

# Clinical Challenges and Treatment Strategies for Rare ICU Pathogens: A Case Series

Muthu Nagarathinam<sup>1</sup>, Swati Srivastava<sup>2</sup>, Pallavi<sup>3</sup>

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## ABSTRACT

The emergence of rare bacterial strains in intensive care units (ICUs) presents numerous challenges for treatment and infection control. This case series describes the detection and management of three uncommon bacteria *Pluralibacter gergoviae*, *Stenotrophomonas maltophilia*, and *Elizabethkingia anopheles* in ICU patients. The clinical implications and antibiotic susceptibilities of these pathogens are critical for effective management and infection control within healthcare settings. These cases highlight the opportunistic nature and antibiotic resistance patterns of *P. gergoviae*, *S. maltophilia*, and *E. anopheles*, underscoring the need for vigilance in diagnosis and treatment. This series underscores the significant clinical impact of rare bacterial strains in ICU settings, particularly in immunocompromised patients. Prompt identification and appropriate antibiotic therapy are crucial to ensure a favorable outcome.

**Keywords:** Antimicrobial drug resistance, Intensive care units, Multi-drug resistance, Opportunistic infections, Sepsis.

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## INTRODUCTION

The emergence of rare bacterial strains presents a significant clinical concern, posing treatment and infection control challenges in the intensive care unit (ICU). In this case series, we present an intriguing investigation into detecting and managing three uncommon bacteria *Pluralibacter gergoviae*, *Stenotrophomonas maltophilia*, and *Elizabethkingia anopheles* from cultures of ICU patients. Understanding these pathogens' clinical implications and antibiotic susceptibilities is critical for effective management and infection control strategies within healthcare facilities.

## CASES DESCRIPTION

### Case 1

A 68-year-old male patient with diabetes and hypertension was shifted to ICU as post operated case of bilateral frontal burr hole and drainage of chronic subdural hematoma. The patient was intubated, requiring ventilatory support. The patient also had a high-grade fever and was on inotropic support with a picture of sepsis. Routine blood workup and all the cultures were sent. The patient was started with empirical broad-spectrum antibiotics according to local sensitivity patterns. The patient then underwent a tracheostomy given prolonged ventilatory support due to the underlying neurological condition. The blood cultures were found to be positive for *P. gergoviae*, sensitive to amikacin, amoxicillin, aztreonam, meropenem, piperacillin-tazobactam, tobramycin and newer generation cephalosporins. Ongoing antibiotics included meropenem and aztreonam. C-reactive protein (CRP) and procalcitonin levels were monitored at regular intervals, showing a declining trend over treatment. Inotropic supports were gradually reduced. Overall, the patient improved and was discharged from the hospital.

### Case 2

A 29-year-old female patient was shifted to ICU as a postoperative case of exploratory laparotomy with peritoneal lavage with

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<sup>1-3</sup>Department of Anaesthesiology, King George's Medical University, Lucknow, Uttar Pradesh, India

**Corresponding Author:** Muthu Nagarathinam, Department of Anaesthesiology, King George's Medical University, Lucknow, Uttar Pradesh, India, Phone: +91 8667278264, e-mail: m.kaushik3596@gmail.com

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resection of bowel with double barrel ileostomy with single pelvic drain for post dilatation and curettage ileal perforation. The patient was intubated, had a high-grade fever, and required inotropic support with a picture of septic shock. Routine blood workups and cultures were sent. The patient was started on empirical broad-spectrum antibiotics according to local sensitivity patterns. Contrast-enhanced computed tomography (CECT) abdomen showed a free fluid collection. The surgical team planned to open the abdomen and consider Bogota bag dressing. The tracheostomy tube aspirate culture was positive for *S. maltophilia*, sensitive to minocycline, chloramphenicol, levofloxacin, co-trimoxazole, and ceftazidime. Ongoing antibiotics included ceftazidime and minocycline. C-reactive protein and procalcitonin levels were monitored at regular intervals, and inotropic supports were gradually reduced. The patient recovered in 15 days and was subsequently discharged from hospital.

### Case 3

An 18-year-old male patient was admitted to ICU with a case of acute necrotizing pancreatitis. Contrast enhanced computed tomography

abdomen done outside showed peripancreatic collection and a high CT severity score.

The patient was initially on a high-flow nasal cannula and was started on broad-spectrum antibiotic coverage. The patient was intubated on day 2 of the ICU stay given respiratory distress and ARDS-like picture on the chest X-ray, and was started on ionotropic support. A USG-guided peripancreatic pigtail catheter was placed. Initial culture reports of blood and endotracheal tube aspirate were sterile, but urine was positive for budding yeast-like cells and pseudo-hyphae for which antifungal was added. C-reactive protein and procalcitonin levels were monitored at regular intervals along with daily routine investigations.

