

Approach to Aquatic Skin Infections

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KEYWORDS

- Aquatic infection • Skin infection • *Vibrio* • *Aeromonas* • *Edwardsiella*
- *Erysipelothrix* • *Mycobacterium*

KEY POINTS

- Although *Staphylococcus* and *Streptococcus* are the most common causative agents of skin infection, consider other species in aquatic infections.
- Skin and soft tissue infections from an aquatic source can rapidly progress to necrotizing fasciitis.
- Mortality is decreased by starting empiric antibiotics without waiting for culture results and considering early surgical evaluation if indicated.

INTRODUCTION

Aquatic-based infections can present a treatment challenge for primary care physicians because of the likely polymicrobial nature of the infection and the possibility of uncommon pathogenic organisms.^{1–3} Skin and soft tissue infections (SSTIs) acquired in aquatic environment are usually the result of wound exposure to the multitude of organisms present. Microbiologic cultures in this setting most commonly yield polymicrobial gram-negative organisms.¹ All aquatic wounds should receive routine wound care, including irrigation, removal of foreign bodies, tetanus prophylaxis, and wound culture if possible. Although *Staphylococcus* and *Streptococcus* species that colonize the skin are the most common etiologic agents associated with salt water and freshwater infections, other significant pathogens can include *Vibrio*, *Aeromonas*, *Edwardsiella*, *Erysipelothrix*, and *Mycobacterium* as seen in **Table 1**.^{4,5} Early detection and

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Bacteria	Type	Location	Characteristic Presentation
<i>Vibrio</i> spp (<i>Vulnificus</i> , <i>Parahaemolyticus</i> , <i>Alginolyticus</i> , and <i>Damsela</i>)	Facultative anaerobic gram-negative rod	Oceans, coastal waterways, but may survive in freshwater	“Salt loving”; virulent infection associated with severe cellulitis, osteomyelitis, necrotizing fasciitis, and septicemia.
<i>Aeromonas hydrophila</i>	Facultative gram-negative rod	Freshwater and aquariums	Onset similar to standard cellulitis but within 24 h bullae with purulent discharge may develop. If improperly treated, may develop gas within the soft tissue, necrotizing fasciitis, or osteomyelitis. May be coinfecting with <i>Pseudomonas</i> spp.
<i>Edwardsiella tarda</i>	Facultative, anaerobic, gram-negative rod	Fresh and brackish water	Associated with wounds caused by fish or suffered in infected waters; causes abscess formation and invasive infections in the immunocompromised.
<i>Erysipelothrix rhusiopathiae</i>	Gram-positive bacillus	Saltwater and fish handling	“Fish-handler’s disease”; causes erysipeloid (ring-shaped lesion with a sharply demarcated purplish/red border, associated with intense pain); may mimic septic arthritis or result in disseminated endocarditis.
<i>Mycobacterium marinum</i>	Atypical nontuberculous mycobacterium	Marine and freshwater	“Swimming pool granulomas”; may take weeks or months to manifest clinically; begins with a focal area or erythema followed by an ulceration and may progress to cellulitis, myelitis, tenosynovitis, septic arthritis, osteomyelitis, or a disseminated infection; most likely requires surgical debridement.

Data from Crosby SN, Snoddy MC, Atkinson CT, et al. Upper extremity myonecrosis caused by *Edwardsiella tarda* resulting in transhumeral amputation: case report. J Hand Surg Am 2013;38(1):129–32; and Noonburg GE. Management of extremity trauma and related infections occurring in the aquatic environment. J Am Acad Orthop Surg 2005;13(4):243–53.

appropriate management of aquatic infections can significantly decrease morbidity and mortality. This article reviews the pathophysiology, presentation, and management for the most common water-borne pathogens causing SSTI.

VIBRIO SPECIES

Vibrio spp are halophilic, gram-negative bacilli found worldwide in salt and brackish water.^{6,7} *Vibrio* thrives at water temperatures of 9°C to 31°C, and has typically been

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