Bacterial and Parasitic Diseases of Pet Fish

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• Pet fish • *Aeromonas* • *Ichthyophthirius* • Wet-mount cytology • Ornamental fish

BACTERIAL DISEASE IN PET FISH

Bacterial disease is extremely common in ornamental fish and is most frequently associated with bacteria that are ubiquitous in the aquatic environment acting as opportunistic pathogens secondary to stress. Less commonly, bacterial disease is caused by primary or obligate pathogens. Most bacterial infections of fish are caused by gram-negative organisms and include the genera *Aeromonas*, *Citrobacter*, *Edwardsiella*, *Flavobacterium*, *Pseudomonas*, and *Vibrio*.[1–3] Bacterial disease in fish is complex and involves the interplay of various factors including the environment, the host (immune system function, host susceptibility, etc.), and pathogen-specific factors such as virulence. Stress can result in immune suppression and is critical in the pathogenesis of bacterial disease in fish with poor environmental conditions as the most common stressor involved in precipitation of bacterial disease. Water quality should routinely be assessed when investigating any disease outbreaks in aquatic organisms. Major bacterial pathogens in fish can be divided into the following four major groups[1] and one minor newly emerging group of pathogens:

Ulcer forming or systemic, gram-negative bacteria. This group includes bacteria in the genera Aeromonas, Vibrio, Edwardsiella, Pseudomonas, Flavobacterium, and others. This is the most common group of bacterial pathogens that affect fish.

External, gram-negative bacteria. This group of bacteria most commonly causes external infections. Some of these bacteria may also cause systemic infections.

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Included in this group are Flavobacterium columnarae, Flexibacter maritimus, yellow-pigmented bacteria, Cytophaga spp, and others.

Systemic, gram-positive, rapidly growing bacteria. These bacteria generally cause systemic infections and include Streptococcus spp and related species.

Slow-growing, acid-fast bacteria. These bacterial pathogens cause systemic, chronic, granulomatous disease. The most common pathogens in this group are Mycobacterium spp.

Newly emerging intracellular rickettsial pathogens.

Clinical signs of bacterial disease may be peracute (mortality without gross evidence of disease), acute, or chronic and varies with the particular pathogen and various host related factors. With misuse of antibiotics, antibiotic resistance is becoming more important in treating bacterial diseases in fish. This article discusses specific bacterial diseases in fish including clinical presentation, diagnostics, and treatments.

ULCER-FORMING AND SYSTEMIC INFECTIONS CAUSED BY GRAM-NEGATIVE BACTERIA

This is the most common group of bacterial pathogens that affect fish and includes bacteria in the genera *Aeromonas*, *Vibrio*, *Edwardsiella*, *Pseudomonas*, *Flavobacterium*, and others. Clinical signs of ulcer-forming and systemic infections caused by gram-negative bacteria include lethargy, anorexia, abnormal swimming patterns or spinning, hemorrhagic lesions on the skin, ulcerative skin lesions, abdominal distension, ascites, abnormal position in the water column, exophthalmia (“pop-eye”), skin darkening, gill necrosis, and mortality.[1–3] With gill involvement, respiratory signs such as increased opercular rate, piping (gasping for air at the water surface) and respiratory distress may be seen.

Motile Aeromonad Septicemia

Motile aeromonads are the most common bacterial pathogens of fish and may result in a syndrome called motile aeromonad septicemia (MAS). MAS is most commonly caused by ubiquitous aquatic bacteria of the *Aeromonas hydrophila* complex, including *A hydrophila*, *A sobria*, and *A caviae*. *A hydrophila* is the most common isolate and is more commonly isolated from freshwater than marine fish. MAS is almost always secondary to an underlying stressor and is most commonly found in conjunction with eutrophic water quality conditions. In fishponds, this aeromonad is commonly isolated from clinically ill fish in the warmer months of the year. Common clinical signs include cutaneous hemorrhages and ulcers that can be deep through the dermis to connective tissue and muscle, visceral hemorrhages, edema, dropsy or ascites, and exophthalmia.[1–3]

*Ulcerative Dermatitis in Koi (*Cyprinus carpio)

Ulcerative dermatitis (UD) is a multifactorial syndrome seen in koi (*Cyprinus carpio*) and related cyprinids such as goldfish (*Carassius auratus*) that results in ulcerative skin lesions. Clinical signs include raised or erythematous and missing scales, and ulcers that extend from the skin into the underlying musculature; in severe cases, bone may be exposed or penetration into the coelomic cavity may occur. Progression to septicemia can also occur resulting in clinical signs such as those seen with MAS. Osmotic distress due to loss of epidermal integrity may result in fluid retention, exophthalmos, and dropsy. **Fig. 1** exhibits the typical ulcers in a koi with UD. Various bacterial pathogens have been isolated from these cases including *A salmonicida* and *A hydrophila*.[1,2,4] *A salmonicida* can be difficult to culture as it is fastidious and quickly overgrown by other rapidly growing bacteria such as motile aeromonads.[1] In a recent