

Dokdonella koreensis bacteremia: A case report and review of the literature

Boeun Lee MD¹, Mitchell R Weinstein MD²

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Dokdonella koreensis is a non-spore-forming, aerobic, Gram-negative bacillus that was initially isolated from soil. The pathogenicity of this organism in humans remains unclear. The authors report a case of successfully treated *D koreensis* bacteremia in a patient with a hematological malignancy who presented with a fever and palmar-plantar erythrodysesthesia.

Key Words: Bacteremia; CRBSI; *Dokdonella koreensis*; Neutropenia; *Xanthomonadaceae*

CASE PRESENTATION

A 75-year-old man with newly diagnosed acute myeloid leukemia with maturation (M2) developed a fever of 38.0°C on the fifth day of his second induction chemotherapy with cytarabine and idarubicin. Chemotherapy had been administered through a peripherally inserted central catheter (PICC) in his right brachial vein. He also reported persistent bilateral pain in his ankles and heels, accompanied by swelling and tenderness. A review of systems revealed a dry cough and a mild headache.

The patient did not have any significant medical history before his diagnosis of leukemia. He developed persistent neutropenia, polymerase chain reaction (PCR)-proven herpes simplex virus type 1 labialis, disseminated intravascular coagulation and a diffuse rash after he received the first cycle of cytarabine. The biopsy from the skin lesions was consistent with leukocytoclastic vasculitis attributed to either allopurinol or ciprofloxacin.

On physical examination, he was alert and not in distress. His blood pressure was 124/66 mmHg, heart rate 96 beats/min, temperature 38.0°C, respiratory rate 18 breaths/min and oxygen saturation 95% on room air. Pertinent findings on examination were mildly tender, erythematous swelling of both ankles and lower legs, with bullae on his feet. Desquamations on the fingers and palms were also noted. The remainder of the examination was normal including a non-inflamed PICC line insertion site.

Laboratory studies revealed a white blood cell count of $0.4 \times 10^9/L$ (reference range $4.4 \times 10^9/L$ to $5.7 \times 10^9/L$), an absolute neutrophil count of $0 \times 10^9/L$, a hemoglobin level of 63 g/L (140 g/L to 174 g/L in men) and a platelet count of $31 \times 10^9/L$ ($140 \times 10^9/L$ to $400 \times 10^9/L$). The values of the chemistry panel were within the normal range except for an albumin level of 28 g/L (34 g/L to 52 g/L) and a total protein level of 57 g/L (64 g/L to 83 g/L). A chest radiograph showed atelectatic changes at the bases. Initial blood cultures from two peripheral sites and one culture from the PICC were sent.

La bactériémie à *Dokdonella koreensis* : rapport de cas et analyse bibliographique

Le *Dokdonella koreensis* est un bacille à Gram négatif aérobie non sporogène qui, à l'origine, était isolé dans le sol. On en comprend mal la pathogénicité chez l'humain. Les auteurs rendent compte d'un cas de bactériémie à *D koreensis* traitée avec succès chez un patient ayant un cancer hématologique malin qui a consulté à cause de fièvre et d'érythrodysesthésie palmo-plantaire.

He was started empirically on intravenous vancomycin (1500 mg every 12 h) and cefepime (2 g every 8 h) for neutropenic fever. He continued to experience daily fevers, with a peak temperature of 38.9°C. He was diagnosed with palmar-plantar erythrodysesthesia due to cytarabine by a dermatologist, and his chemotherapy was discontinued. On day 4 of incubation, a blood culture drawn from the PICC line grew a Gram-negative rod in the aerobic bottle. Antibiotics were changed to meropenem (1 g every 8 h) and amikacin (1500 mg every 24 h). On day 5 of incubation, one blood culture sample drawn peripherally also reported growth of a Gram-negative rod.

