

# SUCCESSFUL SALVAGE THERAPY WITH CEFTAZIDIME-AVIBACTAM PLUS AZTREONAM FOR PAN-RESISTANT SERRATIA MARCESCENS SEPSIS IN AN INFANT: A CASE REPORT

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## ABSTRACT

Invasive infections caused by pan-resistant Gram-negative pathogens pose significant therapeutic challenges in neonatal intensive care units. We report a 35-day-old male infant presenting with severe sepsis, respiratory failure, and apnea. Initial empirical antimicrobials failed. Blood culture isolated *Serratia marcescens* with pan-resistance to conventional antibiotic classes, including carbapenems, aztreonam, and ceftazidime-avibactam. Following a pediatric infectious diseases consultation, a weight-adjusted combination of intravenous ceftazidime-avibactam and aztreonam was initiated to exploit potential mechanistic synergy. The patient achieved clinical cure and hematologic recovery over a 21-day course without renal toxicity, suggesting a potential salvage option when standard choices are exhausted.

**Keywords:** Anti-Bacterial Agents; Drug Resistance, Multiple, Bacterial; Infant; Sepsis; *Serratia marcescens*

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## INTRODUCTION

Neonatal and infant sepsis remains a leading driver of pediatric mortality in developing countries, a burden intensified by rising antimicrobial resistance among Gram-negative bacilli.<sup>1,2</sup>

*Serratia marcescens* is a resilient opportunistic pathogen capable of causing neonatal outbreaks and acquiring extensive drug resistance.<sup>3</sup>

When isolates are resistant to standard antimicrobial classes, clinicians have few viable single-agent options. Ceftazidime-avibactam, combined with aztreonam, has emerged as a salvage therapy for refractory Gram-negative infections, but clinical validation in young infants remains limited.<sup>4,5</sup>

## CASE REPORT

A 35-day-old male infant weighing 2.2 kg presented with one week of pyrexia, poor feeding, lethargy, and severe respiratory distress.

On arrival, he developed apnea and required im-

mediate bag-mask ventilation before stabilization on continuous positive airway pressure. Empirical intravenous fluids, cefotaxime, and gentamicin were started for presumed sepsis. Baseline testing revealed leukopenia ( $2.8 \times 10^9/L$ ), thrombocytopenia ( $115 \times 10^9/L$ ), anemia (hemoglobin 10.0 g/dL), and indirect hyperbilirubinemia. Chest radiography showed bronchopulmonary pneumonia.

Admission blood culture yielded *Serratia marcescens* with pan-resistance to cephalosporins, piperacillin-tazobactam, carbapenems, aminoglycosides, fluoroquinolones, ceftazidime-avibactam, and aztreonam.

Given the clinical decline, a pediatric infectious disease review was obtained. Intravenous ceftazidime-avibactam 90 mg every 8 hours was given concurrently with aztreonam 100 mg every 8 hours to exploit functional synergy.

Platelets reached  $51 \times 10^9/L$ , and hemoglobin dropped to 6.7 g/dL, requiring platelet and packed red cell transfusions. Renal metrics remained stable.

A single-bottle growth of a *Staphylococcus* species was treated as skin contamination, as the infant was improving with no other symptoms.

The infant completed 21 days of dual therapy, achieved hematologic recovery, and was discharged stable. The integrated clinical timeline is summarized in Table 1.

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**Table No 1: Chronological Timeline and Patient Management**

Phase / Dates	Key Findings	Management / Outcome
Admission (08-09 Sep 2025)	Fever, lethargy, respiratory distress, apnea; WBC $2.8 \times 10^9/L$ , platelets $115 \times 10^9/L$ ; pneumonia on chest radiograph	CPAP support, intravenous fluids, cefotaxime plus gentamicin; blood culture sent
Culture Phase (12-13 Sep. 2025)	Pan-resistant <i>Serratia marcescens</i> isolated; platelet nadir $51 \times 10^9/L$	Infectious diseases consultation obtained; ceftazidime-avibactam plus aztreonam initiated
Supportive Phase (14-16 Sep. 2025)	Hb nadir 6.7 g/dL; repeat <i>Staphylococcus</i> culture considered contaminant	Platelet and packed red cell transfusions; salvage therapy continued
Recovery (18 Sep-04 Oct. 2025)	Clinical improvement; WBC $11.9 \times 10^9/L$ , platelets $155 \times 10^9/L$ , Hb 14.5 g/dL	Completed 21-day therapy; discharged stable

## DISCUSSION

Management of invasive *Serratia marcescens* infection is challenging due to its environmental persistence and rapid acquisition of resistance.<sup>3</sup>

Aztreonam resists degradation by metallo-beta-lactamases, while avibactam inhibits co-produced serine beta-lactamases; together, they may restore activity despite apparent single-agent resistance.<sup>5</sup>

In settings without molecular testing or synergy panels, expert-guided combination therapy may be a practical bedside option.

Although limited by a single-patient design and lack of genotypic confirmation, this case supports cautious use of ceftazidime-avibactam plus aztreonam when all standard therapies fail.

## CONCLUSION

A carefully dosed combination of ceftazidime-avibactam and aztreonam cured pan-resistant *Serratia marcescens* sepsis in an early infant, supporting its use as expert-guided salvage therapy when standard antimicrobial choices are exhausted.

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