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CASE REPORT

Ochrobactrum anthropi: a rare cause of pneumonia

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Abstract *Ochrobactrum anthropi*, a Gram-negative bacillus, is an unusual human pathogen. It has been implicated primarily in catheter-related bloodstream infections. Sporadic cases of infection at other body sites have been reported. Pneumonia, however, is an exceedingly rare clinical manifestation; only one case has been reported in the medical literature so far. We present another case of lower respiratory tract infection secondary to *O. anthropi* in a patient who was critically ill, but recovered with a favorable outcome. We have provided an overview of clinical manifestations, diagnosis, and treatment of infections due to this rare microorganism.

Keywords Ochrobactrum · Pneumonia

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Introduction

Ochrobactrum anthropi, previously known as CDC group Vd, was initially implicated as causing infections mainly in immunocompromised individuals [1, 2]. Its role in causing serious infections in healthy hosts also has been established [3–5]. We present a case of septic shock and respiratory failure from pneumonia secondary to *O. anthropi* infection. The patient responded well to antimicrobial therapy (ciprofloxacin), was gradually weaned off of pressor support, and was eventually extubated. Pneumonia due to *O. anthropi* has been reported once previously [6]. This is the second case published in the literature to date, and adds to our knowledge of infections secondary to this rare microorganism.

Case

A 49-year-old Caucasian male presented to another hospital with an acute change in mental status following drug overdose in an attempted suicide. On admission, he was found to be hypotensive and hypoxic. Chest X-ray (CXR) revealed opacification of the right lower lobe. He was immediately intubated, started on a norepinephrine drip, and transferred to a tertiary care center for further management. The patient's urine drug screen was positive for opiates, benzodiazepines, and citalopram. His past medical history was significant for hepatitis C treated with pegylated interferon and ribavirin 2 years ago, depression with a history of suicidal ideation, and gastro-esophageal reflux disease. His clinical course was complicated by acute respiratory distress syndrome requiring high ventilatory support (fractional inspired oxygen [FIO_2] of 100 % and positive-end expiratory pressure [PEEP] of 20 cm of

water). Cultures obtained by diagnostic bronchoscopy were positive for *Streptococcus pneumoniae*. He completed a 10-day course of ceftriaxone with improvement in his clinical condition and resolution of the lung infiltrate. He was extubated on day 5.

On day 10 of admission, the patient developed fever, increased respiratory secretions, leukocytosis, and new lung infiltrates on the right, with increasing oxygen requirements and hypotension requiring mechanical intubation and vasopressor support. Blood cultures and transtracheal secretions were obtained. Bronchoscopy with bronchoalveolar lavage (BAL) was also performed. Antibiotics (vancomycin, cefepime, ciprofloxacin) were initiated to cover healthcare-associated pathogens. The patient responded well to the antibiotic regimen. His temperature normalized in the following 48 h, blood pressure stabilized, and oxygen requirements decreased in 4 days. Tracheal as well as BAL cultures (25,000 colony-forming units [cfu]/ml) subsequently showed a moderate monomicrobial growth of non-lactose-fermenting, oxidase-positive, Gram-negative bacillus on MacConkey agar. The colonies measured 1–2 mm, and were circular and smooth. The bacterium was identified as *Ochrobactrum anthropi* by the Microscan Walkaway 97 (Siemens Healthcare Diagnostics Inc., Tarrytown, NY, USA) (an automated bacterial identification and susceptibility testing system). Because this is an uncommonly encountered organism, the identification was confirmed utilizing another microidentification system—API 20NE (version 7) (bioMérieux sa, Durham, NC, USA), which re-identified the organism to be *O. anthropi* with an accuracy of 99.8 % (details of identification and worksheet available from the corresponding author upon request). Four sets of blood cultures remained negative. The isolate was sensitive to ciprofloxacin, meropenem, gentamicin, and tobramycin, but resistant to ampicillin, ampicillin–sulbactam, cefazolin, aztreonam, cefepime, cefotaxime, ceftazidime, piperacillin–tazobactam, and trimethoprim–sulfamethoxazole (Table 1). Cefepime and vancomycin were discontinued and the patient completed a 10-day course of ciprofloxacin. He was extubated and transferred to a routine medical floor on day 17. A repeat CXR, done prior to discharge, revealed resolution of the infiltrate. Although the outcome was favorable, the new infection prolonged his stay in the intensive care unit and increased the number of ventilator-dependent days.

Table 1 Antimicrobial susceptibility pattern of *Ochrobactrum anthropi* isolated in respiratory cultures

Antibiotic	MIC (μg/ml) with interpretation
Cefepime	>32.0 R
Gentamicin	≤2.0 S
Ciprofloxacin	≤0.5 S
Ampicillin	>32.0 R
Ceftazidime	>32.0 R
Ampicillin/sulbactam	>32/16 R
Sulfamethoxazole/trimethoprim	4/76 R
Piperacillin	>128.0 R
Piperacillin/tazobactam	>128.0/4 R
Tobramycin	≤2.0 S
Cefuroxime	>32.0 R
Cefotaxime	≤8.0 S
Ticarcillin/clavulanate	>64/2 R
Aztreonam	>32.0 R
Meropenem	≤2.0 S
Cefazolin	>32.0 R

MIC minimum inhibitory concentration, *R* resistant, *S* susceptible

Discussion

Ochrobactrum anthropi is a Gram-negative, aerobic, non-lactose-fermenting bacillus that was formerly classified as CDC group Vd [1]. The first reported case of human infection secondary to this organism was that of a pancreatic abscess in an elderly patient with multiple co-morbid conditions [7]. In 1988, Holmes et al. [8] provided a distinct identity to this organism based on DNA–DNA hybridization and phenotypic testing.

