Pseudomonas Mendocina Bacteremia: A Case Study and Review of Literature

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Conflict of interest: None declared

Patient: Male, 64
Final Diagnosis: Pseudomonas mendocina bacteremia
Symptoms: Encephalopathy • fever • hypotension • rigors • tachypnea
Medication: —
Clinical Procedure: —
Specialty: Infectious Diseases

Objective: Rare disease
Background: Pseudomonas mendocina is a Gram-negative, aerobic, rod-shaped bacterium belonging to the family Pseudomonadaceae. In nature, P. mendocina has been isolated from water and soil samples. The species rarely causes disease in humans though severe infections resulting in hospitalization and intensive care have been documented. This case is perhaps the second reported case in the United States of a P. mendocina related infection. In this case report, we analyze the clinical and laboratory features of P. mendocina infection in a severely immunocompromised acquired immunodeficiency syndrome (AIDS) patient and review the available literature.

Case Report: A 64-year-old white male with past medical history significant for human immunodeficiency virus (HIV)/AIDS (CD4 count on admission <10 cells/mm³) diagnosed in 1988 and on antiretroviral therapy since 1992, was admitted to our facility for acute management of a suspected invasive mold infection. On hospital day 20 the patient developed a fever of 39.9°C, had an elevated lactate of 2.6 mmol/L and absolute neutrophil count greater than 1000 cells/mm³. On hospital day 22, both blood culture sets were positive for Pseudomonas mendocina. Antibiotic therapy was de-escalated to ceftazidime and after a total treatment course of 10 days the was successfully discharged.

Conclusions: There have been 14 reported cases of P. mendocina in the world. Four cases presented with meningitis and 5 with endocarditis. Beyond typical anti-pseudomonal agents, 2 of the reported cases show susceptibility of P. mendocina antibiotics such as sulfamethoxazole/trimethoprim and ceftriaxone. All documented case reports of P. mendocina infection resulted in successful treatment with antibiotics and survival of the patient.

MeSH Keywords: Bacteremia • Gram-Negative Bacterial Infections • Pseudomonas Mendocina

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/914360
**Background**

*Pseudomonas mendocina* is a Gram-negative, aerobic, rod-shaped bacterium belonging to the family Pseudomonadaceae. In nature, *P. mendocina* has been isolated from water and soil samples and is documented as able to survive on over 75 different substrates [1], growing at temperatures ranging from 25°C to 42°C. The species rarely causes disease in humans though severe infections resulting in hospitalization and intensive care such as endocarditis have been documented. *P. mendocina* infections have been reported in various countries ranging from the USA to Taiwan suggesting a ubiquitous nature. A few cases of *P. mendocina* infection have also been reported in otherwise healthy individuals following suspected prolonged exposure to the bacteria.

Of the Pseudomonas species, *P. aeruginosa* is an important nosocomial pathogen due to its ability to flourish in a hospital environment and its high level of resistance to many antibiotics. Unlike *P. aeruginosa*, *P. mendocina* has reported susceptibilities to antibiotics that *P. aeruginosa* is inherently resistant to. This may be due to the infrequency that it causes human infection. In this case report, we analyze the clinical and laboratory features of *P. mendocina* infection in a severely immunocompromised acquired immunodeficiency syndrome (AIDS) patient. This case is the second reported case in the United States of a *P. mendocina* related infection.

