



Shewanella putrefaciens, an emerging foe from climate change: a case report

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Case presentation (1)

Patient:

- 74-year-old woman with recurrent post traumatic soft tissue infection (October 2024)
- Initial trauma to the right tibial crest wound after a fall (July)
- Exposure during bathing activities in the coastal seas of Valencia (Spain)
- Symptoms onset two weeks later

Diagnostics:

- **Microbiology:** purulent wound discharge coltures positive for *Shewanella putrefaciens* (intermediate sensitivity to quinolones and cephalosporins) and *Bacteroides fragilis* (multi-sensitive)
- **Ultrasound findings:** hypoechogenic area (8×11×24 mm) beneath fascial plane

Treatment:

- **Antibiotic therapy:** Amoxicillin/clavulanic acid 875/125 mg every 8h × 10 days
- **Surgical intervention:** wound debridement
- **Outcome:** persistent symptoms after 1 month, treatment failure

Case presentation (2)

Physical examination:

- persistent erythema
- local swelling
- hard edema of the foot
- afebrile, normal vital signs

New antibiotic course with
high dose ciprofloxacin (750
mg q12h)



Case presentation (3)

1 week later:

- **self-withdrawal from antibiotic therapy** after 5 days for myalgia and insomnia
- **Physical examination:** residual hard edema, initial wound healing and scar formation

2 weeks later:

- **Soft tissue ultrasound:** thickened superficial fascial tissue, interpreted as granulation tissue, no significant fluid collections.

1 month later:

- complete wound healing



Background

Shewanella putrefaciens

- **Gram-negative, non-fermenting, facultative aerobic** bacterium
- **Produces biofilm**; found in aquatic environments and seafood
- **Part of marine microflora**; associated with decomposition of dead fish and algae
- **Produces hydrogen sulfide** (H_2S), contributing to organic matter breakdown
- **Thrives under variable conditions**: temperature, salinity, oxygen levels
- **Rare opportunistic human pathogen**: can cause bacteremia, cellulitis, wound infections



Discussion (1)

Risk factors for *Shewanella* spp. infections:

- **Chronic ulcers** of the lower extremities
- Traumatic wounds exposed to **seawater**

Higher-risk populations:

- Immunocompromised individuals (e.g., severe renal failure on **dialysis**)

Key pathogenic mechanism:

- **Biofilm production** → potential colonization of peritoneal or hemodialysis catheters



Discussion (2)

Climatic factors favoring the proliferation of *Shewanella putrefaciens*:

High water temperature

- Optimal growth above 20–25 °C
- More common during summer or in tropical/subtropical regions

Moderate to high salinity

- Thrives in marine and brackish waters (e.g., estuaries, lagoons)
- Adapted to a wide range of salt concentrations

Low oxygen levels in sediments

- Can survive in microaerophilic or anaerobic environments (e.g., seabed)

Organic pollution and eutrophication

- Organic matter promotes bacterial growth
- Coastal areas with runoff or stagnant water are higher risk

Extreme weather events (e.g., heavy rain, flooding)

- Disturbs sediments and releases bacteria into surface waters
- Increases human exposure during marine activities

Discussion (3)

How global warming contributes to key marine environmental changes:

High water temperature

- Trapped greenhouse gases raise atmospheric heat → oceans absorb ~90%
- Leads to steady increase in sea surface temperatures globally

Moderate to high salinity

- Increased evaporation from warmer oceans concentrates salt
- Melting glaciers can shift salinity patterns locally (increasing or decreasing depending on currents)

Low oxygen levels in sediments

- Warmer water holds less dissolved oxygen
- Stratification reduces mixing → oxygen depletion in deeper layers and sediments
- Increased microbial activity consumes more oxygen

Organic pollution and eutrophication

- Warmer conditions promote algal growth and microbial metabolism
- Heavy rains increase nutrient runoff (e.g., fertilizers) into coastal waters
- Leads to algal blooms and oxygen-depleted “dead zones”

Extreme weather events (e.g., heavy rain, flooding)

- More heat = more energy in the atmosphere → more frequent and intense storms
- Increased rainfall causes flooding, runoff, coastal erosion, and sediment disturbance
- Spreads pollutants and pathogens into marine environments

Discussion (4)

Evidence of increasing *Shewanella* infection reports:

- **Comprehensive review (1978–2022):** 273 case studies, noting that *Shewanella* species have “rapidly increased within the past decade” and are now emerging pathogens worldwide
- **128-patient case series (2010–2020):** a Hong Kong hospital reported 128 *Shewanella* infections over 10 years, highlighting them as emerging pathogens, not rare events
- **Rise in reported cases in recent years:** a pediatric septic arthritis case report mentioned a recent rise in reported *Shewanella* infections, mainly *S. algae* and *S. putrefaciens*
- **Meta-analysis of 56 articles (260 cases):** increasing documentation, especially of skin, soft tissue, and ear infections
- **Emerging pathogen in warm climates:** a Portuguese hospital study ($\approx 2\frac{1}{2}$ years ago) observed that *S. algae* is being found worldwide and that reports of infection are increasing

Conclusion

Shewanella spp. are **no longer rare curiosities**, but **emerging human pathogens**, particularly in warm marine environments

Infections are **increasingly reported in traumatic wounds exposed to seawater**, especially in immunocompromised individuals.

Climate change plays a key role by:

- Raising sea surface temperatures
- Increasing extreme weather events
- Enhancing bacterial growth and distribution

Several case series and reviews confirm a **rising trend in reported infections worldwide**.

Clinicians should **consider *Shewanella* in differential diagnosis of marine-related wounds**, especially with unusual resistance profiles or slow healing.

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