Ochrobactrum anthropi is ubiquitous in nature. It has been isolated in the hospital environment as well as from human clinical specimens of almost every type [1]. Although it is rarely implicated in human infections, it has been well known to infect different body sites [1]. Catheter-related bloodstream infection is by far the most common clinical presentation [1, 9]. Although initially believed to be an opportunistic pathogen causing infections among immunocompromised patients with indwelling catheter devices, it is increasingly being recognized as a pathogen in immunocompetent patients as well [3–5]. Cases of peritonitis [10], osteomyelitis [11], septic arthritis [12], endophthalmitis [13], infective endocarditis [4, 5], and soft tissue infections [6] have been reported. There has been one previous case of pneumonia, described by Cieslak et al. [6] in a patient who underwent lobectomy, and subsequently developed pneumonia and empyema secondary to *O. anthropi*. We are not aware of any other cases of pneumonia caused by this organism reported in the literature to date. Our patient had the typical signs and symptoms of ventilator-associated pneumonia. The quantitative cultures from BAL of 25,000 cfu/ml and clinical improvement with ciprofloxacin monotherapy suggested that *O. anthropi* was the causative organism. Our patient had a central line, but the clinical and radiographic

evidence favoring pneumonia and the repeatedly negative blood cultures made it unlikely to be a catheter-related infection.

While this organism is generally considered to have relatively low virulence with a low pathogenic potential in most instances [1, 14], it has the potential to cause severe pyogenic infections. A case of life-threatening septic shock was described in an immunocompetent host who received an infusion contaminated with this organism [3]. The microbe also has a significant degree of propensity to involve prostheses. In vitro studies have revealed that this organism, like *Staphylococcus*, has a predilection to adhere to foreign objects [15]. This phenomenon is clinically relevant, because infections such as vascular catheter-related bacteremias may not resolve if the catheters are not removed [15]. A case of prosthetic mitral valve infective endocarditis caused by *O. anthropi* that necessitated valve replacement has been reported [4].

Ochrobactrum anthropi grows readily on MacConkey agar, but accurate identification can be challenging at times [1]. *O. anthropi* has been misidentified as *Shewanella putrefaciens*, a Gram-negative microbe that may rarely cause infections in humans [16]. Similarly, *Brucella melitensis* was misidentified as *O. anthropi* by one of the automated systems [17]. At least 72 h of incubation may be needed for the growth of this bacterium on culture medium [1]. Appropriate identification and differentiation of these related microorganisms is needed because of the different treatment regimens required. Teyssier et al. [18] have proposed a protocol for the identification of *Ochrobactrum* by routine microbiological techniques. Definitive identification is best made by genotypic analysis, however [18]. Laboratory identification should be correlated with clinical findings and additional testing performed to accurately identify the etiologic agent [17]. Another species of the same genus, *Ochrobactrum intermedium*, has been identified to cause pyogenic infections in humans [19]. Differentiation between these two species is not possible on biochemical testing in the laboratory though [1]. Polymyxin resistance may be utilized to differentiate *O. intermedium* (inherently resistant) from *O. anthropi* [20]. This characteristic, however, may not be reliable with the developing resistance patterns among Gram-negative organisms. Strains of *O. anthropi* resistant to colistin have been described recently [21].

Antimicrobial options to treat *Ochrobactrum* infections are limited [1]. Beta-lactam antibiotics other than carbapenems are not effective [1]. This is partly related to the production of ampC beta-lactamase to which carabepenems are stable [1]. Nonetheless, cases of impinem failure have also been reported [1]. Trimethoprim–sulfamethoxazole, fluoroquinolones, and aminoglycosides are generally active against *O. anthropi* [1, 18]. The isolate in the present case was resistant to trimethoprim–sulfamethoxazole, however. Thus, we recommend obtaining antibiotic susceptibilities for all clinically relevant isolates.

Clinicians need to be aware of this organism for a few reasons. Firstly, despite its rarity, isolation of this microbe should not be disregarded because there is enough evidence to suggest its pathogenic role in human infections. Moreover, infections secondary to *Ochrobactrum* may also be increasing in frequency [1]. In addition to sporadically reported cases, outbreaks have occurred in healthcare settings secondary to contaminated medical equipment and supplies such as intravenous medications and tissue grafts [2, 22]. Secondly, one should be cognizant of the propensity of this organism to bind to foreign objects and this may be an important factor in treating infections related to prostheses [15]. Thirdly, some of the antimicrobials that are routinely used to treat infections in the healthcare setting; for instance, fourth-generation cephalosporins (cefepime) and antipseudomonal penicillins (piperacillin–tazobactam) are not effective against *Ochrobactrum* [1]. The case we have reported adds to the spectrum of infections that this organism can cause in humans.

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Conflict of interest None.

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