**Case Report**

A 64-year-old white male with past medical history significant for human immunodeficiency virus (HIV)/AIDS (CD4 count on admission <10 cells/mm³) diagnosed in 1988 and on antiretroviral therapy since 1992, was admitted to our facility for acute management of a suspected invasive mold infection. The patient’s pertinent past medical history includes Kaposi Sarcoma (KS) treated with radiation and involving the right inner thigh, right forearm, and palate, pancytopenia managed with thrice weekly filgrastim, recently diagnosed left orbital apex syndrome and *Aspergillus fumigatus* sinusitis managed initially on isavuconazonium sulfate. Upon admission, treatment with isavuconazonium sulfate was discontinued, and liposomal amphotericin-b and voriconazole were started. Liposomal amphotericin-b was discontinued with recovery of only *Aspergillus fumigatus* from surgical cultures, and voriconazole was changed to posaconazole 300 mg daily on hospital day 13 due to a subtherapeutic voriconazole trough level of 0.3 mg/L. On hospital day 20, the patient developed a fever of 39.9°C, had an elevated lactate of 2.6 mmol/L and absolute neutrophil count greater than 1000 cells/mm³. Blood cultures were obtained at that time with results from urinalysis and chest x-ray less concerning for infection. Increasing drainage from KS lesions on the thigh was noted and considered as a potential infection source. Broad empiric antibiotic therapy was initiated with intravenous (IV) vancomycin 1250 mg IV every 12 hours and cefepime 2000 mg IV every 8 hours. The patient continued to clinically worsen developing encephalopathy, rigors, persistent fever, hypotension, and tachypnea. Cefepime was changed to piperacillin/tazobactam 4.5 g extended IV infusion every 8 hours and IV fluid bolus was given. The rationale for the switch from cefepime was based on concern for cefepime related encephalopathy, though this was felt to be less likely given the relatively short duration of exposure and contribution from sepsis. The Wound Care Team was consulted in the setting of a potential new infection of his right thigh KS lesion that appeared to have increased sloughing and drainage with a musty odor. On hospital day 22, both blood culture sets were positive for *P. mendocina* with equal time to positivity and non-significant difference in quantitative culture results between the peripherally inserted central catheter (PICC) line and peripheral cultures. The PICC line was removed on hospital day 21, with catheter tip culture and repeat blood cultures from this day and day 22 remaining negative for bacterial growth. Antibiotic susceptibilities were requested for cefepime, ceftazidime, levofloxacin, and meropenem by Etest (bioMérieux, Marcy l’Etoile, France). Unfortunately, piperacillin-tazobactam Etest strips were unavailable due to manufacturer shortage and thus this antibiotic was not tested. Antibiotic susceptibilities of the *P. mendocina* isolate from this patient are summarized in Table 1. Interpretations were determined using the Clinical and Laboratory Standards Institute (CLSI) M100-S27 criteria for other non-Enterobacteriaceae and non-*Aeruginosa pseudomonas spp*. Antibiotic therapy was adjusted to ceftazidime ultimately to complete a total 10-day course from first negative blood culture. The ultimate source of infection was unclear, but thought to be related to the open wound (no cultures obtained from this site). Blood cultures cleared quickly, and patient’s infection was successfully treated. Rationale for the choice of ceftazidime was based on in vitro susceptibility and concern for cefepime related encephalopathy, though this was felt to be less likely given the relatively short duration of exposure and contribution from sepsis. Despite improvement while receiving piperacillin-tazobactam and anticipated

| Antibiotic       | Minimum inhibitory concentration (MIC, mcg/mL), interpretation |
|------------------|---------------------------------------------------------------|
| Cefepime         | 0.50, susceptible                                             |
| Ceftazidime      | 1, susceptible                                                |
| Levofloxacin     | 0.064, susceptible                                            |
| Meropenem        | 0.125, susceptible                                            |

