A 38 year-old female with no significant past medical history was brought to the emergency department following a motor vehicle rollover and submersion into swampy waters alongside a Louisiana interstate. In addition to multiple blunt force injuries, she suffered a laceration injury over the right lower extremity, which initially required irrigation and sterile dressing. On hospital day two, the wound became grossly infected. The wound was swabbed for culture and Gram stain, and the patient was empirically started on intravenous Piperacillin/tazobactam. Results from the Gram stain showed few white blood cells and numerous Gram negative rods. The following day, the wound continued to drain purulent material but with a stable zone of erythema. The wound was drained and debrided. On hospital day four, the blood agar plate, previously inoculated with the wound culture, grew the colonies shown in the below photograph.

What is the microorganism causing the wound infection in this case?
DIAGNOSIS: Aeromonas hydrophila

DISCUSSION

Aeromonads are Gram-negative, rod-shaped, facultative anaerobic water-borne bacteria. Aeromonas hydrophila is the most commonly isolated species associated with human infections. Although molecular techniques involving gene sequencing analysis have been developed for identification of Aeromonas hydrophila, automated DNA sequencing is beyond the means of most routine clinical laboratories.

Morphological and biochemical characteristics are paramount in the routine identification of Aeromonas hydrophila. Morphologically, Aeromonas hydrophila are short bacilli occurring singly and in pairs with a single polar flagellum. Aeromonas hydrophila produce distinctive colonies on blood agar as illustrated in Figure 1. Colonies are large, round, raised, and opaque with beta-hemolysis. After three to five days of incubation at room temperature, the growth develops a characteristic iridescent greenish hue.

Aeromonas hydrophila physiologically resembles members of the Enterobactericeae family of bacteria but can be easily differentiated by an oxidase test for which aeromonads are positive. Furthermore, Aeromonas’ resistance to vibriostatic compound O/129 (150µg) and the variable presence of ornithine decarboxylase activities differentiate the genus from the oxidase-positive Enterobactericeae-like organisms, Plesiomonas, and Vibrio.

Aeromonads are widely distributed in a variety of aquatic environments and have been isolated from marine waters, rivers, lakes, swamps, sediments, chloride water, water distribution systems, drinking water, and residual waters. An increased isolation rate of Aeromonas species in floodwaters after the 2004 Indian Ocean tsunami, as well as after Hurricane Katrina in 2005, suggests that this microbe is a potential public health threat, especially during natural disasters.

Worldwide, aeromonads have historically been associated with gastrointestinal disease and travelers' diarrhea. In recent years, however, skin and soft tissue infections due to Aeromonas species have become a close second in prevalence after gastrointestinal illnesses. Case reports of fatal myofascial necrosis due to Aeromonas have gained attention, particularly in geographical areas with warm brackish waters such as those found in the southeastern United States. Cutaneous infections are most often a result of freshwater exposure of the organism to abrasions, puncture wounds, and/or lacerations, which can occur following trauma such as propeller injuries and alligator and water moccasin snake bites.

Aeromonas hydrophila is capable of producing several virulence factors, including cytotoxins, enterotoxins, hemagglutinins, and exoenzymes. As was seen in our case, resulting cellulitis typically develops within 48 hours of exposure to water. Treatment of Aeromonas wound infections is complicated by the fact that aeromonads are universally resistant to penicillin due to the presence of chromosomal beta-lactamase, rendering standard empirical antibiotic treatment for common streptococcal or staphylococcal wound infections ineffective. More than 90% of aeromonad strains, however, are susceptible to third-generation cephalosporins, aminoglycosides, and fluoroquinolones. Fortunately, in our case, proper isolation of Aeromonas hydrophila, effective wound care, and appropriate antibiotic therapy contained the infection and resulted in a favorable outcome for the patient.

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REFERENCES


In the Department of Pathology at Louisiana State University School of Medicine in New Orleans, Dr. Donthamsetty is a second-year Pathology Resident and Drs. Barbeau and McGoey are Associate Professors. In the Department of Internal Medicine, Division of Infectious Disease, Dr. Figueroa is an Associate Professor.