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Edward Lovering

*MedStar Health Internal Medicine Residency Program, Baltimore, MD, USA, ed.lovering98@gmail.com*

Ananta Paudel

*Department of Medicine, MedStar Franklin Square Medical Center, Baltimore, MD, USA*

Christopher J Haas

*Department of Medicine, MedStar Franklin Square Medical Center, Baltimore, MD, USA, Georgetown University School of Medicine, Department of Medicine, Washington, D.C., USA*

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# *Myroides odoratus* Induced Cellulitis and Bacteremia in an Elderly Male

Edward Lovering<sup>a,\*</sup>, Ananta Paudel<sup>b</sup>, Christopher J. Haas<sup>b,c</sup>

<sup>a</sup> MedStar Health Internal Medicine Residency Program, Baltimore, MD, USA

<sup>b</sup> Department of Medicine, MedStar Franklin Square Medical Center, Baltimore, MD, USA

<sup>c</sup> Georgetown University School of Medicine, Department of Medicine, Washington, DC, USA

## Abstract

*Myroides odoratus* is a relatively little-known pathogen despite its ubiquitous presence in the environment. It is an opportunistic gram-negative bacillus commonly found in soil and water. Infection by *Myroides* species is rare, but the spectrum of illness varies from skin and soft tissue infections, urinary tract infections, pneumonia, and, in severe cases, bacteremia and septic shock. Though infection with *Myroides* species is uncommon and typically limited to immunocompromised individuals, the wide range of antimicrobial resistance it exhibits makes treatment challenging. In this report, we present the case of a 76-year-old male with compensated cirrhosis who presented with cellulitis complicated by bacteremia secondary to *M. odoratus* and was managed successfully with levofloxacin.

**Keywords:** *Myroides odoratus*, Cellulitis, Bacteremia

## 1. Introduction

*Myroides odoratus* is a relatively unknown and understudied bacterium, formerly a member of the *Flavobacterium* genus (*Flavobacterium odoratum*), subsequently reclassified under the *Myroides* genus.<sup>1</sup> *Myroides* species are opportunistic, gram-negative bacteria that commonly inhabit water and soil sources. They are not part of the normal human flora. *Myroides* infection is rare, with only 48 reported cases as of 2017.<sup>2</sup> The majority of infections have been reported in immunosuppressed hosts,<sup>3–5</sup> and infections from *Myroides* species are commonly multi-drug resistant.<sup>6</sup> Hence there are few clues except perhaps just exposure to soil in an immunocompromised individual that would lead a clinician to suspect such an infection. Here we describe the case of a 76-year-old male who presented to the hospital with erythema of the lower extremity following a small puncture wound from a crab shell fragment.

## 2. Case presentation

A 76-year-old male presented to the emergency department with left lower extremity redness, pain,

subjective fever, and shortness of breath. The patient reported usual health until 7 days prior to the presentation, when he suffered a puncture wound to his left lower extremity from a segment of steamed crab shell. He denied any exposure to brackish or saltwater environments. Following the initial injury he developed progressive erythema, swelling, and pain that was associated with subjective fever and chills and worsening mentation. Medical history was notable for chronic atrial fibrillation, well-established compensated NASH cirrhosis diagnosed 8 years prior, and prostate cancer 20 years prior with history of prostatectomy without adjuvant therapy. The patient had no history of diabetes, HIV, or active malignancy and had not received any recent immunosuppressive medications.

On presentation to the emergency department, the patient was febrile (38.3 °C), tachycardic (114 beats per minute), and normotensive (123/67 mmHg) with preserved oxygen saturation on room air. During his emergency department course, he developed hypotension nadiring to 88/57 mmHg. Examination was remarkable for a slightly erythematous, warm left lower extremity with associated excoriations and a visible puncture mark with eschar and mild bilateral

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\* Corresponding author.  
E-mail address: [edward.j.lovering@medstar.net](mailto:edward.j.lovering@medstar.net) (E. Lovering).

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lower extremity pitting edema. Blood cultures were collected, and he was given IV crystalloid fluids. While in the emergency department he was given a dose of ceftriaxone, piperacillin/tazobactam, and vancomycin. Laboratory diagnostics demonstrated mild leukocytosis (12.1 k/uL; reference range 4.00–10.80 k/uL) with neutrophilic predominance (83.3%). Metabolic panel and lactic acid were otherwise unremarkable. Diagnostic imaging included a lower extremity ultrasound that was unremarkable and CT of the left lower extremity that revealed soft tissue swelling but was negative for abscess or soft tissue gas collection.

