

## Complicated septic shock caused by *Achromobacter xylosoxidans* bacteremia in a patient with acute lymphoblastic leukaemia

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**Abstract:** Infections caused by *Achromobacter xylosoxidans* cause significant morbidity and mortality in debilitated individuals. Eradication of these infections requires prolonged therapy with antimicrobial agents and removal of any infected central venous catheter. The outcome is usually poor in patients with high risk malignancy, septic complications, and/or multi-organ dysfunction.

**Key Words:** *A. xylosoxidans*; *Achromobacter xylosoxidans*; ICU: Intensive care unit; ALL: Acute lymphoblastic leukemia; SS: Septic shock.

### Introduction

*Achromobacter xylosoxidans* (*A. xylosoxidans*) is a Gram-negative bacillus which can cause severe infection with a high mortality rate, particularly in immunocompromised individuals despite its low intrinsic pathogenicity [1-6]. Several clinical syndromes have been described including primary bacteremia, meningitis, and pneumonia [3-8]. The lack of standard therapy and the resistance to several antibiotics render the management of infections caused by this organism difficult [4, 6, 9-13].

This report describes a young patient with acute lymphoblastic leukemia (ALL) who suffered several bacterial infections during and after induction chemotherapy given at Riyadh Armed Forces Hospital. Afterward, while receiving treatment in the general intensive care unit (ICU), the patient developed *A. xylosoxidans* bacteremia, complicated by septic shock and multiorgan failure.

### Case Report

A nineteen year old Saudi male with Philadelphia positive ALL presented with fever. General and systemic examinations were unremarkable with no evidence of palpable lymphadenopathy or abdominal organomegaly. Chemistries on admission revealed: anaemia, thrombocytopenia and hypercalcemia. However, his white cell count was normal. After correcting the hypercalcemia with intravenous fluids and clodronate, the patient was started on UK XII ALL induction chemotherapy composed of prednisolone, vincristine, idarubicin and L-asparaginase in addition to intrathecal methotrexate. Ten days later, the patient experienced fever and diarrhea. Blood cultures grew *E.coli* and *Klebsiella pneumoniae*. Intravenous ceftazidime and amikacin were started according to susceptibility results. The patient responded well to treatment and remained clinically stable for about ten days.

Three weeks after starting chemotherapy, the patient developed a small painful nodule over the left thigh. Cultures from the left groin grew a highly resistant *Pseudomonas aeruginosa*

sensitive only to ciprofloxacin and imipenem. Methicillin resistant *Staphylococcus aureus* (MRSA) was cultured from a nasal swab and *E.coli* grew from a urine sample. Recent cultures were reviewed, and it was decided to change ceftazidime and amikacin to imipenem, ciprofloxacin, and vancomycin for additional gram positive bacterial coverage, since the patient was continuously febrile. The central venous catheter was removed, the induction course of chemotherapy was placed on hold, and granulocyte-colony stimulating factor (G-CSF) was initiated. Despite measures taken, the patient remained pyrexial and the thigh nodule developed into cellulitis with a fluid collection. Surgical incision and drainage was required, but the patient continued to deteriorate with the cellulitis extending toward the perineum. The patient remained febrile, and became hypotensive. He was transferred to the intensive care unit.

The patient had a slow and complex recovery. Eight days after the first septic episode, he became hemodynamically unstable and required ventilatory and inotropic support. Central and peripheral blood cultures were repeated which grew a gram negative bacillus identified as *A. xylosoxidans*. The organism was classified as an oxidizer in the glucose oxidative fermentation medium. It oxidized xylose better than glucose. It was oxidase and nitrate positive and had a negative reaction for urea, mannitol, sucrose, and maltose. The antimicrobial susceptibility testing was performed with disc diffusion method according to the CLSI (Clinical and Laboratory Standards Institute). The cultured organism was found to be sensitive to colistin, imipenem, ceftazidime and piperacillin/tazobactam. Despite the addition of intravenous colistin to the previous antibiotic coverage and despite the removal of the central venous catheter, the patient deteriorated further, had cardiac arrest, and died.

### Discussion

*A. xylosoxidans* is an aerobic, non-fermenting, Gram-negative rod initially characterized by Holmes and further studied and named by Yabuuchi and Ohyama (1971) after isolation of the

organism from seven patients with chronic otitis media [1,14]. It is often encountered in aqueous environments but rarely recognized as a human pathogen. Despite its low intrinsic pathogenicity, it can cause serious infections in humans, especially immunocompromised hosts [8, 11, 12]. *A. xylosoxidans* has been reported in patients with cancer, neutropenia, bone marrow or liver transplant, diabetes mellitus, renal failure, cystic fibrosis, HIV infection, IgM deficiency, neonates, and healthy individuals [2-4, 5-8,10,11,13,15-17]. The clinical manifestation of infection caused by *A. xylosoxidans* is variable and includes primary bacteremia, pneumonia, meningitis, endocarditis, cholecystitis, peritonitis, pyelonephritis, osteomyelitis, lymphadenitis and keratitis [3-6, 8, 14, and 18].

Treatment of infections caused by this organism is usually difficult as multidrug resistance is commonly encountered and as the optimal therapy is not yet determined [5, 10-12, 16]. However, previous reports have found that empirical antibiotic therapy with piperacillin-tazobactam or a carbapenem would be a reasonable choice until results of susceptibility tests are available. *A. xylosoxidans* is characteristically susceptible to trimethoprim/sulphamethoxazole, colistin, antipseudomonal penicillins, and carbapenems. It is usually resistant to aminoglycosides, ampicillin, aztreonam, quinolones and most of the cephalosporins [1, 4, 6, 9-13]. Eradication of these infections requires prolonged therapy with drug combinations as well as the removal of infected central venous catheters [2, 12, 15, and 18]. Poor prognosis and high mortality rates are expected in neonates, elderly individuals, patients with malignancies, neutropenia, sepsis syndrome, multi-organ failure, those on mechanical ventilation, and patients having meningitis, endocarditis and pneumonia [3-7, 9]. However, catheter-related infections are associated with low mortality rates [3, 4]. Infection outbreaks should be recognized and appropriate infection control measures taken [12].

### Conclusion

*A. xylosoxidans* is a Gram-negative oxidative organism which causes infections in patients with certain underlying illnesses. It is a rare but an important cause of bacteremia in immunocompromised individuals. The strains are often resistant to multiple antimicrobials. Empirical antibiotic therapy with piperacillin-tazobactam or a carbapenem is a reasonable choice until the results of susceptibility tests are available.

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