Septicemia Caused by *Leifsonia aquatica* in a Healthy Patient after Retinal Reattachment Surgery

Lei Han, a, Jin-e Lei, a, b Xue Wang, c Li-tao Guo, c Qian-yan Kang, d Li He, a and Ji-ru Xu a

Department of Immunology and Pathogenic Biology, Health Science Center, Xi’an Jiaotong University, Xi’an, China, a Department of Laboratory Medicine, b Intensive Care Unit, c and Department of Ophthalmology, d The First Affiliated Hospital, Health Science Center, Xi’an Jiaotong University, Xi’an, China

Address correspondence to Jin-e Lei, jine.lei@foxmail.com

L.H. and J.-E.L. contributed equally to this work.
Leifsonia aquatica is an aquatic bacterium that is typically found in environmental water habitats. Infections due to *L. aquatica* are rare, and commonly catheter-associated in immunocompromised patients. We report the first case of an acute septicemia caused by *L. aquatica* in a healthy immunocompetent host after cryopexy in the absence of catheter.

**CASE REPORT**

A 60-year-old man who had undergone cryopexy was transferred from the Department of Ophthalmology to the Intensive Care Unit (ICU) in our hospital due to the symptoms of septic shock. The patient lived in Pucheng County of Shaanxi Province, was a peasant, with daily exposure to agricultural environment. His medical history did not reveal any specific illness, including acquired immune deficiency syndrome. He did not smoke or consume alcohol, and had no recent travel outside his hometown.

Approximately half a month prior to presentation, the patient noticed a non-removable dense shadow in the lower field of vision of his right eye after heavy manual work. He underwent fundus laser treatment in a local hospital without improvement. Therefore, he was admitted to the Department of Ophthalmology in our hospital with the diagnosis of rhegmatogenous retinal detachment (RRD) in the right eye. Cryopexy was performed successfully, and the retina reattached well. Triphosadenine, coenzyme A, citicoline and riboflavin sodium phosphate were given intravenously to help the recovery of retina after the operation. On the next day, two hours after infusion of the same medications, the patient presented with an elevated temperature of 39.9 °C. Ibuprofen was given and helped to control the fever. While, the patient showed increased respiratory rate (RR), weak pulse and low blood pressure.
On examination in ICU, the vital signs of the patient were as follows: body temperature, 38.0 °C; heart rate (HR), 118 beats/min; BP, 71/39 mmHg; and RR, 26 breaths/min. There was a yellowish pigmentation of the skin and left conjunctiva. His right eye was covered by sterile dressing, which was dry. Cyanosis, cardiac murmur and breath sounds were absent. Moreover, his liver and spleen were not palpable. Percussion pain was found over the right renal region, but not the left. Laboratory examinations revealed a white blood cell (WBC) count of $32.34 \times 10^9$/liter with 96.7% neutrophils, C-reactive protein of 92.7 mg/liter, procalcitonin of $>10$ ng/ml, albumin of 19.38 g/liter, alanine aminotransferase of 124 U/liter, aspartate aminotransferase of 147 U/liter, total bilirubin of 51.45 µmol/liter, blood urea nitrogen of 12.23 mmol/liter, and creatinine of 239.06 µmol/liter. Both B-ultrasonography and abdominal computed tomography (CT) images revealed calculous cholecystitis. The patient was placed on empirical intravenous meropenem and linezolid therapy at 1.0 g every 8 h and 600 mg every 12 h, respectively (day 1 to day 7). Symptomatic treatments were also administrated including 20 g/d immunoglobulin (day 1 to day 4) and one million units/d ulinastatin (an anti-inflammatory agent, day 1 to day 2) for anti-inflammation; 500 ml/d hydroxyethyl starch 130/0.4 and sodium chloride, and 20 g/d albumin for blood volume restoration (day 1 to day 2); dopamine (200 mg/5 h on day 1 and 400 mg/12 h on day 2 to day 5) to increase blood pressure; and blood purification therapy for toxin elimination and organ protection (day 1 to day 4). The patient remained clinically stable, with improvement in his signs and symptoms. In addition, his right eye recovered well. Blood cultures performed 4 days after the completion of antibiotic treatment showed no growth. Blood cultures were conducted prior to antibiotic treatment. The aerobic bottles from each of four
separately taken sets of blood cultures were incubated in the BacT/Alert 3D system (bioMérieux). Positive growth was shown in all cultures, and Gram-positive rods were observed by Gram stain. Subcultures on 5% sheep’s blood agar (bioMérieux) revealed tiny, non-haemolytic, white colonies after overnight incubation at 35 °C in 5% CO₂. The colonies were catalase and oxidase positive. After 3 days of incubation, colonies were yellow-pigmented. The RapID CB Plus System (REMEL inc, USA) identified all isolates as *Leifsonia aquatica* (99.9% probability, profile 0675513). The strains were further identified by sequencing the 16S rRNA gene from genomic DNA. A 1390-bp fragment was amplified using the universal primers 27F (AGAGTTTGATCCTGGCTCAG) and XB4 (GTGTGTACAAGGCCCGGAAC) (1, 2). PCR products were purified and sequenced by Sangon Biotech (Shanghai, China). A 1296-bp 16S rRNA sequence of our strain was deposited in GenBank (accession no. KF373556), and had 99% identity with *L. aquatica* (accession no. NR_043412.1). Antibiotic susceptibility testing was performed using Etest strips (bioMérieux) on Mueller-Hinton agar supplemented with 5% sheep’s blood according to the manufacturer’s instruction. After the incubation at 35 °C in 5% CO₂ for 24 h, the minimal inhibitory concentrations (MICs) of penicillin G, vancomycin, imipenem, meropenem and linezolid were >32 µg/ml, 12 µg/ml, 4 µg/ml, 4 µg/ml, and 0.75 µg/ml, respectively.