Shortly after admission, repeat laboratory diagnostics demonstrated worsening leukocytosis (24.4 k/uL) and new lactic acidosis (10.4 mmol/L). The patient was subsequently admitted to the intensive care unit. He was continued on empiric ceftriaxone, and vancomycin. Doxycycline was added for empiric *Vibrio* coverage given the shellfish exposure. Blood cultures revealed gram-negative rods, and the antibiotic regimen was modified to doxycycline and cefepime. On hospital day 2, cultures demonstrated growth of *M. odoratus* sensitive only to levofloxacin (Table 1). Cefepime and doxycycline were discontinued, and levofloxacin 500 mg daily was initiated. Repeat blood culture on day 5 was negative, demonstrating successful clearance of bacteremia. The patient's cellulitis showed clinical improvement, and he was discharged to complete a 2-week course of levofloxacin.

### 3. Discussion

Infection from *Myroides* species is almost entirely associated with an immunocompromised host,<sup>3–5</sup> In the current case, the patient was immunocompromised given his established NASH liver cirrhosis.<sup>7</sup> A review detailing the suspected immunocompromising factors in certain *Myroides* infections has previously reported 4 cases where liver cirrhosis was deemed as the immunocompromising factor.<sup>8</sup>

Table 1. Culture and sensitivity data for *Myroides odoratus* species isolated in peripheral blood culture.

Drug	MIC dilution	MIC Interpretation
Amikacin	>32	Resistant
Aztreonam	>16	Resistant
Cefepime	16	Intermediate
Ceftazidime	>16	Resistant
Ceftriaxone	>32	Resistant
Ciprofloxacin	2	Intermediate
Gentamicin	>8	Resistant
Levofloxacin	1	Sensitive
Piperacillin/Tazobactam	32/4	Intermediate
Tobramycin	>8	Resistant

MIC, minimum inhibitory concentration.

Studies have shown that patients with liver cirrhosis are at increased risk of infections including skin and soft tissue infections primarily due to the immune dysfunction present in liver cirrhosis.<sup>7,9</sup>

*Myroides* is a normally benign, opportunistic gram-negative bacteria. Infections with this bacterium are rare. However, of the reported cases, the predominant presentation is cellulitis and bacteremia,<sup>2</sup> as in the current case. Besides the rarity of this organism as a causative factor in human disease, it is well known for its' antibiotic resistance. The inherent property of increased antimicrobial resistance of certain strains of *Myroides* species has been well documented since the 1960s, yet this property is not fully understood.<sup>10</sup>

Multiple different mechanisms of resistance have been hypothesized. First, it has been shown that *Myroides* species carry the beta-lactamase gene that produces chromosomally encoded metalloproteinases with an ability to hydrolyze beta lactam antibiotics.<sup>11</sup> Second, in one prior case of a *Myroides* species infection, the presence of a carbapenem-hydrolyzing enzyme (KPC-2) on the plasmid accounted for the resistant profile to broad-spectrum carbapenems.<sup>12</sup> It has also been suggested that known antibiotic resistance mechanisms that have been found in bacteria of the same family as *Myroides* could play a part in the antibiotic resistance seen in *Myroides* species.<sup>6</sup> Antibiotic resistance has been reported to vary between subtypes and genotypes of *Myroides* species,<sup>6</sup> and antibiotic resistance might be mediated by both the chromosome and plasmid.<sup>13</sup> These points highlight the future role that whole genome sequencing might hold in understanding exact mechanisms of resistance.

A 2022 review of *Myroides* species cases highlighted the wide range of resistance against antimicrobial agents this species exhibits, with minocycline and moxifloxacin demonstrating the highest rates of susceptibility.<sup>14</sup> In this case, the isolated organism demonstrated multidrug resistance with preserved sensitivity to levofloxacin. Recent reports have demonstrated perhaps further narrowing of the antimicrobial spectrum for *Myroides* species, with one isolate sensitive only to minocycline,<sup>4</sup> underscoring the role of antimicrobial stewardship.<sup>14</sup> Given the multidrug resistance of *Myroides* species, there might be a new role of combination antibiotic therapy, but this requires further investigating.<sup>15</sup>

### 4. Conclusion

*Myroides* infection is a rare phenomenon with limited data in the literature. In the event of a soft

tissue infection, bacteremia, or pneumonia in an immunocompromised individual with an atypical microbial picture, the possibility of *Myroides* infection should be kept in mind given its ubiquitous presence in nature. In this case, early identification of the microorganism and appropriate antibiotics brought about complete recovery even in an immunocompromised host.

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## Author contributions

EL and AP contributed to case presentation, literature review, writing, critical review of the manuscript and approval of the final manuscript. CH had a role in supervision, literature review, critical review of the manuscript, and approval of the final manuscript.

## Consent

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

## Conflict of interest

The authors report no conflicts of interest.

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