



THE HIDDEN DANGERS OF FISH HANDLING: A REVIEW OF FOODBORNE AND OCCUPATIONAL HEALTH RISKS

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(Received on October 10, 2025; Revised on November 13, 2025; Accepted on December 26, 2025)

ABSTRACT

Causes of fish diseases is by viruses, bacteria, parasites, and fungi not only arbitrate aquaculture production but also present significant risks to human health. This comprehensive review explores the epidemiology, transmission, clinical effects, and mitigation strategies related to fish-borne diseases impacting humans through foodborne pathways and occupational exposure. It synthesizes current evidence to inform stakeholders about emerging threats and control measures, emphasizing the need for integrated approaches in surveillance, public health policy, and aquaculture management. Fish borne diseases can have a significant impact on human health, especially when eating spoiled or infected fish. Understanding these risks is essential to preventing foodborne illness and handling and eating fish safely.

Keywords: Fish diseases, zoonoses, foodborne pathogens, occupational health, aquaculture

INTRODUCTION

The consumption of fish is integral to global nourishment, providing important nutrients such as omega-3 saturated acids, high-quality protein, vitamins, and minerals (FAO, 2022). Worldwide fish consuming per capita has steadily increased, with aquaculture contributing over one half of the fish supplied for public consumption (FAO, 2020). However, the rapid expansion of aquaculture and fisheries industries has been accompanied by a rise in fish diseases, many of which have potentially affect the human health.

Fish diseases arise from a multifarious of infectious extents, considering viruses, bacteria, parasites, and fungi, which can cause illness in fish populations and economic losses for producers (Austin & Austin, 2016). Importantly, several fish pathogens are zoonotic, means they may infect humans either directly or indirectly. Human exposure to these pathogens occurs primarily through eating raw or poorly cooked fish and shellfish, or through work involving the handling and processing of fish. (Hassanin et al. 2020).

Fish-borne zoonoses are a growing public health concern worldwide. Foodborne transmission of pathogens like *Vibrio vulnificus*, *Mycobacterium*

marinum, and *Anisakis simplex* can cause severe illness, sometimes life-threatening, especially in vulnerable demography like elderly, immunocompromised, or individuals with pre-existing conditions (Chai et al. 2005; Horseman & Surani, 2011). Meanwhile, fishery and aquaculture workers are at risk of occupational infections and allergic reactions due to repeated exposure to fish and their pathogens (Meyer et al. 2006).

1. FOLLOWING ARE THE RISKS OF FISH DISEASES TO HUMANS

1.1. Food Poisoning: Consuming contaminated fish can result in food poisoning, with feeling like vomiting, nausea, diarrhoea, and abdominal pain.

1.2. Neurotoxin Exposure: Certain fish carry toxins like ciguatera, causing neurological symptoms such as tingling, dizziness, or paralysis.

1.3. Bacterial Infections: Pathogens like *Vibrio* or *Salmonella* in sick fish can lead to infections requiring medical attention.

1.4. Common Fish Diseases Affecting Humans: Many of common fish disease affecting human like infections of bacteria, pathogens, viruses associated with intake of contaminated fish.

1.5. Ciguatera Poisoning: Caused by toxic algae consumed by fish, leading to nausea, tingling, and muscle pain.

1.6. Scombroid Poisoning: Histamine buildup in spoiled fish causes rash, sweating, headache, and diarrhea.

1.7. Vibriosis: *Vibrio* bacteria in contaminated fish lead to fever, chills, skin lesions, and stomach upset.

Despite the importance of this issue, knowledge gaps remain concerning the full scope of fish diseases affecting human health, their transmission mechanisms, and effective control strategies. This review provides a comprehensive examination of fish diseases with an emphasis on their impact on human health via foodborne and occupational exposure routes. It aims to inform policymakers, health professionals, aquaculture managers, and consumers about the risks and necessary preventive measures.

2. OVERVIEW OF FISH DISEASES AND THEIR PATHOGENS

Fish diseases are caused by an array of microorganisms that can infect fish either in wild environments or in aquaculture systems. Understanding these pathogens is crucial for recognizing their potential human health impacts.

2.1. Bacterial Pathogens

Fish can harbour various bacterial pathogens, some of which are zoonotic. Key bacterial agents include:

- ***Vibrio spp.:*** Members of the genus *Vibrio*, including *Vibrio vulnificus* and *Vibrio parahaemolyticus*, are natural inhabitants of marine and estuarine environments. They are liable to diseases in fish and humans (Horseman & Surani, 2011). In humans, *Vibrio*

vulnificus infection can lead to severe wound infections and sepsis, particularly after consumption of raw seafood or exposure of open wounds to seawater (Raghunath, 2015).