Table 1. Antibiotic susceptibility profile of *Pseudomonas mendocina* isolated.
| Case | Patient age/sex | Underlying conditions | Location | Symptoms | Type of infection | Mono/polymicrobial infection |
|------|----------------|-----------------------|----------|----------|------------------|-----------------------------|
| 1    | 63/M           | Resistant HIV/AIDS    | USA      | Encephalopathy, rigo rs, tachypnea, fever, hypotension | Bacteremia | Mono |
| 2    | 55/M           | DM, buccal cancer, community-acquired spontaneous | Taiwan   | –        | Meningitis | Mono |
| 3    | 66/F           | Spontaneous ICH, external ventricular drainage | Taiwan   | –        | Meningitis | Mono |
| 4    | 79/M           | Spontaneous, COPD, respiratory failure, nosocomial | Taiwan   | –        | Meningitis | Poly – Aeromonas caviae |
| 5    | 78/F           | Spontaneous, community-acquired | Taiwan   | –        | Meningitis | Poly – Acinetobacter spp. |
| 6    | 65/M           | Alcohol hepatitis, CKD | Taiwan   | Lower back pain, deep tissue pus | Spondylodiscitis | Mono |
| 7    | 63/M           | Prosthetic aortic valve, T2DM, poliomyelitis | Argentina | Fever, shivering | Native mitral valve endocarditis | Mono |
| 8    | 34/M           | None, healthy (motorcycle accident) | Singapore | –        | Foot wound infection | Poly – Stenotrophomonas maltophilia |
| 9    | 22/M           | CKD, peritoneal dialysis | Portugal | Abdominal pain, cloudy effluent | Peritonitis | Mono |
| 10   | 28/F           | Tetralogy de Fallot, previous CV surgeries | Denmark | Abdominal pain, dyspnea, flu-like syndrome, tricuspid stenosis | Native tricuspid valve endocarditis | Mono |
| 11   | 79/F           | Afib, TIA, HTN | France | Fever | Native aortic valve endocarditis | Mono |
| 12   | 36/M           | Mentally retarded | Turkey | Fever, malaise, anorexia, substantial weight loss (~10kg), tachycardia, hypotension | Native mitral valve endocarditis | Mono |
| 13   | 31/M           | None, healthy | Israel | Fivers, shivering, malaise, chills, headache, muscle cramps | Bacteremia | Mono |
| 14   | 57/M           | Gout, chronic alcohol use | USA | Leg ulcers, fever, leukocytosis, tachycardia, hypertensive | Native mitral valve endocarditis | Mono |

M – male; F – female; HIV – human immunodeficiency virus; AIDS – acquired immunodeficiency syndrome; DM – diabetes mellitus; ICH – intracerebral hemorrhage; COPD – Chronic obstructive pulmonary disease; CKD – chronic kidney disease; T2DM – type 2 diabetes mellitus; CV – cardiovascular; Afib – atrial fibrillation; TIA – transient ischemic attack; HTN – hypertension.
susceptibility, we chose not to treat with this agent definitively given inability to document in vitro susceptibility of this isolate and unnecessary anaerobic coverage. Patient received all treatment for infection during his 44-day total hospital stay and was successfully discharged back to the outpatient care by his primary care provider.

**Discussion**

A literature search was performed using PubMed by searching the term “Pseudomonas mendocina”. As shown in Table 2, this case is the second reported case in the USA and overall the fourteenth reported case of human *P. mendocina* infection. *P. mendocina* has a ubiquitous nature which is supported by the large geographic spread of the case reports. Of the 13 reported cases, 6 were reported from Asia (Taiwan [2,3], Singapore [4],), 3 cases were reported from Europe (Portugal [5], Denmark [6], France [7]), 2 cases were reported from the Middle East (Turkey [8], Israel [9]), 1 case was reported from North America (USA [10]), and 1 case was reported from South America (Argentina [11]). The majority type of infection were 5 cases of native valve endocarditis (35%), 4 cases of meningitis, 2 cases of bacteremia, 2 cases of skin and soft tissue infections (spondylodiscitis, foot wound), and 1 case of peritonitis. *P. mendocina* human infections appear to have a slow, insidious onset. Many of the reported patient symptoms included fever, malaise, and shivering days before presentation to the hospital. Positive markers of inflammation were present in several cases including elevated C-reactive protein (CRP), estimated sedimentation rate (ESR), and leukocytosis. Elevated CRP levels ranged from 16 to 233.6 mg/L [4,5,9–11]. Elevated ESR ranged from 33 to 105 mm/hr [4,5,9–11]. Elevated white blood cell counts ranged from 14.7–24 g/L [8,10,11].

