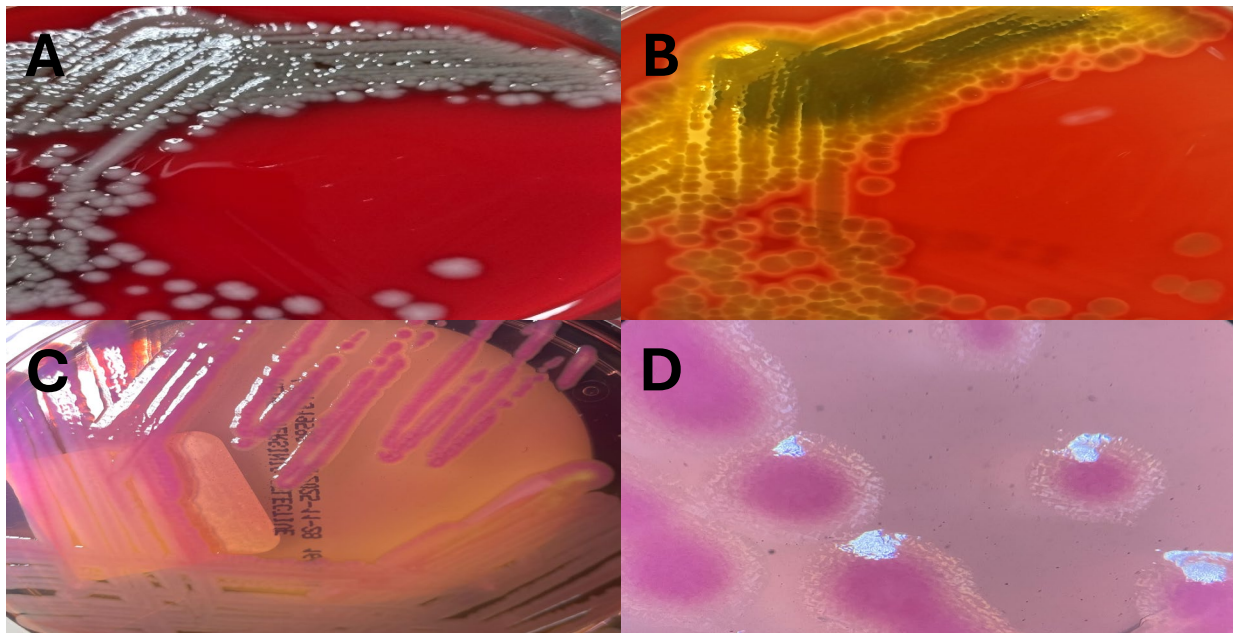


A teenage male presented to the ED with a 3 cm horizontal laceration over the left patella. The injury occurred while he was playing in a shallow river at a state park and the patient tripped over a rock. The wound was initially contaminated with river water, mud and sand. Upon presentation, his caregiver irrigated the wound with saline, and he received four sutures to ensure closure of the laceration. He was discharged on oral cephalexin (500mg for 7 days). The following day, he returned to the ED with worsening knee pain, swelling, and inability to flex the joint. He was hypertensive, and laboratory tests revealed an elevated CRP (11 mg/L) but normal WBC counts. The wound was now exhibiting mucopurulent drainage and erythema consistent with cellulitis, so the patient was admitted to the general pediatrics service for management.

After hospital admission, the wound was incised and drained and the purulent drainage material was sent to the microbiology laboratory for culture. The patient was started on IV clindamycin and cefepime to expand antibiotic coverage. No imaging was performed to assess deeper infection or joint involvement. The patient reported significant improvement following the drainage procedure. A day later, the culture revealed moderate growth a beta-hemolytic, Gram-negative organism which was definitively identified *Aeromonas* spp. in addition to a mixture of skin and enteric flora.



Representative images of *Aeromonas* spp. in culture on blood agar and CIN media.

A) Colony morphology on blood agar. B) Characteristic beta-hemolysis on blood agar. C) Characteristic growth on CIN media. D) "Bull's-eye" colony morphology on CIN media. Photos courtesy of Ahnika Kline, MD, Ph. D, D(ABMM) and Matt England, PhD, D(ABMM).

Which of the following review questions about *Aeromonas* spp. are false?

