

Pyogenic Infections Due to *Ochrobactrum anthropi*

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Ochrobactrum anthropi is a nonfermentative gram-negative bacillus that has been isolated with increasing frequency from human clinical specimens. Previously, its pathogenic niche was believed to involve the causation of catheter-associated bacteremic illnesses. We describe three cases of pyogenic infection due to *O. anthropi*, thereby expanding the known pathogenic potential of this organism.

Ochrobactrum anthropi, formerly classified under CDC group Vd, is an oxidase-producing, non-lactose-fermenting, gram-negative bacillus that oxidizes glucose, grows readily on MacConkey agar, and is motile by means of peritrichous flagella. In 1992, we reported the case of a 3-year-old girl with central venous catheter-associated bacteremia due to *O. anthropi* and reviewed the confusing history and taxonomy associated with this organism [1]. Shortly thereafter, Gransden and Eykyn reported seven cases of catheter-associated bacteremia due to this organism and suggested that the pathogenic niche for *O. anthropi* may be in such catheter-related bacteremias [2]. Three subsequent reports [3–5] detailed eight additional cases of catheter-associated bacteremia due to *O. anthropi*, while a fourth report [6] described five organ transplant recipients who developed *O. anthropi* bacteremia as a result of the administration of contaminated antithymocyte globulin. We now report three cases of pyogenic infection due to *O. anthropi*, thereby expanding the spectrum of disease associated with this unusual organism.

Case Reports

Patient 1. A 61-year-old female was admitted to the hospital for evaluation of right-upper-quadrant abdominal pain accompanied by chills, dark urine, and acholic stools of 3 days' duration. She had a history of hypertension, hypothyroidism, renal insufficiency, chronic congestive heart failure that had developed following a myocardial infarction, and residual dementia that had developed following a cerebrovascular accident. Four months before her current admission, she had had an

episode of gallstone pancreatitis for which she had undergone cholecystectomy.

The serum aspartate aminotransferase level was 220 mg/dL; alanine aminotransferase level, 246 mg/dL; and total bilirubin level, 5.1 mg/dL. Endoscopic retrograde cholangiopancreatography revealed chronic pancreatitis as well as a stricture of the common bile duct. On the eighth hospital day, the patient became acutely hypotensive, and a diagnosis of cholangitis was made. Surgical biliary decompression was undertaken, and cultures of bile yielded *Pseudomonas aeruginosa*. Ceftazidime and aztreonam were administered intravenously for 10 days. Despite these interventions, the patient continued to have episodic hypotension and fevers, and ultimately, progressive renal and hepatic failure developed.

Cultures of bile obtained from a draining T tube on the 22nd hospital day yielded *O. anthropi* and *Candida tropicalis*. Gentamicin, imipenem, and amphotericin B were administered intravenously, but the fevers and hypotension continued; subsequent cultures of blood and bile yielded *Stenotrophomonas maltophilia* and *Enterococcus faecalis*. Vancomycin, gentamicin, and ceftazidime were administered, but the patient's condition continued to slowly deteriorate. On the 57th hospital day, a blood culture yielded *O. anthropi*. Therapy with intravenous trimethoprim-sulfamethoxazole (TMP-SMZ) and ceftazidime was instituted. Although subsequent blood cultures did not yield any growth, the patient died on the 71st hospital day following progressive hepatic failure and her refusal of further intervention.

Patient 2. A 66-year-old male was admitted to our institution for evaluation of productive cough and an 8-pound weight loss. He was a smoker (60 pack-year history) and had undergone radical neck dissection for squamous cell carcinoma of the tonsil 5 years before his current hospitalization. CT of the chest revealed a 1-cm nodule in the middle lobe of the right lung. On the sixth hospital day, the patient underwent right middle and upper lobectomies, at which time a well-differentiated non-small-cell carcinoma was discovered. A chest tube was placed at the time of surgery, and vancomycin and gentamicin were administered prophylactically. On the ninth hospital day, a left-lower-lobe pulmonic infiltrate developed, and on the 11th day, adult respiratory distress syndrome was noted. His temperature reached 103.7°F, and purulent discharge was

The data contained herein were presented in part at the 32nd Interscience Conference on Antimicrobial Agents and Chemotherapy held on 11–14 October 1992 in Anaheim, California [abstract 670].

