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Case Report

Uncommon Pathogen, Common Device: Roseomonas mucosa Bacteremia Associated with Long-Term PICC Line Use

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Abstract: *Roseomonas mucosa* is a slow-growing, pink-pigmented, Gram-negative coccobacillus historically considered an opportunistic pathogen in severely immunocompromised oncology patients. However, recent genomic and clinical data demonstrate its primary reservoir is the human skin microbiome, facilitating an evolving epidemiology. We report a case of *R. mucosa* bacteremia in a 69-year-old woman with short bowel syndrome (SBS) and total parenteral nutrition (TPN) dependence. This case supports an emerging pattern: *R. mucosa* is increasingly identified in "device-compromised" hosts. Furthermore, this pathogen may present without elevated host-response biomarkers and exhibits intrinsic resistance to empiric broad-spectrum beta-lactams, complicating early management.

Keywords: *Roseomonas Mucosa*; Bacteremia; PICC Line; Total Parenteral Nutrition; Short Bowel Syndrome; Device-Associated Infection

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1. Introduction

Roseomonas mucosa is a slow-growing, non-fermenting, Gram-negative coccobacillus. Historically, the medical literature associated *Roseomonas* bacteremia primarily with states of severe systemic immune compromise, particularly in adult and pediatric cohorts suffering from hematologic malignancies, solid tumors, and HIV [1, 3, 8]. In these populations, profound neutropenia and oncologic immunosuppression were viewed as the primary prerequisites for infection.

However, recent microbiome research has definitively mapped *R. mucosa* as an endogenous member of the human cutaneous microbiota [2]. Consequently, the epidemiology of the pathogen is evolving, largely linked to the increased use of long-term indwelling vascular access devices and total parenteral nutrition (TPN) [3].

This report presents a clinical case of *R. mucosa* bacteremia in a non-neutropenic 69-year-old female with short bowel syndrome and chronic TPN dependence. This case addresses a gap in the current literature by highlighting the organism's emerging role in device-dependent patients and exploring its distinct antimicrobial resistance profile and subclinical biomarker presentation.

2. Case Presentation

2.1. Patient Profile and Medical Background

The patient is a 69-year-old female who presented to the Infectious Disease service in late August 2025. A retired bank teller, she lives at home with her husband and denies

tobacco (since 2020), alcohol, or illicit drug use. She has no history of travel to tropical regions or unusual environmental exposures.

Her medical history is primarily significant for short bowel syndrome (SBS) secondary to a superior mesenteric artery thrombus and subsequent bowel resection in March 2020. Consequently, she is dependent on total parenteral nutrition (TPN) to maintain her caloric and micronutrient needs. Long-term venous access is maintained via a right brachial Peripherally Inserted Central Catheter (PICC), which had been in place for over one year prior to this admission. Her baseline medical history is also notable for chronic kidney disease, recurrent nephrolithiasis, and a prior documented episode of catheter-associated sepsis.

2.2. Clinical Narrative

In the two to three weeks leading up to her admission on August 22, 2025, the patient experienced a gradual decline in functional status, reporting profound fatigue, lassitude, and intermittent low-grade fevers. Notably, she did not experience rigors, hemodynamic instability, or localized symptoms such as pain, erythema, or purulence at the PICC insertion site. A review of systems was negative for respiratory, urinary, or gastrointestinal infectious symptoms.

Recognizing the high risk of bacteremia in a TPN-dependent patient with fever, her home care nurse facilitated outpatient blood culture collection on August 19, 2025. These cultures flagged positive, prompting immediate referral to the hospital.

Upon admission, the patient was hemodynamically stable. Physical examination was unremarkable, with a soft, non-tender abdomen and a clean PICC site. Admission laboratory evaluation showed mild leukocytopenia (WBC 3.6 x 10^9/L) and anemia (Hgb 10.3 g/dL), likely reflecting chronic illness and nutritional factors rather than acute marrow suppression. Renal function was impaired with a creatinine of 1.64 mg/dL.

