Case Report

Achromobacter xylosoxidans subsp. *xylosoxidans* prosthetic aortic valve infective endocarditis and aortic root abscesses

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We report a case of prosthetic valve infective endocarditis and aortic root abscesses caused by *Achromobacter xylosoxidans* subsp. *xylosoxidans*. The patient was an intravenous drug user and had injected amphetamines using 'duck pond water' as a diluent. After surgical intervention and 6 weeks of intravenous meropenem therapy, the patient made an uneventful recovery.

Case report

A 37-year-old male was transferred from a peripheral hospital to St Vincent's Hospital, Sydney, Australia, for surgical management of an aortic root abscess and prosthetic valve endocarditis (PVE). The patient's native aortic valve (AV) was replaced in November 2006 secondary to a meticillin-sensitive *Staphylococcus aureus* AV endocarditis following episodes of intravenous drug use. Following AV replacement, the patient returned to his normal activities. However, he denied any further intravenous drug use. A follow-up transthoracic echocardiogram in March 2007 revealed a normally functioning AV. Two months later (May 2007), the patient presented to a rural hospital with fevers, hypotension and congestive cardiac failure. A diagnosis of PVE was considered and intravenous gentamicin, ceftriaxone and vancomycin were commenced. However, the symptoms of sepsis and congestive cardiac failure failed to improve with medical therapy and the patient was transferred for surgical intervention. A repeat AV replacement and a homograft aortic root replacement were performed for PVE and multiple aortic root abscesses.

Blood cultures and tissue from the AV and root were sent for microbiological analysis. An oxidase-positive Gram-negative rod was isolated from both tissue and blood culture after 48 h of incubation. The Gram-negative rod from the blood culture was identified as *Burkholderia cepacia* by an API 20 NE (bioMérieux) with 99.5% probability and a 'very good identification' confidence level (biotype profile number 1047777), while the Gram-negative rod from the tissue cultures was identified as *Achromobacter xylosoxidans* by an API 20 NE (bioMérieux) with 94.5% probability (biotype profile number 1040477) and a 'good identification' confidence level. Identical phenotypic results were obtained on repeat API 20 NE

testing on fresh subcultures from both the blood culture and the tissue isolates.

Due to identification discrepancies, further testing by analysis of whole-cell long-chain fatty acids and 16S rRNA were performed on both isolates. The Microbial Identification System (MIDI Corporation) confirmed both isolates to be *A. xylosoxidans* subsp. *xylosoxidans* (similarity index of 0.658; an index >0.5 is considered adequate for speciation). To exclude the possibility of the *B. cepacia* complex, a PCR was performed as previously described using primers targeting the *recA* gene (Mahenthiralingam *et al.*, 2000). The PCR was negative for *B. cepacia* complex DNA.

Genomic DNA was extracted from both isolates using a QIAamp DNA Mini Kit (QIAGEN), and DNA amplification of the small-subunit rRNA gene was performed using universal primers as previously described by Fry *et al.* (2005). The PCR products were purified using the QIAquick PCR Purification kit (Qiagen) according to the manufacturer's instructions. The PCR products were sequenced in both directions on an ABI Prism 3730 automated sequencer at the SUPAMAC facility (Royal Prince Alfred Hospital, Sydney). The sequences generated were compared to those available in the GenBank databases using the BLASTN program run on the National Center for Biotechnology Information server (<http://www.ncbi.nlm.nih.gov/BLAST/>).

The sequence data generated from the 16S rRNA gene from both isolates were identical and demonstrated 100% similarity with the 16S rRNA gene sequence of numerous *A. xylosoxidans* subsp. *xylosoxidans* isolates (GenBank accession nos DQ466568, DQ361075, AF411021, AF411020, AF411019 and AB161691). The organism revealed the following susceptibilities by E-test: gentamicin MIC 0.094 µg ml⁻¹; ticarcillin–clavulanate MIC 12 µg ml⁻¹; cefepime MIC 0.016 µg ml⁻¹; cefotaxime MIC 12 µg ml⁻¹; ciprofloxacin MIC 0.75 µg ml⁻¹; and meropenem

Abbreviation: AV, aortic valve.

MIC 0.38 µg ml⁻¹. The patient was treated with meropenem for 6 weeks and made an uneventful recovery.