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Received 11 August 1995, revised 21 November 1995.

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Clinical Infectious Diseases 1996;22:845–7
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noted to be draining from the chest tube; culture of the discharge yielded *O. anthropi*. Ceftazidime and aztreonam were added to the antibiotic regimen. Because the fever persisted, fiberoptic bronchoscopy was performed on the 17th hospital day; cultures obtained during this procedure yielded *O. anthropi* and *S. maltophilia*. Treatment with ceftazidime, aztreonam, and vancomycin was discontinued, and TMP-SMZ was administered via a gastrostomy tube. The patient became afebrile while receiving this regimen, and the chest-tube discharge rapidly resolved. The patient was ultimately weaned from ventilatory support and discharged on the 55th hospital day.

Patient 3. A 29-year-old male was in good health until he injured his foot while running on his lawn. He was not wearing shoes at the time and sustained an avulsion of the tissue (3.5 cm × 3.5 cm) on the medial aspect of the right foot. He was seen at his local hospital, where the wound was cleansed and sutured and oral cephalexin was prescribed. Seven days later, he presented to our institution with increasing pain and tenderness at the avulsion site and was found to have a 7-cm area of erythema and swelling surrounding the injury. A serosanguineous discharge was present in the wound. The sutures were removed, local incision and drainage were carried out, oral cephadrine was prescribed, and the wound was left to heal by secondary intention. A culture of drained material yielded pure growth of *O. anthropi*. The patient was seen in follow-up 2 days later, by which time his erythema and tenderness had resolved.

Discussion

O. anthropi (from the Greek term *ochros*, meaning pale yellow, because of the pale appearance of colonies on nutrient agar [7]) is an unusual and infrequently encountered bacterium that was previously known as CDC group Vd. Its taxonomic history is confusing and has been reviewed in detail elsewhere [1, 7]. Several recent reports indicate that isolation of *O. anthropi* may not be rare. Our experience with four cases (one was previously reported [1]) over a 3-year period supports this contention.

A member of the nonfermentative aerobic gram-negative bacilli, *O. anthropi* grows readily on MacConkey agar and is differentiated from pseudomonads and *Flavobacterium* by its lack of pigment production and its peritrichous flagella. A positive oxidase reaction differentiates *O. anthropi* and its taxonomic cousins from *Acinetobacter* and *Flavimonas*. Further separation of *Ochrobactrum* from other oxidase-positive organisms such as *Achromobacter*, *Alcaligenes*, and *Agrobacterium* is based on the production of 3-ketolactose and hydrogen sulfide, the ONPG test, growth on cetrinide, and the hydrolysis of esculin and urea. Such microbiological characterization is discussed in greater detail elsewhere [1, 7–9].

The natural habitat of *O. anthropi* is uncertain. Barson and colleagues [10] have speculated that the organism may be distributed in soil and water, including hospital water sources. In

an examination of reference strains of *O. anthropi* [7], however, only a small fraction of such strains originated from soil, water, or hospital apparatus; the majority were obtained from human clinical material. In fact, the species designation *anthropi* was proposed in recognition of this finding [7]. Nonetheless, the superficial resemblance of *O. anthropi* to other soil and water organisms such as *Pseudomonas*, *Agrobacterium*, and *Alcaligenes* makes such an ecologic niche plausible. The association with foot injuries, as seen in our third patient and in a previously reported case [10], the nosocomial nature of many cases of *O. anthropi* infection [2, 5, 11] including the first two cases in the present series, and the association of recent outbreaks with contaminated pharmaceuticals [6, 12] lend support to this theory.