Microbiology Timeline:

- **August 19 (Outpatient):** Aerobic and anaerobic cultures drawn from the right PICC line and a peripheral site were positive for *Roseomonas mucosa*.
- **August 22 (Inpatient):** Repeat peripheral blood cultures drawn from the left arm confirmed persistent *Roseomonas mucosa* bacteremia.

2.3. Antimicrobial Susceptibility Profile

The isolate demonstrated the classic "Carbapenem-Susceptible / Cephalosporin-Resistant" phenotype that distinguishes it from many other hospital-acquired Gram-negative bacteria (Table 1). Definitive identification in such cases generally relies on Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS) or 16S rRNA gene sequencing [9].

2.4. Intervention and Outcome

The right brachial PICC line was removed on hospital day 3 (August 24, 2025) for source control. The patient was initiated on intravenous meropenem (1 gram every 12 hours, renally adjusted). Following line removal and the initiation of targeted antibiotic therapy, her constitutional symptoms resolved completely, and she remained afebrile. Surveillance blood cultures drawn on August 26, 2025, were negative. A new PICC line was placed on August 28 to resume TPN administration, and she was discharged on August 29 to complete a 14-day intravenous antibiotic course.

Table 1. Antimicrobial Susceptibility Profile of Patient's *R. mucosa* Isolate

Antimicrobial Agent	MIC (µg/mL)	Interpretation
Meropenem	≤ 0.25	Susceptible
Imipenem	≤ 0.5	Susceptible
Amikacin	≤ 2	Susceptible
Ciprofloxacin	0.5	Susceptible
Levofloxacin	≤ 0.5	Susceptible
Cefepime	16	Intermediate
Piperacillin-Tazobactam	≥ 128/4	Resistant
Trimethoprim/Sulfamethoxazole	≥ 4/76	Resistant

3. Discussion

3.1. Changing Epidemiology and Device Vulnerability

While *Roseomonas* species are ubiquitous in the environment, human infections are rare but increasing in recognized incidence. To contextualize the novelty of our 2025 case, the classical baseline documented prior to 2020 primarily involved profoundly neutropenic oncology patients with active central venous lines for cytotoxic chemotherapy [1].

Contemporary literature reflects a distinct shift toward device-associated infections, where the pathogen colonizes synthetic conduits to access deeper tissues [3]. The presentation of adult short bowel syndrome with *Roseomonas* bacteremia diverges from the typical oncologic presentation. The combination of advanced age, acquired anatomical alterations, and reliance on TPN creates a specific vulnerability. TPN solutions provide a nutritional environment that supports the development of intravascular microbial biofilms, making the patient's primary vulnerability anatomical and metabolic rather than neutropenic.

3.2. Expanding Clinical Spectrum

Beyond bacteremia (which constitutes ~75% of cases and is facilitated by biofilm production on silicone or polyurethane catheters), *R. mucosa* infections increasingly manifest in other device-associated or barrier-compromised contexts. This expanding clinical spectrum now includes peritonitis in continuous ambulatory peritoneal dialysis (CAPD) patients (often presenting with cloudy dialysate without systemic signs) [6], central nervous system infections such as ventriculoperitoneal shunt peritonitis [10], musculoskeletal infections following direct inoculation (e.g., epidural injections) [7], and soft tissue infections like cellulitis in patients with compromised skin barriers [11].

3.3. Pathogenesis and Biomarker Presentation

Historically considered an environmental organism, microbiome research now identifies *R. mucosa* as a commensal of the human skin, particularly in the antecubital fossa and volar forearm, which are common sites for PICC insertion [2]. This suggests that

central line-associated bloodstream infections may originate from the extraluminal migration of skin flora along the catheter tract.

