

Case Report

First case of pneumonia caused by *Cupriavidus pauculus* in an infant in the Gulf Cooperation Council

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Abstract

Cupriavidus pauculus is an emerging organism causing infections in immunocompromised and immunocompetent patients. We report a *C. pauculus* pneumonia case susceptible to cefepime in an infant with end-stage renal failure. To our knowledge, this is the first case report of *C. pauculus* causing respiratory infections in the Gulf Cooperation Council.

Key words: *Cupriavidus pauculus*; end-stage renal failure; cefepime; pneumonia; Gulf Cooperation Council.

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Introduction

Cupriavidus pauculus, formerly CDC group IV c-2, is a Gram-negative mesophilic bacillus widely distributed in nature, especially in water and soil [1,2]. It causes infections in immunocompromised patients with underlying diseases such as malignancies and AIDS as well as infections in otherwise healthy patients [2-4]. It can be an opportunistic pathogen in a hospital setting and can cause outbreaks, especially in intensive care units [2,5]. Water, including tap and bottled water, has been suspected to be a potential source of contamination [2,5]. *C. pauculus* has been implicated in several types of infections, including bacteremia, pneumonia, meningitis, and septicemia [2,6,7]. Here, we report a case of pneumonia caused by *C. pauculus* in an infant in Saudi Arabia. To the best of our knowledge, this is the first case of lower respiratory infection caused by *C. pauculus* in the Kingdom of Saudi Arabia and other Gulf States.

Case report

The patient was a one-year-old Saudi boy born by normal vaginal delivery with multiple congenital medical problems including dysmorphic face, microcephaly, severe hypotonia, and seizure disorder. He was found to have end-stage renal failure, bilateral

giant inguinal hernia, and hepatosplenomegaly with elevated liver enzymes, severe gastroesophageal reflux disease with recurrent aspirations, chest infection, and failure to thrive. The patient was admitted to the pediatric ward frequently with aspiration pneumonia requiring oxygen supplementation and intravenous antibiotics. His last admission was straight to the pediatric intensive care unit (PICU) with severe respiratory distress secondary to aspiration and chest infection. The patient was intubated and connected to a conventional ventilator for two months, which was interrupted by the need for high-frequency oscillator for five days with difficulty to extubate, as he failed an extubation trial three times. The patient ended up having a tracheostomy. During prolonged intubation in the PICU, he developed pneumonia. The laboratory work-up revealed a high count of neutrophils ($9.7 \times 10^9/L$), decreased hemoglobin (7.2 g/dL), and normal platelet count ($236 \times 10^9/L$), as well as high C-reactive protein (CRP) (61.6 mg/L). Portable supine AP chest X-ray showed bilateral perihilar consolidation with atelectatic changes in the right lung and left lower lobe (Figure 1A).

Sputum specimen obtained from the endotracheal tube (ETT) was sent to the laboratory for culture. Gram stain revealed more than 25 white blood cells (WBC) in

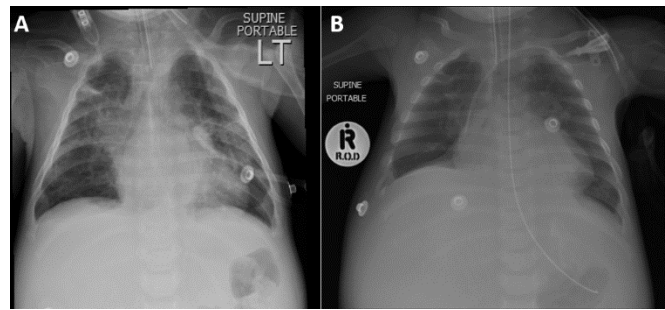
the low power field and many (4+) Gram-negative bacilli. Round, smooth, non-pigmented, convex colonies grew on blood agar plates, and non-lactose-fermenter colonies were detected on MacConkey agar plates (SPML Co, Riyadh, Saudi Arabia). The organism was oxidase positive. It was identified by the Vitek 2 system (Biomérieux, Paris, France) as *C. pauculus*. The organism identification and speciation were also both confirmed by 16S rRNA sequencing. The antimicrobial susceptibility testing was performed using a Vitek 2 system. Minimum inhibitory concentrations (MICs) and breakpoints were determined based on the recommendations of Clinical and Laboratory Standard Institute (CLSI). *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa* ATCC27853 were used as controls for antimicrobial susceptibility testing. The organism was susceptible to cefepime, ceftazidime, imipenem, piperacillin/tazobactam, trimethoprim/sulfamethoxazole, ciprofloxacin, and levofloxacin. It was resistant to gentamicin, amikacin, and aztreonam. Another sputum specimen was collected from the patient after four days, with identical findings. The patient was clinically improved by treatment with intravenous cefepime, and chest X-rays revealed interval regression of the bilateral peri-hilar opacities (Figure 1B). After 10 days, the patient's clinical status critically deteriorated with disseminated intravascular coagulation features, requiring multiple transfusions of red blood cells and platelets. The patient was pronounced dead at day 70 of PICU admission due to multiple organ failure.

Discussion

Cupriavidus pauculus was previously classified as CDC group IV c-2, *Ralstonia paucula* and then as *Wautersia paucula* [1,8]. It is a ubiquitous environmental organism found mainly in soil, water, and on plants [1,2,8]. *C. pauculus* is a Gram-negative, motile, aerobic, non-spore-forming rod bacteria. It is catalase and oxidase positive, and a non-lactose fermenter on MacConkey agar [1,2].

C. pauculus can cause infections in hospitalized immunocompromised patients, especially in patients with hematologic malignancies, transplants, and AIDS patients. Examples of these infections include bacteremia, peritonitis, abscess, and septicemia caused by *C. pauculus* [2,9]. The patient in this case was not an exception; he had end-stage renal failure as an underlying disease along with other complications. There have also been several cases of *C. pauculus* causing infections in immunocompetent patients. These cases include a case of bacteremia in an infant,

Figure 1. Posteroanterior (PA) chest X-ray film.



A. The PA view shows bilateral perihilar consolidation with atelectatic changes. B. The PA view shows the improvement of bilateral perihilar consolidation.

tenosynovitis in a female after a cat bite, meningitis in a neonate, and community-acquired pneumonia in a newborn baby [1,2,6,7].

Environmental contamination has been suspected as the source of infection. Examples of the source of contamination include nebulization solutions, tap water, hydrotherapy pools, and bottled mineral water [5,8,10]. In addition, medical devices, such as extracorporeal membrane oxygenation (ECMO) equipment and ventilators, have been reported to be a source of contamination [5,9,10]. All environmental samples collected from the patient's room, ventilator, and water sink did not grow any organism in this case, suggesting that no environmental contamination was involved in the respiratory infection process. There are several factors suggesting that *C. pauculus* caused a true infection, not just a contamination. These factors include isolation of the organism from several sputum specimens, and the improvement of both the patient's clinical status and the chest-X-rays with the intravenous administration of cefepime.

Conclusions

We report a case of pneumonia in an infant caused by *Cupriavidus pauculus*. To the best of our knowledge, this is the first report of *C. pauculus* causing respiratory tract infection in Saudi Arabia and the Gulf States.

Authors' contributions

Baha Abdalhamid, RaghdaYahya, AbdelwahabOmara, and Alanoud Alshami reviewed the literature and prepared the manuscript. Wafaa Alyousefand Soha Alamoudi performed the technical work. All authors approved the final version of the manuscript.

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