The first reported case of catheter-associated *O. anthropi* bacteremia occurred in 1984 in a 16-year-old girl with Hodgkin's disease [13]. In 1992, we reported a second case of catheter-associated bacteremia caused by *O. anthropi*; this case involved a 3-year-old girl with retinoblastoma [1]. Shortly thereafter, Gransden and Eykyn [2] described seven cases of *O. anthropi* bacteremia, all associated with the presence of an indwelling central venous catheter. Moreover, these authors suggested that such catheter-associated bacteremias represented the pathogenic niche for this organism and that infections might be managed by catheter removal. Three subsequent reports [3–5] detailing eight cases of bacteremia, all associated with indwelling central venous catheters, support these suggestions.

A recent nosocomial outbreak of *O. anthropi* infection among five organ transplant recipients treated with contaminated rabbit antithymocyte globulin also involved bacteremia without apparent localized disease [6], and an earlier report [11] described a case of *O. anthropi* bacteremia with concomitant urinary tract infection. A second nosocomial outbreak involved three cases of *O. anthropi* meningitis in postoperative pediatric neurosurgical patients and was traced to pericardial patches processed in apparently contaminated aliquots of Hanks' balanced salt solution [12].

While bacteremic *O. anthropi* infections are recognized with increasing frequency, reports of pyogenic infections caused by this organism have been quite rare. It is of interest, however, that the first reported case of disease caused by the organism now known as *O. anthropi* involved a pancreatic abscess reported by Applebaum and Campbell [14]. Since then, additional reports have detailed single cases of puncture wound osteochondritis [10] and necrotizing fasciitis [15] caused by *O. anthropi*. The three additional cases described herein, coupled with these three previously reported cases, expand the reported pathologic capabilities of this organism beyond those of catheter-associated bacteremias.

The optimal therapeutic approach to patients with *O. anthropi* infection remains unsettled. In the case of catheter-associated bacteremia, Gransden and Eykyn [2] noted that catheter removal alone without antimicrobial therapy was adequate for

curing their two patients for whom this approach was used. Alternatively, catheter retention has been possible for some bacteremic patients treated with parenteral antimicrobial agents [1, 4].

While the optimal choice among such agents for the treatment of *O. anthropi* infections is likewise unknown, the clinician should note that *O. anthropi* isolates appear to be resistant to many antibiotics commonly employed in the empirical treatment of gram-negative infections. In a review of in vitro susceptibilities noted in published cases, Kern and colleagues [4] found such isolates uniformly resistant to ampicillin, piperacillin, cefotaxime, ceftriaxone, and aztreonam as well as to the combination of amoxicillin and clavulanate. On the other hand, aminoglycosides appeared to be generally efficacious in vitro, with 16 of 19 strains susceptible to gentamicin and amikacin and 12 of 19 susceptible to tobramycin. Similarly, 14 of 16 strains of *O. anthropi* were susceptible to imipenem, 14 of 15 to ciprofloxacin, and 17 of 19 to TMP-SMZ.

Clinical successes have been reported using combinations of amikacin and TMP-SMZ [1], as well as ceftazidime and netilmicin [4]. In addition, the condition of our second patient improved markedly following a change in antibiotic therapy from intravenous ceftazidime and aztreonam to enterally administered TMP-SMZ. The fact that our third patient was cured of a wound infection by surgical debridement alone, without treatment with an antibiotic to which his isolate of *O. anthropi* was susceptible, attests to the presumed low virulence of this organism in the immunocompetent host.

In summary, *O. anthropi*, formerly known as CDC group Vd, is an infrequently encountered oxidase-producing and catalase-producing nonfermentative gram-negative bacillus. While the organism's most common clinical manifestation appears to be catheter-associated bacteremia, *O. anthropi* seems capable of producing pyogenic infections as well.

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