A nonmotile, oxidase-positive, non-spore-forming Gram-negative aerobic bacillus was recovered from both aerobic blood culture bottles, although the organism could not be identified in the microbiology laboratory using routine phenotypic methods. The isolate was identified by Quest Diagnostics as *Dokdonella koreensis* by sequencing the amplified 16S ribosomal RNA gene from genomic DNA (1) using the BLAST program (www.ncbi.nlm.nih.gov/BLAST). Antimicrobial susceptibility testing was performed with the Kirby-Bauer disk diffusion method. The organism was susceptible to most antimicrobials, including amikacin, gentamicin, tobramycin, piperacillin/tazobactam, cefepime and meropenem, but exhibited intermediate susceptibility to ciprofloxacin.

The PICC was exchanged through a guide wire. His fever subsided after the catheter change. Follow-up blood cultures remained sterile. The catheter tip did not grow any organisms. Meropenem was continued for 21 days. He had a prolonged recovery course with extended neutropenia and probable fungal pneumonia. He was treated with voriconazole after a brief course of liposomal amphotericin. He was ultimately discharged home.

DISCUSSION

D koreensis is a non-spore-forming, aerobic, non-lactose fermenting, Gram-negative rod. It was first isolated in 2006 from soil samples

¹Tufts Medical Center, Department of Infectious Diseases, Boston, Massachusetts; ²Presence, Saint Joseph Hospital, Department of Internal Medicine, Infectious Diseases Section, Chicago, Illinois, USA

Correspondence: Dr Boeun Lee, Tufts Medical Center, Department of Infectious diseases, 800 Washington Street, Boston, Massachusetts 02111, USA. Telephone 773-677-5655, fax 617-636-1580, e-mail boeun.lee@hotmail.com



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collected in Dokdo, a naturally preserved island in Korea (2). The *Dokdonella* genus comprises six species: *D koreensis* (2), *D fugitiva* (3), *D soli* (4), *D ginsengisoli* (5), *D kunshanensis* (6) and *D immobilis* (7). All strains were found in the environment, especially from soil. It belongs to the *Xanthomonadaceae* family with other 17 genera including *Stenotrophomonas* (www.bacterio.cict.fr/classifgenerafamilies.html). Sequencing of the amplified 16S ribosomal RNA gene using universal primers is needed to identify this genus. The differences in phenotypic characteristics, including high DNA G+C content, differentiate *Dokdonella* from other phylogenetically related genera *Dyella*, *Frateriella*, *Fulvimonas* and *Rhodanobacter* (2).

Little is known about *Dokdonella* colonization in the hospital environment or pathogenicity in humans. To our knowledge, there has been only one previously published case of *D koreensis* infection in humans reported in the English-language medical literature (8). Similar to our case, the patient was immunocompromised (bone marrow transplant recipient) and had a bloodstream infection related to a centrally inserted venous catheter. The similarity of the two cases suggests that immunocompromised hosts with indwelling central catheters may be more vulnerable than other hosts to this emerging organism.

The antibiogram of this organism appears to be favourable. However, intermediate susceptibility to ciprofloxacin needs attention

in our case. The patient received ciprofloxacin before infection as prophylaxis. This may imply that this organism develops drug resistance from previous antibiotic exposure, similar to other multidrug-resistant Gram-negative organisms.

In our case, it is unclear which symptoms were attributed to *D koreensis* bacteremia. His skin manifestations were best explained by palmar-plantar erythrodysesthesia, also known as hand-foot syndrome, which has been previously well described in patients who have received cytarabine (9). Fungal pneumonia, which was later suspected, could have complicated his febrile clinical presentation. However, it is still possible that *D koreensis* bacteremia was related to his skin or pulmonary manifestations. In our case, *D koreensis* bacteremia was assumed to be a catheter-related bloodstream infection based on clinical presentations (10); however, this was not proven because the catheter tip culture was sterile.

Our case brings to the attention of clinicians and microbiologists a previously uncommonly recognized organism. *D koreensis* may be a cause of bloodstream infection in severely immunocompromised hosts with central venous catheters. In addition, our case emphasizes that the use of 16S ribosomal RNA gene sequencing needs to be considered early to identify unusual organisms (11). Further studies are warranted to establish the definitive epidemiology, clinical presentation and management of *D koreensis* infection.

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