On further questioning, the patient admitted to injecting intravenous drugs 1 week prior to his presentation. Furthermore, the patient described a febrile illness immediately after injecting amphetamines which spontaneously resolved several hours later. The probable source of infection was established when the patient described the process of injecting. He was undertaking a long drive and decided to inject amphetamines to keep awake. He stopped at a friend's house and obtained water from his duck pond, which he used to solubilize the drug for injection without filtering or boiling.

Discussion

The family *Alcaligenaceae* comprises several genera, based on phenotypic and genotypic data, including the genus *Achromobacter* (Yabuuchi *et al.*, 1998). *A. xylosoxidans* is a ubiquitous environmental Gram-negative, oxidase-positive, non-glucose-fermenting rod. There are two subspecies, *A. xylosoxidans* subsp. *xylosoxidans* and *A. xylosoxidans* subsp. *denitrificans*.

Human infections are rare. Nosocomial infections predominate with an association between infection and immunosuppression, especially in patients with underlying malignancy, in HIV-infected patients and in premature infants (Aisenberg *et al.*, 2004; Manfredi *et al.*, 1997). Contaminated intravenous lines are the most common source of infection, with other potential sources including dialysis fluid, incubators and mechanical ventilators (Gómez-Cerezo *et al.*, 2003; Reverdy *et al.*, 1984). Community-acquired infections account for the minority of cases and are generally restricted to cystic fibrosis patients with temporary or persistent infections of the respiratory tract (Davies & Rubin, 2007).

The most common manifestation of infection with this organism is bacteraemia. Polymicrobial bacteraemia occurs in 28 % of patients, with coagulase-negative *Staphylococcus* the most common accompanying organism (Gómez-Cerezo *et al.*, 2003). Endocarditis has been described on four previous occasions only (Ahn *et al.*, 2004; Duggan *et al.*, 1996; Lofgren *et al.*, 1981; Martino *et al.*, 1990). Our patient is unique as infective endocarditis was secondary to a community-acquired bacteraemia as a consequence of intravenous injection of drugs. The previously reported cases required removal of the pacemaker leads and prosthetic valve. The virulence of this organism was confirmed in our patient, who required an AV and root replacement. The importance of an accurate medical history to ascertain the source of unusual organisms is highlighted.

Characteristic antimicrobial susceptibility patterns of *A. xylosoxidans* subsp. *xylosoxidans* include high levels of resistance to cephalosporin (>90 %), aminoglycoside (>90 %) and quinolone (>80 %) antibiotics. Variable intrinsic resistance to broad-spectrum anti-pseudomonal

penicillins is described. Although our isolate was sensitive to ticarcillin–clavulanic acid on MIC testing, a β-lactamase enzyme was detected by nitrocephin disc testing; therefore, meropenem was chosen as resistance to this antibiotic is rare (Gómez-Cerezo *et al.*, 2003; Shie *et al.*, 2005).

Identification of *A. xylosoxidans* subsp. *xylosoxidans* may be problematic. Traditional phenotypic and commercially available tests are often unreliable and may lead to misidentification as other non-fermenting organisms, in particular members of the *B. cepacia* complex (Wellinghausen *et al.*, 2006). Tissue and blood isolates which were subsequently proven to be identical gave different profiles and hence a different identification using the API 20 NE system. Molecular methods such as sequencing of ribosomal genes allow for more accurate identification of non-fermenting Gram-negative rods than traditional phenotypic methods. However, care should be taken when interpreting the sequence data generated as public DNA databases such as GenBank may have faulty or incorrectly assigned sequences leading to the misidentification of isolates (Wellinghausen *et al.*, 2006).

A. xylosoxidans bacteraemia has a mortality rate of between 15 and 48 % (Duggan *et al.*, 1996; Shie *et al.*, 2005). Risk factors for higher mortality rates include age over 65 years, neutropenia, presence of polymicrobial infection and nosocomial infection (Gómez-Cerezo *et al.*, 2003; Shie *et al.*, 2005).

In conclusion, community-acquired *A. xylosoxidans* bacteraemia is uncommon while endocarditis is rare. An accurate intravenous drug use history should be sought, especially related to the paraphernalia and methods used in the injecting process. The most appropriate antimicrobial therapy has not been determined but our patient responded well to surgical intervention and meropenem.

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