- ***Aeromonas spp.:*** These bacteria are common in freshwater and estuarine environments and can cause hemorrhagic sepsis in fish. In human population, *Aeromonas hydrophila* is related to gastroenteritis, contagious injury, and occasionally systemic infections (Janda & Abbott, 2010).
- ***Mycobacterium marinum:*** Known for causing “fish tank granuloma” in humans, *M. marinum* is a slow-growing mycobacterium found in both fresh and saltwater. It causes chronic skin infections following touch with infected water or fish (Falkinham, 1996).

Other fish-borne bacterial pathogens include *Edwardsiella tarda*, *Streptococcus iniae*, and *Flavobacterium* species, some with zoonotic potential (Austin & Austin, 2016).

2.2. Viral Pathogens

Viruses affecting fish, such as Infectious Salmon Anemia Virus (ISAV) and Koi herpesvirus, cause significant morbidity and mortality in fish populations but rarely infect humans directly (Miller et al. 2017). Nonetheless, viral contamination of seafood and fish products is a concern due to potential indirect effects, such as immunosuppression in fish that may increase susceptibility to other zoonotic agents (Kibenge et al. 2007).

Human infections caused by fish viruses are uncommon but occupational exposures may pose risks, particularly to immunocompromised individuals (Miller et al. 2017).

2.3. Parasitic Pathogens

Fish-borne parasites represent a substantial risk to human health. Common parasitic infections include:

- ***Anisakis simplex:*** A nematode found in marine fish that causes anisakiasis in humans after consumption of raw or undercooked infected fish. Symptoms vary from normal gastrointestinal discomfort to severe allergic reactions and intestinal obstruction (Chai et al. 2005).



- ***Clonorchis sinensis* and *Opisthorchis viverrini*:** These liver flukes infect humans following consumption of raw freshwater fish and are linked to cholangiocarcinoma (bile duct cancer) (Sripa et al. 2010).
- ***Diphyllobothrium latum*:** The fish tapeworm infects humans through consumption of raw or undercooked freshwater fish, causing diphyllobothriasis with symptoms such as abdominal discomfort and vitamin B12 deficiency (Scholz et al. 2009).

Fish parasites can persist through various cooking methods, posing food safety challenges (Levsen et al. 2018).

2.4. Fungal Pathogens

Fungal infections in fish, predominantly caused by *Saprolegnia* species, rarely affect humans but may cause opportunistically contamination in immunocompromised individuals (Roberts, 2012). Fungal spores may be transmitted via contaminated water or equipment, representing an occupational hazard.

3. FOODBORNE RISKS ASSOCIATED WITH FISH DISEASES

Fish consumption is a major route for transmission of zoonotic pathogens to humans. The risks arise primarily from raw, undercooked, or inadequately processed fish products.

3.1. Bacterial Foodborne Illnesses

Fish and seafood are commonly implicated in bacterial foodborne outbreaks. *Vibrio vulnificus* is notable for causing severe wound infections and 77arbouring77, often resulting from ingestion of raw oysters or fish (Horseman & Surani, 2011). The Centers for Disease Control and Prevention (CDC) estimates approximately 80,000 cases of *Vibrio* infections occur yearly in the US, with around 100 deaths (CDC, 2023).

Aeromonas hydrophila can cause diarrheal illness, and its presence in fish products is a concern for food safety (Janda & Abbott, 2010). Inadequate cooking or cross-contamination during fish processing can facilitate transmission.

Some different bacteria i.e. *Listeria monocytogenes*, *Salmonella* spp. Have also 77arbourin from fish, raising

additional foodborne illness concerns (Dechet et al., 2006).

3.2. Parasitic Foodborne Diseases

Consumption of raw or undercooked fish 77arbouring parasites remains a significant risk, particularly in cultures where raw fish dishes (e.g., sushi, sashimi, ceviche) are popular.

Anisakiasis caused by *Anisakis simplex* larvae is a notable example, symptoms including with acute abdominal pain, nausea, and allergic reactions (Audicana & Kennedy, 2008). Studies suggest increasing anisakiasis cases worldwide, partly due to globalization of raw fish cuisine (Levsen et al. 2018).

Liver flukes likewise *Clonorchis sinensis* cause chronic hepatobiliary disease and are endemic in parts of Asia, needs targeted public health interventions (Sripa et al. 2010).

3.3. Viral Foodborne Risks

Fish viruses rarely infect humans directly; however, contamination of seafood with human viruses (e.g., norovirus) via fecal pollution is a recognized food safety issue (Lees, 2000). Additionally, immunosuppressed individuals may face increased risks from fish-associated viral agents (Miller et al. 2017).

3.4. Cooking, Processing, and Control Measures

Proper cooking (internal temperature >63°C) effectively kills most fish-borne pathogens (Levsen et al., 2018). However, raw fish consumption, such as sushi and ceviche, poses inherent risks.

Freezing fish at -20°C for at least 7 days is recommended to kill parasites like *Anisakis* (FDA, 2020). Nevertheless, informal fish markets and home preparation may not follow these guidelines.