Throughout his ICU stay, the patient had 1–2 spikes of fever every day. Repeat cultures showed a rare gram-negative organism, *E. anophelis*, in ET culture resistant to ciprofloxacin, levofloxacin, and ceftazidime and sensitive to minocycline, while blood and urine cultures were sterile. Based on the sensitivity reports, the antibiotics were revised, and the patient recovered with sterile culture reports.

## DISCUSSION

*Pluralibacter gergoviae* belongs to the *Enterobacteriaceae* family. It is an opportunistic bacteria found in the urinary tract and is associated with antibiotic-resistant outbreaks in several hospitals. It has also been cultured from respiratory and blood samples.<sup>1</sup> The resistance of *P. species* to antibiotics has been a focal point of interest, with many seeking to expand the data on the newer taxa within the genus. Due to their membrane structure, they are naturally resistant to fusidic acid, vancomycin, teicoplanin, telavancin, lincosamide, and rifampicin.<sup>2</sup> Tetracyclines, aminoglycoside antibiotics, carbapenems, and fluoroquinolones are active against them. However, they are only moderately sensitive to penicillin and ampicillin. They have moderate to high levels of sensitivity to cephalosporins, except ceftazidime, which they are resistant to.<sup>3</sup> But, resistance to third-generation cephalosporins is quickly emerging due to extended-spectrum beta-lactamases' production. Most of the species are sensitive to carbapenems, including ESBL producers, and are considered to be the preferred empiric therapy for serious *Enterobacteriaceae* infections.<sup>4</sup>

*Stenotrophomonas maltophilia* is a gram-negative, non-fermenting, aerobic bacteria which is previously known as *Pseudomonas maltophilia* or *Xanthomonophilia*.<sup>5</sup> It has very low virulence and is considered a commensal to human beings. It causes opportunistic infections. The respiratory system is most commonly involved, but it can also cause infections in the eyes, biliary system, bones, joints, and urinary system.<sup>6,7</sup> Risk factors for *S. maltophilia* infection include dialysis dependence, cystic fibrosis, and other chronic respiratory illnesses, hematologic malignancy, neutropenia, human immunodeficiency virus infection, and organ transplant recipients.<sup>8</sup> The first-line treatment for *S. maltophilia* is trimethoprim-sulfamethoxazole. Studies indicate that it is bacteriostatic for *S. maltophilia* and must be given at higher doses to be effective.<sup>9</sup> *S. maltophilia* is also sensitive to tetracyclines and fluoroquinolones, and these can be used as alternative treatment if needed. The duration of treatment is usually seven days, but the treatment may need to be continued for up to two weeks in immunocompromised patients and bacteremia.<sup>10</sup>

*Elizabethkingia anophelis* is a gram-negative, aerobic, non-motile rod belonging to the *Flavobacteriaceae* family. *E. anophelis* is ubiquitous and is found in soil, water, and healthcare settings.<sup>11</sup> It has emerged as an opportunistic human pathogen involved in

neonatal meningitis and sepsis as well as nosocomial infections in adults with underlying medical conditions like malignancy, diabetes, and COPD. In previous studies, the case fatality rate of patients with *E. anophelis* infection has been 24–34%.<sup>12</sup> Hence, *E. anophelis* bacteremia should be considered clinically significant, and sensitivity-based antibiotic therapy should be initiated as it is a multi-drug resistant organism.<sup>13</sup> The antibiotic susceptibility pattern of this organism is not widely known. The organism was resistant to fluoroquinolones and third-generation cephalosporins but was sensitive to minocycline, which was initiated immediately. The finding of this isolate could be attributed to anemia, prolonged hospital stay, multiple in-dwellings, and immunocompromised status of our patient.

## CONCLUSION

This case series underscores the clinical challenges of rare bacterial strains such as *P. gergoviae*, *S. maltophilia*, and *E. anophelis* in ICU settings. These pathogens, though uncommon, exhibit significant clinical impact, particularly in immunocompromised patients or those with complex medical conditions. Effective management hinges on prompt identification through culture-based diagnostics and tailored antibiotic therapy based on susceptibility patterns. The cases highlighted the importance of vigilance in infection control practices within healthcare facilities. Moving forward, continued surveillance and research into the antibiotic resistance profiles of these organisms are crucial for enhancing treatment outcomes and minimizing the spread of nosocomial infections.

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