

# Percutaneous nephrostomy tube-associated bacteremia caused by *Corynebacterium urealyticum*

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*Corynebacterium urealyticum*, an infrequent cause of bacteremia, is an emerging pathogen in humans, especially immunocompromised hosts. This report describes a patient with prostate cancer complicated with obstructive nephropathy who developed *C. urealyticum* bacteremia after placement of a percutaneous nephrostomy tube. The bacteremia was not controlled until the infected nephrostomy tube was removed.

**Key words:** Bacteremia; *Corynebacterium*; Nephrostomy, percutaneous; Sepsis

## Introduction

*Corynebacterium urealyticum*, formerly known as *Corynebacterium* group D2, was originally considered a nitrate-negative variant of *Corynebacterium pseudodiphtheriticum* [1]. However, in 1992, *C. urealyticum* was recognized as a new species, which could be separated from other species in the genus on the basis of DNA base composition, DNA-DNA hybridization values, and other biochemical characteristics such as failure to produce acid from carbohydrates, failure to reduce nitrates, and ability to hydrolyze urea [2]. This organism has long been recognized as a uropathogen due to its urease activity, which plays an important role in the pathogenesis of infection [1]. The predisposition of *C. urealyticum* for adherence to urinary catheters has also been noted [3]. However, few cases of bacteremia relating *C. urealyticum* to either urinary or non-urinary tract infection have been reported, and most of these were opportunistic infections in the increasing population of immunocompromised hosts [4-8]. This report describes a patient

with prostate cancer who developed percutaneous nephrostomy (PCN) tube-associated *C. urealyticum* bacteremia.

## Case Report

An 80-year-old Taiwanese man had stage B prostate cancer diagnosed in 1995 after an initial presentation of gross hematuria. The patient underwent radical prostatectomy, brachytherapy, and hormone therapy.

Local recurrence of bladder tumor with left hydronephrosis occurred in June 2004, and transurethral resection of the bladder tumor was performed. A cystoscopy was performed due to difficulty with urination in August 2005, which disclosed urethral stricture and bladder neck contraction. Bladder neck incision and urethrotomy with the Otis urethrotome (Otis, Sarasota, FL, USA) was performed. Whole body bone scan did not detect bone metastasis. However, the prostate specific antigen level gradually increased from 48.12 ng/mL to 354.7 ng/mL (normal range,  $\leq 4$  ng/mL) during the following 6 months.

Anuria and hematuria with acute exacerbation of chronic renal failure developed in February 2006. Renal ultrasound demonstrated moderate right hydronephrosis and severe left hydronephrosis, which

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were considered secondary to the local recurrence of prostate cancer. Cystoscopy revealed complete obstruction of the urinary bladder neck, and bilateral PCN tubes were inserted. Pyuria then developed, and urine culture yielded *Proteus mirabilis* and *Enterococcus* spp. The urinary tract infection resolved with antibiotics, but the patient developed a fever and pyuria in late March. Empirical ampicillin/sulbactam was administered but the fever persisted. Two cultures of peripheral blood yielded Gram-positive bacilli within 48 h of sampling, and culture of urine collected from the right PCN tube also yielded 100,000 colonies/mL of Gram-positive bacilli. Teicoplanin was given but the fever did not subside. The right PCN tube was changed because of suspicion of catheter-related persistent infection, and teicoplanin was changed to vancomycin. The fever subsided gradually and repeated cultures of peripheral blood and urine from the replacement PCN tube were negative. Vancomycin was discontinued after 14 days and the patient was discharged. No recurrence of bacteremia was found during follow-up. Isolates from blood and urine were identified as *C. urealyticum* both by conventional biochemical methods and by the Phoenix automated identification system (Becton Dickinson, Sparks, MD, USA) [9]. The minimal inhibitory concentrations (MICs) of these 2 isolates were penicillin, >32 µg/mL; ampicillin, >256 µg/mL; cefotaxime, >256 µg/mL; vancomycin, 1 µg/mL; and teicoplanin, 0.75 µg/mL.

## Discussion

*Corynebacterium* is non-motile, large, heterogeneous collection of organisms that have a cell wall composed of arabinose, galactose, meso-diaminopimelic acid, and short-chain mycolic acids [9]. Gram stain of these bacteria reveals Gram-positive short chains or clumps resembling Chinese characters. *Corynebacterium* is a normal flora of the skin [9] and some species have been reported to frequently colonize the skin of patients in hospitals, especially during a prolonged hospital stay [10]. Despite frequent colonization, these organisms rarely cause infection in immunocompetent patients. Thus, clinicians often disregard blood cultures yielding *Corynebacterium* as skin contaminants except for *Corynebacterium jeikeium* [11,12]. However, the increasing number of immunocompromised people and increasing use of invasive devices has intensified the clinical importance of Gram-positive

bacilli bacteremia, including that caused by *Corynebacterium* [12,13]. In addition, without identification of the organism, it is difficult to determine which antibiotic should be given. Vancomycin is not universally active against Gram-positive bacilli and the susceptibility criteria are not standardized [13].

*C. urealyticum* usually causes urinary tract infection [1]. A review of urinary tract infection caused by *C. urealyticum* found that risk factors included older age, immunosuppression, prolonged hospital stay, underlying genitourinary disorders, previous urological procedure, indwelling urinary tract catheter, or prior antibiotic therapy [1]. This patient had all of these risk factors. Most patients develop *C. urealyticum* urinary tract infection without bacteremia [1]. A review of the literature for *C. urealyticum* bacteremia by Fernández-Natal et al found only 6 reported patients with bacteremia, 2 of whom had *C. urealyticum* bacteremia related to urinary tract infection [8]. The bacteremia in this patient appeared to be related to urinary tract infection. The organism's ability to adhere to catheter materials plays an important role in the infection [3]. In this patient, the persistent fever before removal of the PCN tube suggests that tube removal was the key factor leading to resolution of the infection.

