Zoonoses Associated with Fish

Shane Boylan, DVM[a,b,c,*]

KEYWORDS

• Fish • Zoonoses • Atypical mycobacteria • Vibrio
• Edwardsiella • Erysipelothrix • *S iniae*

The taxonomic group that composes the fishes is the most diverse group of vertebrates worldwide. The challenges of unique physiologies, a foreign environment, and many unknowns attract a passionate group of biologists and veterinarians. Economically, fishes have become vital as food, bait, and companion animals. Fishermen and fish handlers (processing plants) represent the historical human population exposed to fish zoonoses, but growth in aquaculture and aquarium hobbyists have led to an increase in published fish-borne zoonotic cases starting in the late 1950s that bloomed in the 1980s.[1–9] Human physicians, particularly dermatologists and infectious disease specialists, are now more aware of fish-borne zoonoses, but they can be assisted with diagnosis when informed patients give more detailed histories with fish/water exposure.[8]

One role of the veterinarian is to inform clients about the potential risks of zoonotic disease. While fish-borne zoonoses are rare, the attention they have received in the past few decades has increased due to an overall focus on zoonotic diseases like avian influenza, tick-borne illness, bovine spongiform encephalopathy (BSE), and West Nile virus.[8,10] A recent review of aquatic zoonoses is available.[11] Fortunately, the diversity of fish-borne zoonotic pathogens is restricted to a small number of opportunistic bacterial pathogens. The disease triad of pathogen, host, and environment must always be considered when dealing with fish-borne zoonoses. Immune-compromised veterinarians exposing themselves to heavy infective doses of a pathogen may find themselves with an infection of a novel bacteria or fungus not previously described in the medical literature. Human immunodeficiency virus has demonstrated that many organisms previously considered innocuous can become potentially life threatening when the immune system is altered.[12,13] Fish-borne viral zoonoses have yet to be diagnosed, although some viruses show a tremendous capacity to jump between species in the aquatic environment.[14]

[a] South Carolina Aquarium, Charleston, SC, USA
[b] Medical University of South Carolina, Charleston, SC, USA
[c] College of Charleston, Charleston, SC, USA
* South Carolina Aquarium, 100 Aquarium Wharf, Charleston, SC 29401.
E-mail address: sboylan@scaquarium.org

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PROTOZOA AND PARASITES

Protozoal pathogens are arguably the most prevalent and damaging form of disease in ornamental piscine aquaculture.[15] Zoonotic protozoal fish pathogens are not reported in the literature, although protozoal organisms like *Cryptosporidium* spp, *Giardia lamblia*, *Balantidium* spp, malarial trypanosomes, and *Toxoplasma gondii* are found in aquatic environments where humans can be potentially exposed.[16,17]

Fish-borne parasitic zoonoses are not a typical concern for the veterinarian as part of their practice. Cestodiasis, trematodiasis, pentastomiasis, and nematodiasis are conditions that most aquatic veterinarians treat in their aquatic patients, but the clinician should always remember that a few of these parasites may use humans as a definitive, intermediate, or paratenic host. The clinician should be aware of the complex life cycles of these parasites and the clinical concerns they represent to both animal and human, particularly in food aquaculture. Consumption of raw, undercooked, undersalted, or insufficiently pickled fish meats is the primary route of fish parasite transmission to humans.[18,19] Cultural and socioeconomical factors predispose certain people to infection with the majority of fish-borne parasitic zoonoses occurring in lower-income countries.[18,20] The movement of aquaculture species has also led to the introduction of zoonotic parasites where medical surveillance and diagnosis for these pathogens are usually underdeveloped.[18,19] Gnathostomasis is an example where a helminth parasite is expanding its range due to human dietary and aquaculture practices.[19] Even the immigration/emigration of infected people, who act as definite hosts with fecal egg shedding, have increased the distribution of several parasites like clonorchis/opisthorchis liver flukes.[18,20,21]

In humans, the majority of fish-borne zoonotic parasites show few clinical symptoms unless parasite burdens are high. Biliary and hepatic lesions are common manifestations with hepatic trematode infections. Intestinal, pancreatic, and even bronchial disease are clinical symptoms of parasites that use the gastrointestinal system, like anisakiid nematodes, intestinal flukes, and diphyllobothriid cestodes.[18,19] Cancerous or precancerous growths have also been associated with infections of fish-borne parasite zoonoses in humans.[18,21] Liver fluke infections produce hepatic hyperplasia that may be diagnosed as cholangiohepatic carcinomas.[21,22] In the Pacific Northwest of the United States, the zoonotic intestinal fluke *Nanophyetus salmincola* causes "salmon poisoning" in canids by transmitting the rickettsia *Neorickettsia helmintheca.*[18] Oddly, the fluke causes gastrointestinal disease in humans without apparent pathology contribution by the rickettsia.[18] Although the majority of zoonotic fish parasite life cycles cannot be established in indoor environments, veterinarians working with outdoor aquaculture should be vigilant for these rare zoonotic parasites where life cycles may be completed. Even in ornamental aquaculture, predatory wildlife may spread parasites to areas of food aquaculture that could lead to human zoonoses. Veterinarians should assist in efforts to reduce exposure of all cultured fish to native wildlife, which can sustain significant disease and act as vectors for parasite transmission. Proper disposal of fish carcasses, enclosures that keep out predators, proper handling of waste water, and other containment practices may protect both cultured fish and wildlife. The nematode *Anguicolla crassus* (Asia) is one example of a foreign nematode that is now established in wild eel populations in North America and Europe as a result of possible contamination by introduced aqua-cultured animals.[23,24] Although *Anguicolla crassus* nematodes are not zoonotic, the example reveals how introduced fish parasites can harm both aquaculture and native wildlife.[25]