As a skin commensal, *R. mucosa* generally lacks tissue-destroying exotoxins. Consequently, bloodstream infections are often subacute, relating to biofilm persistence rather than acute endotoxin-mediated shock. Crucially, recent literature notes instances where the organism may not trigger standard physiological or laboratory inflammatory markers. A 2025 report described a case of *R. mucosa* sepsis where host-response biomarkers, including WBC count, procalcitonin, CRP, ESR, and interleukin-6, remained within normal physiological ranges [5]. Our index case mirrored this biomarker presentation, raising the possibility of a diagnostic blind spot.

3.4. Antimicrobial Resistance Architecture

R. mucosa exhibits profound broad-spectrum antimicrobial resistance, including generic high-level resistance to penicillins, piperacillin-tazobactam, and cephalosporins [3, 4]. The molecular basis was elucidated in a 2026 genomic investigation analyzing clinical strains, which identified two putative class-A beta-lactamases and one class-C beta-lactamase within all strains [4]. Crucially, the transcription of one class-A beta-lactamase is significantly induced by cephalosporin exposure, perfectly explaining the widespread clinical failures observed during initial empirical therapies [4].

Table 2. Comparative Analysis of Notable Recent *R. mucosa* Cases

Clinical Feature	Current Case (2025)	Nariyama et al. (2024) [6]	Lin et al. (2023) [7]	Xu et al. (2025) [5]
Primary Infection	Bacteremia	Peritonitis	Spondylitis & Abscess	Sepsis / Septic Shock
Underlying Condition	SBS (TPN dependent)	Peritoneal Dialysis (PD)	Osteoporosis	Type 2 Diabetes
Immunological Status	Device-Compromised	Device-Compromised	Immunocompetent	Immunocompetent
Presentation	Subacute fatigue, afebrile	Cloudy dialysate, painless	Severe back pain	Shock, normal biomarkers
Resistance Profile	Pip-Tazo, Cephalosporins	Pip-Tazo, Aztreonam	Susceptible to Imipenem	Piperacillin-Tazobactam

3.5. Clinical Management Considerations

Based on the published literature and our clinical experience, the management of *R. mucosa* in device-dependent patients relies on four key principles [2, 3]:

1. **Identification:** Definitive identification requires MALDI-TOF MS or 16S rRNA gene sequencing, as automated phenotypic systems frequently misidentify the organism [9].
2. **Source Control:** Catheter removal is typically required to eradicate the biofilm and clear persistent infections [1, 3].
3. **Antimicrobial Therapy:** Carbapenems (meropenem or imipenem) serve as the first-line targeted therapy. Fluoroquinolones or aminoglycosides are viable alternatives based on susceptibility testing. Empiric cephalosporins

and piperacillin-tazobactam should be strictly avoided due to intrinsic resistance [4].

4. **Duration:** A systemic antibiotic course of 7 to 14 days following catheter removal and the first negative blood culture is generally sufficient for uncomplicated bacteremia [1, 3].

4. Conclusion

This case of *Roseomonas mucosa* bacteremia in a 69-year-old woman with short bowel syndrome illustrates an evolving clinical presentation of opportunistic infections. *R. mucosa* is recognized not only in immunocompromised hosts but also as a potential pathogen in device-dependent populations. The antimicrobial susceptibility profile of the pathogen often renders empiric therapies, such as expanded-spectrum cephalosporins and piperacillin-tazobactam, highly ineffective.

Because biofilm-forming pathobionts may not consistently trigger standard inflammatory cascades (e.g., elevated procalcitonin and CRP), clinicians should maintain an appropriate index of suspicion for bacteremia in device-dependent patients presenting with functional decline, even when standard laboratory panels appear reassuring.

Declarations

- Ethics Approval and Consent to Participate: Not applicable.
- Consent for Publication: Written informed consent was obtained from the patient for publication of this case report and any accompanying clinical details.
- Availability of Data and Materials: All data generated or analyzed during this study are included in this published article.
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