

First Report on Recovery of *Pseudomonas Libanensis* in Association with Ventilator-Associated Pneumonia

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1. Abstract

1.1. Background

Pseudomonas leanness has previously been isolated from environmental sources and, to date, has not been reported as a cause of human infection. This prompted the current case report describing ventilator-associated pneumonia (VAP) caused by this rare pathogen.

1.2. Case Summary

We report the case of an 81-year-old female with a history of Parkinson's disease, diabetes mellitus, and coronary artery disease who was admitted to the intensive care unit (ICU) following cardiac arrest and was being treated for methicillin resistant *Staphylococcus aureus* (MRSA) pneumonia. During her ICU stay, she developed VAP. A deep tracheal aspirate culture revealed *P. libanensis*, identified using matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry. Based on antimicrobial susceptibility testing, the patient was treated with ceftazidime, resulting in resolution of VAP. She was subsequently discharged to a long-term care facility.

1.3. Conclusion

To our knowledge, this is the first reported case describing a clinical association between *P. libanensis* and human infection. Further studies are needed to clarify the clinical significance and pathogenic potential of this organism.

2. Introduction

Pseudomonas species are a group of Gram-negative bacteria capable of causing a wide range of infections, including respiratory tract infections. *Pseudomonas aeruginosa*, first described in 1917 [1], remains a well-recognized cause of ventilator-asso-

ciated pneumonia (VAP) [2]. In contrast, *Pseudomonas libanensis* is a relatively newly described fluorescent species that was initially isolated from Lebanese spring waters and characterized by distinct phenotypic features. It can be differentiated from *P. aeruginosa* primarily by the absence of pyocyanin production, unique DNA–DNA hybridization patterns, and distinct phylogenetic characteristics. Based on 16S rRNA gene analysis, *P. libanensis* has been classified within the *Pseudomonas fluorescens* group. To date, there have been no clinical reports associating *P. libanensis* with human disease [3]. This case report therefore represents, to our knowledge, the first documented recovery of *P. libanensis* from a patient with multiple comorbidities and VAP.

3. Case Presentation

We report the case of an 81-year-old female, a non-smoker with no known food or drug allergies. Her past medical history was significant for hypertension, dyslipidemia, diabetes mellitus, coronary artery disease on clopidogrel, and Parkinson's disease, with a baseline of intermittent verbal communication, disorientation, and assisted ambulation.

The patient presented to the emergency department on January 10, 2025, after experiencing a cardiac arrest while eating. She developed acute difficulty swallowing and breathing, became unresponsive, and suffered a cardiopulmonary arrest, likely secondary to aspiration. Emergency medical services were contacted immediately, with an estimated downtime of less than five minutes prior to initiation of cardiopulmonary resuscitation (CPR).

Upon arrival at the emergency department, the patient was intubated, and return of spontaneous circulation (ROSC) was achieved after three cycles of resuscitation. The initial rhythm

was asystole, followed by ventricular fibrillation requiring defibrillation. During CPR, the patient developed an iatrogenic pneumothorax, for which a chest tube was inserted.

Following ROSC, the patient became hypotensive and was started on vasopressors before being transferred to the intensive care unit (ICU). Neurological evaluation revealed evidence of anoxic brain injury, with a low likelihood of regaining consciousness or meaningful neurological function.

Empiric treatment with meropenem and vancomycin was initiated for septic shock. Blood cultures obtained on January 10, 2025, grew *Streptococcus parasanguinis*, prompting de-escalation from meropenem to ceftizoxime to complete a seven-day course. A deep tracheal aspirate (DTA) culture collected on January 13, 2025, grew methicillin-resistant *Staphylococcus aureus* (MRSA), and vancomycin was continued for a total of 14 days. After five days of antimicrobial therapy, the patient was successfully weaned off vasopressors.