The application of Hazard Analysis and Critical Control Points (HACCP) systems in seafood processing can reduce contamination risks (FAO, 2020).

4. OCCUPATIONAL RISKS IN FISHERIES AND AQUACULTURE

Workers in aquaculture, fisheries, and fish processing facilities face elevated risks due to frequent contact with live and dead fish, contaminated water, and fish products.

4.1. Skin and Soft Tissue Infections

Mycobacterium marinum is the most documented occupational pathogen, causing chronic granulomatous infections in fish handlers and aquarium enthusiasts (Falkinham, 1996). Lesions typically appear on exposed skin areas and may persist for months without appropriate treatment.

Other bacterial infections from *Aeromonas*, *Vibrio*, and *Erysipelothrix rhusiopathiae* can also cause cellulitis, abscesses, and systemic disease in workers (Lund et al. 2015).

4.2. Respiratory and Allergic Conditions

Fish processing workers may develop respiratory symptoms and allergic reactions due to inhalation of bioaerosols containing fish proteins, parasites, or microbial contaminants (Meyer et al. 2006). For this Conditions such as occupational asthma and excessive pneumonitis has reported mainly in fisherman (Cullinan et al. 2001).

4.3. Prevention and Control in Occupational Settings

Use of personal protective equipment (PPE), strict hygiene practices, and education on safe handling are critical to minimize occupational infections (FAO, 2020). Regular health screening and workplace risk assessments can help detect early cases.

5. PUBLIC HEALTH IMPLICATIONS AND CONTROL MEASURES

Fish diseases present complex challenges for safety of food, community and occupational health sectors globally. The increase of demand of fish and its products, changes in aquaculture practices, and globalization of seafood trade exacerbate the risks of transmission of zoonotic pathogens to humans.

5.1. Food Security and Economic Impact

Fish diseases reduce fish stocks and farm productivity, affecting food availability and livelihoods in fishing communities (Subasinghe et al. 2009). Outbreaks of fish-borne illnesses in humans can lead to costly public health responses and loss of consumer confidence in seafood products (FAO, 2020).

5.2. Diagnostic and Surveillance Challenges

Many fish-borne zoonoses remain underreported due to limited diagnostic capacity and lack or absence of surveillance systems, especially in low- and progressive

middle-income countries (Torgerson et al., 2015). The asymptomatic nature of some infections complicates detection and control efforts.

5.3. Regulatory and Policy Gaps

Harmonization of food safety regulations for fish products is needed to reduce contamination risks during harvesting, processing, and marketing (FAO, 2020). Occupational health policies must address the unique hazards faced by fishery and aquaculture workers. The public health burden of fish-borne diseases necessitates integrated management approaches.

- **Surveillance and Monitoring:** National and international monitoring of fish pathogens and human cases allows early detection and response (FAO, 2020).
- **Food Safety Practices:** Proper cooking, freezing, and handling of fish reduce foodborne risks (Levsen et al. 2018).
- **Occupational Safety:** Training, PPE, and workplace protocols reduce occupational disease incidence (Meyer et al. 2006).
- **Policy and Regulation:** Regulatory frameworks on aquaculture practices, import/export controls, and public health guidelines are vital (FAO, 2020).

6. FUTURE DIRECTIONS AND RESEARCH NEEDS

Emerging challenges such as climate change, antimicrobial resistance, and globalization impact fish disease epidemiology and human health risks (Burge et al. 2014).

Future research priorities include:

- Development of rapid diagnostics for fish pathogens in aquaculture and clinical settings
- Investigation of climate effects on pathogen distribution
- Assessment of new zoonotic threats and their socio-economic impacts
- Improved education and risk communication strategies targeting consumers and workers

Conclusion:

Fish diseases represent a significant intersection between animal and public health, highlighting One Health paradigm. Addressing the foodborne and occupational risks of fish-borne pathogens requires



collaborative efforts among aquaculture, public health, and environmental sectors to ensure fish safety and protect human health. Fish diseases pose risks to human health primarily through consumption of contaminated fish. Awareness of these risks and adherence to safe handling and cooking practices can significantly reduce the likelihood of foodborne illnesses associated with fish consumption.

Author Contribution

The authors reviewed and analysed the text by final reading and approved it, having contributed substantially to this research review analysis.

Declaration of Conflict Of Interest

The author declares that he has no commercial or financial interest in this research review that could be considered a conflict of interest.

Acknowledgments

We express our special thanks and gratitude to Professor Ahmad Pervez, Director of Research Studies, and Professor D.M. Tripathi, Head of Department, Department of Zoology, Pt. LMS Campus, Rishikesh, Shri Dev Suman Uttarakhand University, for their helpful suggestions on the search strategy, review protocol, and for their continued discussions. We sincerely thank them for their valuable advice and support.

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