Alkaline urine is another characteristic finding of urinary tract infection caused by *C. urealyticum*. Review of the urinalysis results for this patient revealed that all urine samples were alkaline. *C. urealyticum* is unique in the ability of its strong urease activity to produce alkaline urine, which can lead to the formation of struvite calculi [14,15]. In addition, the causative pathogen of this patient's previous urinary tract infection, *P. mirabilis*, is also well known for its urease activity and its relationship to alkaline urine and struvite calculi [15]. However, review of the literature did not find any reported association between these 2 pathogens. In addition, no evidence of urolithiasis was found in this patient.

Few antibiotics have shown reliable activity against *C. urealyticum* [16,17]. A study of 150 isolates of *Corynebacterium* found that *C. urealyticum* and *C. jeikeium* were most resistant to antimicrobial agents [16]. The MICs for the isolate from this patient, determined using the Phoenix automated system, were similar to previous reports, indicating that only vancomycin and teicoplanin would provide a reliable response. The clinical failure of teicoplanin treatment for this patient was largely attributable to failure to remove the infected foreign body.

In conclusion, Gram-positive bacilli in blood culture should not be indiscriminately regarded as a contaminant, especially in patients with risk factors of foreign body or immunosuppression. *C. urealyticum* is an emerging, multidrug-resistant pathogen associated with catheter use. Prompt identification of this microorganism, determination of its antibiotic susceptibility, adequate antibiotic treatment, and the removal of any foreign body are the most important steps to control the infection.

## References

1. Soriano F, Aguado JM, Ponte C, Fernández-Roblas R, Rodríguez-Tudela JL. Urinary tract infection caused by *Corynebacterium* group D2: report of 82 cases and review. *Rev Infect Dis*. 1990;12:1019-33.
2. Pitcher D, Soto A, Soriano F, Valero-Guillén P. Classification of coryneform bacteria associated with human urinary tract infection (group D2) as *Corynebacterium urealyticum* sp. nov. *Int J Syst Bacteriol*. 1992;42:178-81.
3. Soriano F, Ponte C, Galiano MJ. Adherence of *Corynebacterium urealyticum* (CDC group D2) and *Corynebacterium jeikeium* to intravascular and urinary catheters. *Eur J Clin Microbiol Infect Dis*. 1993;12:453-6.
4. Soriano F, Ponte C, Ruiz P, Zapardiel J. Non-urinary tract infections caused by multiply antibiotic-resistant *Corynebacterium urealyticum*. *Clin Infect Dis*. 1993;17:890-1.
5. Wood CA, Pepe R. Bacteremia in a patient with non-urinary-tract infection due to *Corynebacterium urealyticum*. *Clin Infect Dis*. 1994;19:367-8.
6. Buendía B, Delgado T, López S, Vallejo P, del Rey MC, López-Brea M. Transient bacteremia caused by *Corynebacterium urealyticum*: apropos of 2 cases. *Enferm Infecc Microbiol Clin*. 1996;14:367-9. [Article in Spanish].
7. Aracil B, Perea B, Barros C, Gómez-Garcés JL. Bacteremia caused by *Corynebacterium urealyticum* in 2 patients co-infected with HIV and HBV. *Enferm Infecc Microbiol Clin*. 1997;15:172-3. [Article in Spanish].
8. Fernández-Natal I, Guerra J, Alcoba M, Cachón F, Soriano F. Bacteremia caused by multiply resistant *Corynebacterium urealyticum*: six case reports and review. *Eur J Clin Microbiol Infect Dis*. 2001;20:514-7.
9. Funke G, Bernard KA. Coryneform Gram-positive rods. In: Murray PR, Baron EJ, Jorgensen JH, Pfaller MA, Tenover FC, White
10. Soriano F, Rodríguez-Tudela JL, Fernández-Roblas R, Aguado JM, Santamaría M. Skin colonization by *Corynebacterium* groups D2 and JK in hospitalized patients. *J Clin Microbiol*. 1988;26:1878-80.
11. Marshall RJ, Johnson E. Corynebacteria: incidence among samples submitted to a clinical laboratory for culture. *Med Lab Sci*. 1990;47:36-41.
12. Pearson TA, Braine HG, Rathbun HK. *Corynebacterium* sepsis in oncology patients. Predisposing factors, diagnosis, and treatment. *JAMA*. 1977;238:1737-40.
13. Zinner SH. Changing epidemiology of infections in patients with neutropenia and cancer: emphasis on Gram-positive and resistant bacteria. *Clin Infect Dis*. 1999;29:490-4.
14. De Briel D, Langs JC, Rougeron G, Chabot P, Le Faou A. Multiresistant corynebacteria in bacteriuria: a comparative study of the role of *Corynebacterium* group D2 and *Corynebacterium jeikeium*. *J Hosp Infect*. 1991;17:35-43.
15. Cohen TD, Preminger GM. Struvite calculi. *Semin Nephrol*. 1996;16:425-34.
16. Lagrou K, Verhaegen J, Janssens M, Wauters G, Verbist L. Prospective study of catalase-positive coryneform organisms in clinical specimens: identification, clinical relevance, and antibiotic susceptibility. *Diagn Microbiol Infect Dis*. 1998;30:7-15.
17. Sánchez Hernández J, Mora Peris B, Yagüe Guirao G, Gutiérrez Zufiaurre N, Muñoz Bellido JL, Segovia Hernández M, et al. In vitro activity of newer antibiotics against *Corynebacterium jeikeium*, *Corynebacterium amycolatum*, and *Corynebacterium urealyticum*. *Int J Antimicrob Agents*. 2003;22:492-6.