CASE REPORT

Shewanella algae: A Rare Cause of Sepsis and Septic Shock

Deven Juneja[1], Omender Singh[2], Kaushal Madan[3], Amit Goel[4], Anish Gupta[5], Bansidhar Tarai[6]

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Abstract

Septic shock is still associated with high morbidity and mortality. Early aggressive care and appropriate empiric antibiotic therapy remain the cornerstone of therapy and are important for improving outcomes. Infections with rare organisms may complicate diagnosis and make initiation of appropriate antibiotics challenging. Hence, knowledge of rare infections and their sensitivity patterns is imperative for managing such cases. *Shewanella* spp. are facultative anaerobic gram-negative bacilli which are primarily found in marine environments. They have increasingly been recognized to cause human infections, which may rarely be life-threatening. Here, we present a case of septic shock secondary to *Shewanella algae* bacteremia.

Keywords: Bacteremia, Opportunistic infections, Sepsis, Septic shock, *Shewanella algae*.

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Case Description

A 90-year-old bed-bound female, with a history of recurrent urinary tract infection (UTI) presented to emergency room with complaints of altered sensorium and labored breathing. She was a known case of diabetes, dementia, hypothyroidism, anal papilloma, and cerebrovascular accident with left side hemiparesis. There was also a history of bleeding per rectum. She was recently hospitalized and received intravenous antibiotics for her UTI and was discharged on oral antibiotics (ofloxacin) 3 days ago. On examination, she was afebrile, drowsy (E4M5V1), had a heart rate of 72, blood pressure of 82/54, and respiratory rate of 25/min. Her admission Acute Physiology and Chronic Health Evaluation (APACHE) II score was 19 (predicted death rate 25.3%). Initial arterial blood gas revealed a pH of 7.50, pCO_2 22.9 mm Hg, pO_2 223 mm Hg, HCO_3 17.7 mmol/L, and lactate 2.5 mmol/L, on 5 L/min of oxygen through face mask. She was resuscitated as per the surviving sepsis guidelines.[1]

Paired blood cultures were sent and piperacillin-tazobactam was started as the initial empiric therapy for sepsis, but was switched to doripenem, next day, in view of persistent shock and history of multiple antibiotics. Sepsis dose steroids were also added, which were gradually tapered off once she became hemodynamically stable. Initial laboratory reports showed a total leukocyte count of 18,300 cells/mm^3, hemoglobin 8.0 gm/dL but liver, renal, and thyroid function tests and cardiac enzymes were all normal. Lower gastrointestinal endoscopy was performed which revealed internal hemorrhoids and anal papilloma which was oozing slightly. Local adrenaline injection was given. Urine routine showed no pus cells and culture was sterile. On day 2, her initial paired blood culture report came positive for *Shewanella algae,* and doripenem was continued based on the sensitivity pattern (Table 1) and clinical response. Culture was performed using BacT/ALERT system, BioMerieux, and identification was performed using MALDI-TOF analysis and sensitivity using Vitek 2 system.

Over the next few days, she showed gradual improvement in consciousness and became hemodynamically stable. Hemoglobin also remained stable and there was no evidence of any gastrointestinal bleeding. Repeat paired blood culture performed on day 5 was sterile and she was shifted out of intensive care unit on day 6.

[1,2,4,5]Institute of Critical Care Medicine, Max Super Speciality Hospital, Saket, New Delhi, India

[3]Department of Gastroenterology and Hepatology, Max Centre for Gastroenterology, Hepatology and Endoscopy, New Delhi, India

[6]Department of Microbiology, Max Super Speciality Hospital, Saket, New Delhi, India

Corresponding Author: Deven Juneja, Institute of Critical Care Medicine, Max Super Speciality Hospital, Saket, New Delhi, India, Phone: +91 9818290380, e-mail: devenjuneja@gmail.com

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Discussion

Shewanella spp. are facultative anaerobic gram-negative bacilli which are primarily found in marine environments. Over the past few years, they have increasingly been recognized as human pathogens. *S. algae* is the most commonly reported genus causing human infections, followed by *S. putrefaciens*. The most common mode of human infection has been exposure to warm saltwater where this organism may gain entry through cutaneous ulcers. Skin and soft tissue (SST), ear, and abdominal infections are generally reported, but rarely it has been shown to cause bacteremia and sepsis.[2–4] Here, we reported a case of an elderly woman who presented with *S. algae*-induced septic shock.

Sepsis and septic shock are still associated with high morbidity and mortality. Early aggressive care and appropriate empiric antibiotic therapy remain the cornerstone of therapy and are important for improving outcomes.[1] Rare infections may sometimes complicate clinical picture and make initial choice of empiric antibiotics challenging while managing critically ill patients with septic shock. Our patient was an elderly female with long-standing diabetes and history of recurrent UTI requiring multiple hospitalizations and antibiotic therapies. Initiation of early appropriate antibiotics is essential in improving outcomes in such a clinical scenario.

Table 1: Sensitivity pattern for *S. algae*

Sensitive	*Intermediate*	*Resistant*
Cefepime/ Tazobactum	Cefipime	Amikacin
Imipenem	Cefoperazone/ Sulbactam	Ceftazidime
Meropenem	Colistin	Ciprofloxacin
	Polymyxin B	Gentamycin
	Piperacillin/ Tazobactum	Levofloxacin
		Netilmicin
		Ticarcillin/Clavulanic acid
		Trimethoprim/ Sulfamethoxazole

The present case has several salient features. We have presented a case of septic shock with a rare organism, in a rare setting. Most of the previous reports are from the Mediterranean regions and *S. algae* infections have been rarely reported from the Indian subcontinent.[5] Our case had long-standing diabetes and exposure to multiple antibiotics. However, she had no exposure to seawater or seafood.