No sources of *P. mendocina* infections were confirmed in any of the case reports. In 3 case reports, a source of infection was suspected. In a case report by Johansen et al., the authors suspected that *P. mendocina* was introduced during one of the patient’s 3 previous cardiac operations [6]. In a case report by Aragone et al., the authors suspected that bacteria entered the bloodstream through thorn pricks and handling of damp earth in view of the patient’s occupation as a florist; the patient presented with small erythematous lesions on the fingertips of both hands attributed to thorn pricks [7]. In the peculiar case reported by Nseir et al., the patient “reported that he had a new pet cockatiel that he fed and watered directly from his mouth”. Based on this information, cultures of the bird’s bottled drinking water were taken and *P. mendocina* was cultured from the bird’s drinking water [9]. Favorable outcomes were described in all case reports and no mortality from *P. mendocina* infection was reported. In cases that reported fever, patients quickly became afebrile within 24 to 48 hours of antimicrobial therapy initiation.

Most *P. mendocina* infection case reports were monomicrobial infections except for 3 cases of polymicrobial infection [2,11]. In the 3 cases of polymicrobial infection, the other pathogens were also Gram-negative bacteria (Table 2). *P. mendocina* infections were successfully treated with a wide variety of antibiotics including piperacillin, early and later-generation cephalosporins, carbapenems, fluoroquinolones, aminoglycosides, and

| Case | Treated with | Survived |
|------|--------------|---------|
| 1    | IV ceftazidime ×10 days | Yes     |
| 2 [2] | IV ceftriaxone | Yes     |
| 3 [2] | IV ceftazidime | Yes     |
| 4 [2] | IV meropenem | Yes     |
| 5 [2] | IV cefepime | Yes     |
| 6 [3] | IV cefepime ×2 weeks followed by oral ciprofloxacin ×4 weeks | Yes     |
| 7 [4] | PO SMZ/TMP ×16 days | Yes     |
| 8 [5] | Intraperitoneal cefazolin + intraperitoneal ceftazidime + oral ciprofloxacin ×3 weeks | Yes     |
| 9 [6] | IV gentamicin + IV ampicillin, followed by ciprofloxacin | Yes     |
| 10 [7] | IV piperacillin + IV gentamicin ×6 weeks | Yes     |
| 11 [8] | IV ceftazidime + IV amikacin ×6 weeks | Yes     |
| 12 [9] | IV gentamicin + oral ofloxacin ×2 weeks | Yes     |
| 13 [10] | IV piperacillin/tazobactam ×6 weeks | Yes     |
| 14 [11] | IV ceftriaxone + IV gentamicin ×6 weeks followed by oral ciprofloxacin ×2 weeks | Yes     |
### Table 4. Minimum inhibitory concentrations (MICs) and susceptibilities: Case 1–8.

| MIC (µg/mL)     | Case 1 | Case 2 [2] | Case 3 [2] | Case 4 [2] | Case 5 [2] | Case 7 [3] | Case 8 [8] |
|-----------------|--------|------------|------------|------------|------------|------------|------------|
| Amikacin        | –      | S          | S          | S          | S          | S          | S (1)      |
| Ampicillin      |        |            |            |            |            |            | NA (12)    |
| Aztreonam       | –      |            |            | –          | –          | –          | S          |
| Cefepime        | S (0.50) | S          | S          | S          | S          | S          | S (1)      |
| Ceftazidime     | S (1)  | S          | S          | S          | S          | S          | S (2)      |
| Ciprofloxacin   | –      | –          | –          | –          | –          | –          | –          |
| Gentamicin      | –      | –          | –          | –          | –          | –          | R S S (0.25) |
| Imipenem        | –      | –          | –          | –          | –          | –          | S          |
| Levofloxacin    | S (.064) | –          | –          | –          | –          | –          | –          |
| Meropenem       | S (0.125) | S          | S          | S          | –          | –          | –          |
| Piperacillin/Tazobactam | – | –          | –          | –          | –          | –          | S S (2)    |
| SMZ-TMP         | –      | –          | –          | –          | –          | –          | R          |

