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Shewanella, not just found in the marine environment. A rare case of *Shewanella* algae bacteremia

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ABSTRACT

A 63 year old Caucasian female with ampullary pancreatic cancer s/p pancreaticoduodenectomy in 2016 was admitted to our cancer center with complaints of fever (temperature 103° F) and abdominal pain. She was found to have multiple liver abscesses. Her blood culture grew out *Shewanella* algae. We herein report on this rare human bacterial infection.

Keywords: *Shewanella*; Bacterial

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Introduction

Shewanella algae are gram negative motile bacteria typically found in the aquatic environment. It was named in the mid-1980s after a marine microbiologist, James Shewan [1]. This organism most commonly lives in seawater [1]. It is unusual for this organism to cause infection in humans [2]. In the rare instances they do cause blood stream infections it is usually with patients known to have chronic underlying hepato-biliary, pancreatic or kidney disease [3]. We report a unique case of *S. algae* bacteremia at our cancer center.

Case Report

This patient is a 63-year-old Caucasian female with ampullary pancreatic cancer s/p pancreaticoduodenectomy in 2016. She developed post-operative biliary leak and now has cholangiovenous reflux of enteric contents into her biliary system. She underwent biliary stent placements with interventional radiology.

She was admitted to our cancer center with chills, abdominal pain, fevers T max 103° F and shortness of breath. She also complained of being severely fatigued, weak and short of breath with minimal exertion. She was not able to ambulate or take care of herself at home. On admission blood pressure was 119/68, heart rate 91, O2 saturation 100% on room air. Physical exam findings were significant for upper quadrant abdominal tenderness. Her labs showed an elevated white blood cell count of 22 k/ uL, elevated total bilirubin level of 5.49 mg/dL, alkaline phosphatase 810 U/L, AST 103 U/L, ALT 39 U/L.

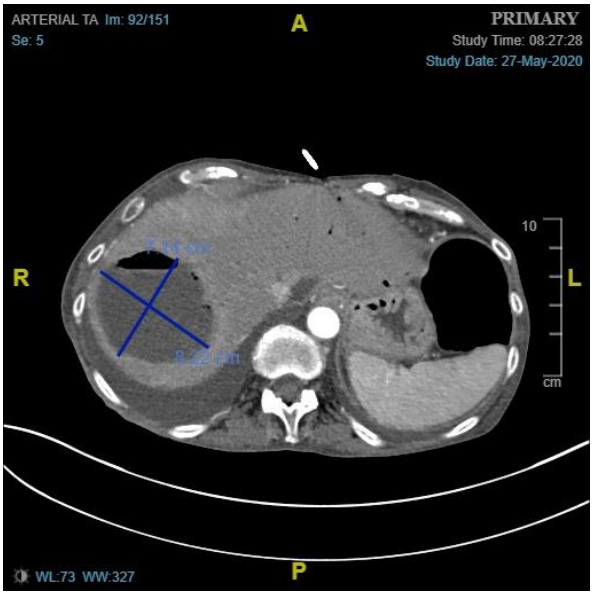

Figure A. CT Abdomen and pelvis showing a large liver abscess in the right liver measuring 8.2 x 7.1 cm.

CT abdomen and pelvis revealed multiple hepatic abscesses with the largest measuring 8.2 x 7.1 cm (Figure A). She had three ultrasound guided drain catheters placed into the liver abscesses. The tubes were left to gravity drainage. The fluid culture grew multi-drug resistant E. Coli and Enterococcus faecalis. Her blood cultures grew *Shewanella algae* susceptible to ciprofloxacin, cefepime, gentamicin and zosyn. Infectious disease was consulted. She was treated with IV zosyn in the hospital. The patient had a prolonged hospital stay and recovered well. On discharge she was switched to oral ciprofloxacin and augmentin to continue at home with follow up CT scans.

Discussion

Shewanella is a motile gram-negative rod bacterium typically found in the natural environment, mainly marine habitat, soil and food spoilage rather than humans [4]**.** It belongs to the family Vibrionaceae [4]. The clinical presentation is similar to this species as well [5]. The bacterium comprises of about 60 known species [6]. Most often, they live and thrive in seawater [7]. The species that our patient was infected with is called *Shewanella algae.* This organism can cause

infection of the skin and ear, cholecystitis and cholangitis [5]. *S. algae* infection in humans is rare. They are not recognized as a common human pathogen. Pathogenicity studies in mice done in a microbial diseases' laboratory at the California Department of Health Services in Berkeley, California found that *S. algae* appear to be one of more virulent species, probably due to the production of a hemolytic substance [7]. It is considered the chief human pathogen within the species [8].

S. algae remains the most common human pathogen of its' species, however S. *putrefaciens has also been implicated in clinical cases. S. algae* has similar properties to another Shewanella bacterium called S. *putrefaciens.* These two pathogens share some common and yet differing characteristics. They both are non-fermentative bacilli with a single polar flagellum. They grow well on conventional solid media [1]. Some key differences include that *S. algae* was found to have weak β-haemolysis on sheep blood agar and an ability to reduce nitrite [1].

In a microbiological and clinical review of *S. algae* at the division of Laboratory Medicine of Gyeongsang National University of School of Medicine in South Korea, *S. algae* infections were found to be strongly associated with diseases of the hepatobiliary tract and pancreas [9]. Patients with associated diseases in the hepatobiliary tract and pancreas appear at an increased risk of becoming infected with this aquatic pathogen [9]. Their institute analyzed medical records of 19 patients infected with this infection. Greater than 50 % of patients had changes including cholangiocarcinoma, biliary stones and pancreatic cancer [9]. This points to a correlation between *Shewanella* infection and diseases of the pancreas and liver.

Antibiotic susceptibility to most strains includes Cephalosporins, Zosyn and Ciprofloxacin. Our patient was treated with IV Zosyn. Patients typically have a good prognosis and outcome with appropriate antibiotic therapy and recover well. There is minimal scientific data regarding the other species of *Shewenalla,* therefore uncertainity remains in regard to severity of patient infections with species other than *S. algae* or *S. putrefaciens* [10]. This makes it important for clinicians to be aware and identify this pathogen.

Conclusion

Shewanella algae can be an overlooked cause of bacteremia in patients, however most empiric antibiotics are able to treat the infection while waiting for blood cultures to grow. Patients with multiple co morbid conditions such as chronic liver disease, chronic kidney disease and diabetes places the individual at a higher risk for infection [11]. It is important to keep this in mind as a differential diagnosis for a patient growing gram negative rods in their blood. Fortunately, patients have a relatively good outcome with appropriate antibiotic therapy. Physicians should be aware of this infection particularly in the setting of a patient with seawater exposure or known hepatobiliary disease to effectively diagnose and treat early on.

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