone, respiratory and extra respiratory signs in

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immunocompromised patients followed by systemic infection and finally death of the affected individuals. *Streptococcus sp* affected individuals show cellulitis, endocarditis, meningitis, suppurative ulcers, septicaemia and arthritis. Infections caused by *E. rhusiopathiae* cause skin infections (especially hands), endocarditis, and septicemia. *Vibrio sp* infection causes erythema, septicaemia, and necrosis of tissues. *Aeromonas* infection causes urinary tract infection, gastroenteritis, respiratory tract infection, cellulitis, necrosis, and septicemia. Some other bacteria causing zoonosis include *Staphylococcus sp*, *Listeria sp*, *Clostridium botulinum*, and, *Campylobacter sp* cause gastroenteritis. Elderly, pregnant women and immunocompromised individuals are a high-risk group for listeriosis-causing meningitis, abortion, gastroenteritis, and pneumonia. Botulism in humans causes gastroenteritis, dizziness, bloat, and constipation while *Campylobacteriosis* causes enteritis.

Furthermore, many edible fishes are host to numerous parasites. Tapeworms (*Diphyllobothrium latum*), roundworms (*Anisakis sp*), and flukes (*Metagonimus yokogawai*) are transmitted to humans via improperly cooked or raw fish/fish products. Trematodes (fluke) such as *Opisthorchis sp*, and *Clonorchis sp*, damage the epithelium of the bile duct leading to gastrointestinal problems and liver damage. They can cause major clinical problems such as cholangitis, choledocholithiasis, pancreatitis, and cholangiocarcinoma. *Paragonimus westermanii* is a lung fluke infection that humans acquire after eating crab/ crayfish harbouring metacercariae of flukes. According to WHO, zoonotic fish trematodes are listed among emerging infectious pathogens. Domestic dogs and cats can act as reservoir hosts of these zoonotic trematodes particularly *Heterophys heterophys* and *Opisthorchis viverrini*. Diphyllbothriosis is usually a mild disease and is usually not life-threatening. Infected people are usually asymptomatic, but some may experience diarrhoea, abdominal pain, anaemia, weight loss and vitamin B₁₂ deficiency. Zoonotic nematodes belonging to the family Anisakidae were detected in popular table fish *Chrysophrys sp* and they can pose a significant threat to humans if served raw as sashimi or in sushi. The larval stage of nematode migrates from the gastrointestinal tract into viscera and surrounding muscle tissue after the fish is dead. So, they can still pose a risk to human health. Humans act as accidental hosts as the development of the parasite is arrested within the gastrointestinal tract of man where it irritates the gastric and intestinal mucosa causing gastroenteritis (this mimics food poisoning). *Anisakis sp* associated hypersensitivity is also an important concern. Even a very small dose of exposure may lead to death. Symptoms of gnathostomiasis are similar to *A. simplex* but are normally more severe and include nausea, abdominal



pain and vomiting, which usually develop 24-48 hours after transmission. If it occurs in the nervous system then it may result in brain hemorrhage, paresis and fatality.

Acute gastroenteritis caused by *Noroviruses* through consumption of ready-to-eat fishery products and shellfish contaminated with faeces is gaining importance as an emerging food-borne illness. Clinical manifestations of the disease include nausea, vomiting, watery diarrhoea and abdominal pain. Symptoms usually manifest about 12-48 hours after consuming the contaminated food but in most cases, the disease is self-limiting except in immunocompromised people.

Zoonotic fungi can sometimes lead to considerable public health problems but due to insufficient attention, this has led to a decline in the development of prevention and control strategies. Basidiobolomycosis (caused by *Basidiobolus ranarum*) occurs via skin following a scratch, cut, or insect bite where it can produce an enlarged hard node beneath the skin, especially in the arms and legs. If left untreated, it can lead to death of the patient by penetrating deeper tissues. In rural areas, sporotrichosis (caused by *Sporothrix sp*) has become an endemic disease that mainly affects woodcutters and farmers. All ages and gender groups are susceptible to this fungal infection. It can enter the skin via cut surfaces and can occur in various forms such as lymphocutaneous, fixed cutaneous and multifocal/disseminated-cutaneous.

Therefore, quality control measures as well as regular monitoring of consumed fish are required. Ponds that have not been cleaned and sterilized before refilling are at increased risk of retaining the intermediate hosts. Wearing disposable gloves and keeping skin away from fish mucus is important. Consulting the doctor is important if symptoms appear. Cooking fish at 62 degrees Celsius for 15 seconds is enough to kill the parasites. One of the most effective means of reducing risk is by freezing or heat inactivation. One should avoid contact with water if he/she has open wounds or abrasions. But if contact with water is unavoidable then topical ointments can be applied on the surface of the wound. Washing hands thoroughly after handling the fish also helps. Recently one health approach has gained immense importance in managing zoonotic fish diseases. The successful implementation of the one health model involves integration and collaboration between multiple sectors of agriculture, animal health and human health.