### Table 5. Minimum inhibitory concentrations (MICs) and susceptibilities: Case 9–14.

| MIC (µg/mL)     | Case 9 [6] | Case 10 [11] | Case 11 [10] | Case 12 [9] | Case 14 [4] |
|-----------------|------------|--------------|--------------|------------|-------------|
| Amikacin        | –          | S (0.5)      | –            | S          | –           |
| Ampicillin      | NA (1)     | NA           | –            | NA         | NA          |
| Ampicillin/Sulbactam | –          | –            | R (≥32)      | –          | NA          |
| Aztreonam       | –          | –            | –            | R          | –           |
| Cefazolin       | –          | –            | NA (32)      | –          | –           |
| Cefepime        | –          | –            | S (≤1)       | –          | –           |
| Ceftazidime     | –          | S (1)        | S (2)        | S          | S           |
| Ceftriaxone     | –          | S (1)        | S (8)        | R          | –           |
| Cephalothin     | –          | NA           | –            | –          | –           |
| Ciprofloxacin   | S (0.023)  | S (0.125)    | S (≤0.25)    | S          | S           |
| Colistin        | –          | S            | –            | –          | –           |
| Gentamicin      | S (2)      | S (≤0.25)    | S (≤1)       | S          | –           |
| Meropenem       | S (0.125)  | –            | –            | –          | –           |
| Ofloxacin       | –          | –            | –            | S          | –           |
| Pefloxacin      | –          | –            | –            | S          | –           |
| Piperacillin     | –          | S (0.62)     | –            | S          | –           |
| Piperacillin/Tazobactam | – | –          | –            | S (≤0.4) | S           |
| SMZ-TMP         | –          | S (≤0.25/4.75) | –            | –          | S           |
| Tobramycin      | –          | –            | –            | S          | –           |
sulfamethoxazole-trimethoprim (Table 3). Treatment of *P. mendocina* was successful with non-traditional *P. aeruginosa* antibiotics such as ampicillin and early-generation cephalosporins. The susceptibility of *P. mendocina* to a broader range of antibiotics than that of *P. aeruginosa* might be attributed to its rare occurrence in human infections. Since *P. mendocina* is not a common clinical human pathogen, there is not much data available about its patterns of susceptibilities and resistance. Available susceptibilities, resistance, and a few reported minimum inhibitory concentrations (MICs) from the 14 case reports are displayed in Tables 4 and 5. As mentioned, *P. mendocina* is susceptible to non-traditional anti-pseudomonal antibiotics. Several cases reported susceptibility to all antibiotics tested (including aminoglycosides, carbapenems, ampicillin, later-generation cephalosporins, fluoroquinolones, and piperacillin/tazobactam) [2,5,6]. Although non-pseudomonal antibiotics, such as ampicillin, cefazolin, and sulfamethoxazole-trimethoprim, were used, there have been some reports of resistance to these drugs. Chi et al. reported resistance to sulfamethoxazole-trimethoprim [4]. Aragone et al. reported resistance to ampicillin and cefalothin [7]. Rapsinski et al. reported resistance to ampicillin/sulbactam and cefazolin [8]. Nseir et al. reported resistance to aztreonam and ceftriaxone [9]. Chiu et al. reported resistance to ampicillin and ampicillin/sulbactam [11]. All documented case reports of *P. mendocina* infection resulted in successful treatment with antibiotics and survival of the patient (Table 3).

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**Conclusions**

*Pseudomonas mendocina* is a rare source of bacterial infection in humans. There have been 14 reported cases of *P. mendocina* in the world. Four cases presented with meningitis and 5 cases presented with endocarditis. Beyond typical anti-pseudomonal agents, 2 of the reported cases show susceptibility of *P. mendocina* to antibiotics such as sulfamethoxazole/trimethoprim and ceftriaxone. In some cases, *P. mendocina* infections were successfully treated with regimens that included ceftriaxone, ampicillin, and sulfamethoxazole/trimethoprim. The present case study results contribute to the limited data available for clinical treatment of this rare infection. This case report and literature review summarizes all antibiotic treatment, susceptibility, and clinical outcomes data available at the time of publication to aid in future therapeutic approaches. All documented case reports of *P. mendocina* infection resulted in successful treatment with antibiotics and survival of the patient.

**Conflict of interest**

None.