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Late-onset sepsis by *Achromobacter xylosoxidans* in a healthy neonate

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Abstract:

Achromobacter xylosoxidans is a rare pathogen in clinical settings. Infections are reported infrequently in immunocompromised neonates. We report a case of late-onset sepsis in a 28-day-old neonate whose cerebrospinal fluid and blood culture grew *A. xylosoxidans*

Keywords:

Achromobacter xylosoxidans, meningitis, neonate, septicaemia

Introduction

Alcaligenes xylosoxidans, also known as *Achromobacter xylosoxidans*, is a Gram-negative, waterborne organism that causes healthcare-associated infections[1,2] and bacteraemia in immunocompromised patients with indwelling catheters.[3,4] *A. xylosoxidans* is found in soil and water and grows in saline.[5] Patients recover bacteriologically indicating low virulence. *A. xylosoxidans* can be confused with other non-fermenting Gram-negative bacteria, especially pseudomonas spp. However, identification of this organism is of clinical importance as *A. xylosoxidans* is usually multidrug resistant and the source of infection needs to be pursued.

Case Report

A 28-day-old neonate presented to the paediatric department with the complaints of fever, abnormal cry and poor feeding. The antenatal period was uneventful, with full-term vaginal delivery from outside hospital. On 26th-post-natal day, the neonate developed abdominal distension, for which she was treated by a homeo doctor. The child was given homeo medicines diluted in water thrice a day, following which she developed fever and abnormal cry. There was no history of seizures. Investigations revealed mild anaemia (Hb 18.2 g/dL) and raised C-reactive protein (28 mg/dL). platelet count, leucocyte count and bilirubin levels were normal. A provisional diagnosis of late-onset sepsis was made and treatment initiated with Amikacin and Cefotaxime.

Cerebrospinal fluid (CSF) protein was 71.2 mg% and sugar 78 mg%. Gram stain of centrifuged deposits showed 2–4/cm^2 pus cells and faint staining Gram-negative bacilli. Normal ranges for this age for cells, protein and glucose are 4.5 cells/cm^3, 77.6 mg% and 67 mg%, respectively. The corresponding serum glucose level was 45 mg/dL.

CSF was inoculated on blood agar and MacConkey agar. MacConkey agar showed small non-lactose-fermenting colonies and blood agar showed 1–2 mm, round, moist, grey, smooth, entire edge, non-haemolytic colonies after overnight incubation at 37°C. Gram-stained smear showed Gram-negative bacilli, which were oxidase and catalase positive. Conventional blood culture also yielded the same isolate within 48 h of incubation.

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A presumptive identification of pseudomonas spp. was made as the biochemical reactions were coinciding with that of pseudomonas spp. (citrate – utilised, nitrate – reduced, urea – not hydrolysed and sugars – not fermented). The growth was subjected to identification by automated VITEK® 2 Compact (C) system version: 06.01 (bioMérieux, North Carolina/USA) using GNID 21-341 and antibiotic susceptibility was done using AST-N 281 card. The organism was identified as *Cupriavidus pauculus* (98.9% – excellent identification). Antimicrobial susceptibility testing (Vitek 2) showed that the strains were susceptible to Co-trimoxazole, Ceftazidime, Cefepime, Piperacillin-Tazobactam and Meropenem and were resistant to Amikacin and Gentamicin. In spite of the treatment, fever continued to persist. Piperacillin-Tazobactam and Meropenem were added after stopping Amikacin and Cefotaxime. Clinical and microbiological resolution was achieved after starting Meropenem. The isolate was further identified as *A. xylosoxidans* by PCR amplification and bidirectional sequencing (molecular diagnostics laboratory, AIMS, Kochi, Primer Sequence Eubac U1 F 5′ TTGGAGAGTTTGATCCTGGCTC 3′Eubac rU 4 R 5′ GGACTACCAGGGTATCTAA 3′).

Discussion

A. xylosoxidans is a non-fermentative, Gram-negative bacillus which is widely distributed in nature, especially in aquatic environments. It was first described by Yabuuchi and Ohyama in 1971 from purulent ear discharge of patients with chronic otitis media.[6] *A. xylosoxidans* has two subspecies: *xylosoxidans* and *denitrificans*, the former of which is the most common cause of clinically recognisable infection.[7] *A. xylosoxidans* may be part of the gastrointestinal and respiratory tracts of some people. It has been recovered from aquatic surroundings in hospitals such as ventilators, humidifiers, sterile saline, intravenous fluids and irrigation and dialysis solutions. They have also been recovered from infant formula, children's soap bubbles, well water and swimming pools. These organisms survive many disinfectants and have been cultured from chlorhexidine, 1% eosin, alcohol and quaternary amine-containing compounds.[1,8] Originally considered commensals, they are increasingly being recognised as important, although rare, hospital pathogens. Outbreaks of infection have been reported in hospitals including neonatal intensive care units. Nosocomial infections occur in association with immunosuppression, malignancies, HIV infection and neonates.[9]

A. xylosoxidans bacteraemia is almost always a nosocomial infection.[10] Septicaemia caused by this organism is rare, occurs usually in immunocompromised hosts and neonates. We report the first case of *A. xylosoxidans* causing concomitant meningitis and septicaemia in a healthy neonate from India. Most neonatal infections are nosocomial; vertical transmission from mother to baby has been described. Community-acquired infections are rare and occur mainly in patients with cystic fibrosis. *A. xylosoxidans* can be confused phenotypically with other non-fermenting Gram-negative bacteria, especially pseudomonas spp. Species-level identification of achromobacter spp. is difficult and isolates are frequently misidentified even by automated identification systems.[11] Therefore, only molecular analysis can give confirmatory results. At present, the genus comprises 19 validly named species,[12] and the clinical importance of different achromobacter spp. has not been comprehensively studied. The source of infection in our case could not be ascertained as surveillance cultures could not be done since the patient was referred from another hospital.

The mortality rate of neonatal infections ranges from 13% to 75%; hence, paediatricians should be aware of this organism. achromobacter spp. typically is resistant to a large number of antibiotics, including Ampicillin, Aztreonam, Aminoglycosides, first- and second-generation Cephalosporins, Tetracyclines and Rifampicin. Most are sensitive *in vitro* to Trimethoprim-Sulphamethoxazole, Imipenem and in some cases to Ceftazidime, Piperacillin and Cefoperazone. Antimicrobial susceptibility profile for each case should be taken into account for determining the therapy. Although the isolate showed *in vitro* susceptibility to Piperacillin-Tazobactam, our patient clinically responded to Meropenem 120 mg IV eight hourly for 14 days. The child became symptomatically better and was discharged with review after one week. No similar cases were reported from the hospital by the same isolate

A. xylosoxidans is a rare isolate which should be considered as a pathogen in neonates and immmunocompromised setting that can be completely cured if identified and treated appropriately. The next important thing that we would like to highlight is the misidentification of this isolate for common pathogens such as pseudomonas spp. whose sensitivity report will be entirely different. And at last but not the least, the importance of molecular analysis of the isolate for final identification is also a diagnostic breakthrough.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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