On January 22, 2025, the patient developed increased thick secretions from the endotracheal tube, accompanied by rising inflammatory markers, with C-reactive protein (CRP) increasing from 70 to 90 mg/dL and leukocytosis from 8,000 to 11,000 cells/ μ L. A repeat DTA culture was obtained, and empiric piperacillin-tazobactam therapy was initiated.

The DTA culture collected on January 22, 2025, demonstrated heavy growth of *Pseudomonas libanensis* after 48 hours. Identification was performed using matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry (Bruker Daltonik GmbH, Bremen, Germany), with a confidence score of 2.07 (green flag). Antimicrobial susceptibility testing showed uniform susceptibility to all tested agents, including amikacin, aztreonam, cefepime, ceftazidime, ciprofloxacin, imipenem, piperacillin-tazobactam, and trimethoprim-sulfamethoxazole. The patient was initially continued on piperacillin-tazobactam; however, two days later, a chest radiograph demonstrated new pulmonary consolidation. Consequently, antibiotic therapy was switched to ceftazidime, which was administered for a total of 10 days for treatment of *P. libanensis* VAP.

After achieving clinical stability and with no evidence of ongoing infection, the patient underwent tracheostomy placement and was subsequently discharged to a long-term care facility on February 28, 2025.

4. Discussion

Pseudomonas libanensis was first discovered and isolated in July 1999 from two Lebanese spring water sources. It is a Gram-negative, aerobic bacterium belonging to the genus *Pseudomonas*, members of which are widely distributed in environmental reservoirs such as soil, water, and plants [4]. *P. libanensis* comprises seven strains that are genotypically and phenotypically homogeneous and can be differentiated from other fluorescent *Pseudomonas* species by distinct phenotypic and genotypic characteristics. Since its initial description, the clinical significance of this microorganism has remained unknown [3].

In our clinical microbiology laboratory, Gram staining of the deep tracheal aspirate (DTA) demonstrated Gram-negative rods, which were subsequently inoculated onto blood agar, MacConkey agar, and chocolate agar and incubated under appropriate temperature and atmospheric conditions. After 24 hours of incubation, limited growth was observed on blood and chocolate agar, forming small, transparent colonies. Identification using matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry confirmed the organism as *P. libanensis*.

To the best of our knowledge, and based on an extensive review of the literature, this represents the first reported case in which *P. libanensis* was isolated from a human deep tracheal aspirate and implicated as the causative agent of ventilator-associated pneumonia. To date, this species has only been reported in environmental samples, specifically from two water springs in Lebanon [3].

The patient had been hospitalized for approximately two weeks prior to the isolation of *P. libanensis* from the DTA. Notably, the initial DTA obtained on admission grew methicillin-resistant *Staphylococcus aureus* (MRSA), with no growth of *Pseudomonas* species, suggesting a nosocomial acquisition. A recent investigation of the hospital water towers revealed limited growth of *Bacillus cereus*, *Pseudomonas stutzeri*, and *Acidovorax temperans*; however, the source of *P. libanensis* in this patient remains undetermined.

Given the absence of prior reports implicating *P. libanensis* in human infections, uncertainty remains as to whether its recovery from the DTA represented true infection or colonization. Nevertheless, the initiation of targeted antimicrobial therapy based on susceptibility testing was followed by clinical improvement and radiographic resolution after a course duration similar to *P. aeruginosa* (7-14 days) [5], supporting its pathogenic role in this case.

5. Conclusion

In conclusion, and to the best of our knowledge, this is the first documented case report in the literature describing a clinical association between *Pseudomonas libanensis* and human infection. The diagnosis was based on isolation of the organism from a deep tracheal aspirate, considered the likely source of infection, in conjunction with the patient's clinical presentation. Until more is known about the clinical manifestations and pathogenic significance of this bacterium, management will likely rely on institutional experience and treatment strategies similar to those used for *Pseudomonas aeruginosa*, with targeted antimicrobial therapy typically administered for 7 to 14 days. Further studies are needed to better define the clinical significance, optimal management, and outcomes of infections caused by this rare organism.

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