A strong association of *S. algae* infections has been reported with seawater exposure and also consumption of raw seafood.[6,7] As it is mainly a seawater pathogen, sailors, fishermen, tourists, and swimmers are generally found to be at risk. Rarely, like ours, cases have been reported with no prior exposure, and *S. algae* is now accepted to be more widely distributed in the environment.[3,8] *S. algae* is an opportunistic bacteria and hence, immunocompromised patients with chronic renal disease, neutropenia, chronic liver disease, and diabetes are also at risk.[8]

The most common infections associated with *S. algae* are SST infections. Other reported infections include otitis, keratitis, osteomyelitis, arthritis, and gastroenteritis. *S. algae* has also been implicated in life-threatening infections like pneumonia, empyema, endocarditis, Fournier's gangrene, peritonitis, and bacteremia.[8]

The mechanisms involved in human pathogenicity are still not clearly understood, but it is suspected that β-hemolysins are involved in the hemolytic activity which makes *S. algae* more virulent as compared to *S. putrefaciens*.[9] Other pathogenic mechanisms may also be involved including production of various virulent factors like siderophores, tetrodotoxin, and pufferfish toxin.[8]

S. algae is generally susceptible to fluoroquinolones, aminoglycosides, third and fourth generation cephalosporins, beta-lactam/beta-lactamase inhibitors, and carbapenems but are generally resistant to trimethoprim/sulfamethoxazole and polymyxins.[8] However, there is an increase in multidrug resistance in the last few years and strains resistant even to carbapenems have been reported.[3] Various resistance mechanisms have been found in *S. algae* including presence of qnr genes, class C beta-lactamases (blaAmpC), oxacillinase class D β-lactamase encoding genes (blaOXA), and eptA gene, conferring resistance to quinolones, cephalosporins, carbapenems, and colistin, respectively.[8]

As most of the infections are SST infections, the related mortality due to *S. algae* is low ranging from 8 to 13%.[8,10] Bacteremia may be present in up to 8% of patients, in whom mortality rates may be higher.[8] In our case, early resuscitation and appropriate empirical antibiotics may have salvaged our patient and prevented her from going into multi-organ failure and having poor outcome.

To conclude, *S. algae* is an emerging human pathogen and may rarely cause sepsis and septic shock. Even though it is generally associated with seawater or seafood exposure, patients with no documented exposure may also be rarely infected, especially if they are immunocompromised. The sensitivity pattern and choice of antibiotic need to be further evaluated for this rare infection, as early appropriate therapy may affect outcomes.

Orcid

Deven Juneja https://orcid.org/0000-0002-8841-5678
Omender Singh https://orcid.org/0000-0002-3847-4645
Kaushal Madan https://orcid.org/0000-0003-2902-9213
Amit Goel https://orcid.org/0000-0002-9509-5705
Bansidhar Tarai https://orcid.org/0000-0001-9742-9855

References

1. Evans L, Rhodes A, Alhazzani W, et al. Surviving sepsis campaign: international guidelines for the management of sepsis and septic shock 2021. Crit Care Med 2021;49(11):1974–1982. DOI: 10.1097/CCM.0000000000005337
2. Latif A, Kapoor V, Vivekanandan R, et al. A rare case of *Shewanella* septicemia: risk factors, environmental associations and management. BMJ Case Rep 2019;12(9):e230252. DOI: 10.1136/bcr-2019-230252
3. Yan Y, Chai X, Chen Y, et al. The fulminating course of infection caused by *Shewanella algae*: a case report. Infect Drug Resist 2022;15:1645–1650. DOI: 10.2147/IDR.S357181
4. Bernshteyn M, Kumar AP, Joshi S. *Shewanella algae*—a novel organism causing bacteremia: a rare case and literature review. Cureus 2020;12(9):e10676. DOI: 10.7759/cureus.10676
5. Sumathi BG, Kumarswamy SR, Amritam U, et al. *Shewanella algae*: first case report of the fast emerging marine pathogen from squamous cell carcinoma patient in India. South Asian J Cancer 2014;3(3):188–189. DOI: 10.4103/2278-330X.136819
6. Vogel BF, Holt HM, Gerner-Smidt P, et al. Homogeneity of Danish environmental and clinical isolates of *Shewanella algae*. Appl Environ Microbiol 2000;66(1):443–448. DOI: 10.1128/AEM.66.1.443-448.2000
7. Holt HM, Gahrn-Hansen B, Bruun B. *Shewanella algae* and *Shewanella putrefaciens*: clinical and microbiological characteristics. Clin Microbiol Infect 2005;11(5):347–352. DOI: 10.1111/j.1469-0691.2005.01108.x
8. Yousfi K, Bekal S, Usongo V, et al. Current trends of human infections and antibiotic resistance of the genus *Shewanella*. Eur J Clin Microbiol Infect Dis 2017;36(8):1353–1362. DOI: 10.1007/s10096-017-2962-3
9. Khashe S, Janda JM. Biochemical and pathogenic properties of *Shewanella alga* and *Shewanella putrefaciens*. J Clin Microbiol 1998;36(3):783–787. DOI: 10.1128/JCM.36.3.783-787.1998
10. Vignier N, Barreau M, Olive C, et al. Human infection with *Shewanella putrefaciens* and *S. algae*: report of 16 cases in Martinique and review of the literature. Am J Trop Med Hyg 2013;89(1):151–156. DOI: 10.4269/ajtmh.13-0055