- A. *Aeromonas* spp. primarily inhabit aquatic environments, including both fresh- and brackish water ecosystems.
- B. *Aeromonas* spp. infections occur most frequently during warmer months, typically from May to October.

- C. *Aeromonas* spp. mainly cause two types of infections: gastroenteritis and wound infections, sometimes accompanied by bacteremia.
- D. *Aeromonas* spp. yield negative results for both oxidase and indole tests.

Answer: D. *Aeromonas* spp. are both oxidase-positive and indole-positive (most strains), not negative as stated. These traits help distinguish them from Enterobacteriaceae, which are almost exclusively oxidase-negative (apart from *Plesiomonas shigelloides*) with variable indole reactivity.

Discussion:

Aeromonas spp. are commonly found in freshwater and marine environments. They infect humans and animals, including colonizing aquatic species such as fish and mollusks. These bacteria can cause human infections through direct exposure to contaminated water via open wounds, or indirectly through ingestion of contaminated food products.

The genus *Aeromonas* consists of 32 recognized species, most of which are opportunistic pathogens. These bacteria are facultative anaerobes, rod-shaped, Gram-negative, and non-spore-forming, typically measuring 1–3 μm in length. They are oxidase- and indole-positive, ferment lactose (as opposed to *P. shigelloides* which is non-lactose fermenting), and tolerate salinity levels ranging from 0.3% to 5%. Based on growth conditions and biochemical characteristics, *Aeromonas* species are classified into two major groups: psychrophilic, which are non-motile and exhibit optimal growth at 22–25 °C, and mesophilic, which generally grow at 35–37 °C and are motile due to a single polar flagellum such as *A. hydrophila*, *A. caviae* and *A. veronii*.

Identifying *Aeromonas* spp. is challenging because these bacteria have a lot of genetic variation and there is no effective biochemical evidence for this task. Although newer molecular techniques exist, PCR amplification of key genes remains the most accurate method for species-level identification. Molecular studies using housekeeping genes (*rpoD*, *gyrB*, etc.) show that four species dominate clinical isolates: *A. caviae* (37.26%), *A. dhakensis* (23.49%), *A. veronii* (21.54%), and *A. hydrophila* (13.07). These species are associated with pronounced immune activation and monocyte damage.

Aeromonas spp. are linked to a wide range of infections, including gastroenteritis, wound infections, urinary tract infections, surgical site infections, pneumonia, meningitis, necrotizing fasciitis, and complications following medicinal leech therapy. Patients with hepatobiliary disease, especially cirrhosis, are at increased risk for severe diseases including rapidly progressing fatal infections. In the setting of gastrointestinal disease, diagnosis is largely reliant on culture as most multiplex molecular panels do not contain targets specific for *Aeromonas* spp. despite being a known cause of diarrheal illness. In this setting, CIN (Cefsulodin, Igrasan, Novobiocin) agar can be helpful as a selective and differential medium, with *Aeromonas* spp. colonies exhibiting a characteristic “bull’s-eye” appearance with a deep red center and transparent edge.

This case highlights a pediatric patient who developed cellulitis after sustaining a knee laceration in a freshwater river. It is important to consider waterborne pathogens such as *Aeromonas* in soft tissue infections, particularly in patients with significant environmental exposures. *Aeromonas* spp. can cause rapid progressive cellulitis and are often resistant to beta-lactam antibiotics,

including penicillin and first-generation cephalosporins. Susceptibility testing based on CLSI M45 guidelines revealed resistance to amoxicillin/clavulanate, but susceptibility to ciprofloxacin, as well as ceftriaxone, ceftazidime and cefepime. Empiric treatment with cefepime was appropriate, and the patient was transitioned to ciprofloxacin at the time of discharge.

References

1. Rafael Bastos Gonçalves Pessoa, Wesley Felix de Oliveira, *et al.* The genus *Aeromonas*: A general approach. *Microbial Pathogenesis*. Volume 130, May 2019, PP. 81-94.
2. Figueras and Fernández-Bravo. *Aeromonas*, the Aquatic Multipotential Bacteria that May Affect Humans and Animals – An Overview of the Past to Face the Future. 2025 January; DOI: 10.5772/intechopen.1008689.

October 2025, case study written by Min He, MLS

Reviewed by Dr. Heba Mostafa and Dr. Andrew Clark