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*L. aquatica* is a non-spore-forming Gram-positive rod. Being a resident of environmental water habitats, it has been isolated from distilled water, municipal water supplies and private wells (3). *L. aquatica* grows in opaque colonies, and produces a yellow pigment after extended incubation. This bacterium is catalase and oxidase positive. *L. aquatica* was once recognized as a species of genus
Corynebacterium. However, because of the chemotaxonomic and genetic differences to corynebacteria, it has been reclassified (4). Of the four species currently assigned to the genus Leifsonia, only L. aquatica is considered a medically relevant species (3).

Infections due to L. aquatica are rarely reported, typically being catheter-related in immunocompromised patients. For example, catheter-associated bloodstream infections caused by L. aquatica are mainly observed in hemodialysis-dependent patients suffering from chronic or end-stage renal diseases (3-5). Furthermore, peritoneal dialysis peritonitis (6, 7) and HIV-related septic shock (8) have been reported. In contrast, the patient in our case was in good health, and did not use any catheters. Moreover, the retinal reattachment surgery was carried out under standard procedure with sufficient sterilization. Such an acute onset and severe symptoms of septicemia caused by L. aquatica were observed for the first time in an immune-competent individual, indicating a potential significant role of this bacterium in causing infectious diseases. Since L. aquatica has properties of passing through polycarbonate water filters (9), slow growth rate and biofilm formation, which likely contribute to the pathogenicity of this bacterium in immunocompromised patients with exogenous devices (10), the intravenous fluids were suspected as a source of L. aquatica contamination. However, cultures from these resources were negative. Additionally, no other patient in the unit showed similar symptoms after treatment with the same batch of intravenous fluids and medications. Thus, the origin of this septicemia is unclear. A potential source of Leifsonia infection might be via the oral cavity, where species of this genus have been isolated recently (11). In addition, a variety of bacteria have been recovered from different sites of gallbladder in symptomatic cholelithiasis (12). Considering the radiographic results of calculous cholecystitis, cholelithiasis might be a reason for the acute bacterial infection in our patient.
Postoperative ocular infections due to various bacteria have been described (13, 14), whereas occurrence of bloodstream infection after ophthalmologic operations is scarcely reported. To our knowledge, this is the first case of Leifsonia septicemia in a patient with normal immunity after cryopexy.

The optimum regimen for management of L. aquatica infections is uncertain, whereas the routinely used antibiotic for therapy is vancomycin (3, 4). Even if symptomatic resolution could occur within two days after the therapy with vancomycin, a long course of treatment is normally administrated for 2-6 weeks (3, 4). Besides, relapse of L. aquatica peritonitis after the treatment with intraperitoneal vancomycin has been reported in a 17-year-old boy undergoing automated peritoneal dialysis (APD). The second round of vancomycin therapy was unable to eradicate the bacteria until the PD catheter was removed (7). Our result was consistent with previous reports that L. aquatica shows intermediate susceptibility to vancomycin (3, 15), which has been considered as not being the most effective treatment for L. aquatica infections (4). Resistance to penicillin G has also been described (3). Because of the slow growth of the causative pathogen, an empirical antibiotic treatment was performed with meropenem in combination with linezolid in this case. The septicemia was controlled efficiently within 7 days, indicating the effectiveness of meropenem and linezolid in the therapy of L. aquatica infection.

This report provides new evidence that L. aquatica, an environmental coryneform bacterium, is able to cause serious infection in healthy persons. It highlighted the potential pathogenicity of this bacterium. Potential endogenous nidus, e.g. cholelithiasis, might be an initial source of bacterial infection. Antimicrobial therapy using meropenem and linezolid was an effective treatment of L. aquatica septicemia.
ACKNOWLEDGEMENT

We thank Peng-bo Yu from Shaanxi Center for Disease Control and Prevention for the technical assistance.

REFERENCES


12. Manolis EN, Filippou DK, Papadopoulos VP, Kaklamanos I, Katostaras T, Christianakis

