

성인에서 발생한 *Lactococcus lactis* subsp. *lactis* 카테터 관련 패혈성 쇼크 1예

A Case of Septic Shock Following Catheter-related Infection Caused by *Lactococcus lactis* subsp. *lactis* in an Adult

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Lactococcus lactis is a gram-positive cocci used extensively in the dairy industry, but considered an unusual pathogen in humans. Among its five subspecies, *L. lactis* subsp. *lactis* in particular has rarely been reported as a pathogen. We report a case of septic shock caused by *L. lactis* subsp. *lactis* in an adult patient. A 64-yr-old male patient was admitted to outpatient clinics, with chief complaints of fever and chills for one week after convalescent hospital admission. He had severe ileus requiring surgery. He had a peripherally inserted central catheter from convalescent hospital, which was immediately removed. From two sets of blood and catheter tip cultures, we identified *L. lactis* subsp. *lactis* using the Vitek 2 system (bioMérieux Inc., USA), and confirmed this result by 16S rRNA sequencing. The patient was empirically treated with ciprofloxacin, and he recovered and was discharged.

Key Words: *Lactococcus lactis* subsp. *lactis*, Catheter-related infections, Septic shock

INTRODUCTION

Lactococcus species are among the most important microorganisms for the industrial production of fermented dairy products. *Lactococcus lactis* and *Lactococcus garvieae* have been reported to cause human infections and are considered opportunistic pathogens. While *L. lactis* subsp. *cremoris* is known to be a pathogen, causing several human infections, and *L. garvieae* is re-

garded as an emerging pathogen, *L. lactis* subsp. *lactis* is thought to have very low virulence to humans. Herein, we report a case of septic shock resulting from catheter-related infection caused by *L. lactis* subsp. *lactis*. To the best of our knowledge, this is the first case of bacteremia caused by *L. lactis* subsp. *lactis* in an adult.

CASE REPORTS

A 64-yr-old male presenting with fever and chills for one week, was admitted to our hospital. He had surgery for adhesive ileus approximately 40 yr ago and subsequently has had three additional colorectal surgeries and an ileostomy. Upon arrival, he had fever and chills, but did not have respiratory symptoms or nausea/vomiting, and exhibited no weight loss. Upon examination, his temperature was 36.5°C due to an antipyretic drug that he had taken before the visit. His initial blood pressure of 70/60 mmHg dropped to 60/30 mmHg in one hour; his pulse rate was 45/min, and his respiratory rate was approximately 20 breaths/min. Physi-

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cal examination revealed unremarkable findings. The white blood cell count was $16.22 \times 10^9/L$ (segmented neutrophil 85.5%), hemoglobin was 11.2 g/dL, and platelet count was $173 \times 10^9/L$ in initial complete blood cell counts. C-reactive protein was 68.99 mg/L, blood urea nitrogen was 55 mg/dL, and creatinine was 1.75 mg/dL. A coagulation study showed a slightly prolonged prothrombin time of 12.7 seconds (INR 1.13). Vital signs and laboratory findings suggested systemic inflammatory response syndrome with shock. Upon radiologic studies, a chest X-ray showed nonspecific findings and computed tomography without enhancement of the abdomen showed findings of postoperative adhesive ileus without any mass or fluid collection. Nelaton-catheterized urine culture and two sets of blood culture (Bact/Alert, bioMerieux Inc., Hazelwood, USA), from a peripheral vein, were conducted. In addition, his peripherally inserted central catheter (PICC) that was thought to be the infection source was removed and sent to the clinical laboratory for tip culture. The urine culture was negative but blood culture was positive after 2 days. From the PICC tip culture, 1-2 mm non-hemolytic whitish-gray colonies were observed on a blood agar plate incubated at 35°C in conditions of 5% CO₂ for 24 hr. Based on Gram staining, the colonies were gram-positive cocci and were catalase-negative. Similar colonies were obtained from subculturing both sets of blood cultures. These colonies were subsequently identified as *L. lactis* subsp. *lactis* using a GP identification card with the Vitek 2 system (99% probability, bioMerieux Inc., Hazelwood, USA), with Vitek MS (99.9% probability, bioMerieux Inc., Hazelwood, USA), and through 16S rRNA sequencing (9F: 5'-GAGTTTGATCCTGGCTCAG-3', 1512R: 5'-ACGGCTACCTTGTTACGACTT-3') in GenBank (99% homology with Accession number: NR_103918). The minimal inhibitory concentration (MICs) for penicillin, gentami-

cin, ciprofloxacin, clindamycin, and vancomycin were 0.5, 1, 4, 0.5, and 1 µg/mL, respectively, by E-test (bioMerieux Inc., Hazelwood, USA). The patient was empirically treated with ciprofloxacin, starting at hospital day 1. On hospital day 4, two blood culture sets were negative and the patient recovered. He was symptom-free at an outpatient clinic visit 1 month after discharge.

DISCUSSION

L. lactis is a catalase-negative gram-positive cocci with five subspecies. *L. lactis* subsp. *lactis*, *L. lactis* subsp. *cremoris*, and *L. lactis* subsp. *lactis* biovar diacetylactis are used for the production of fermented dairy products and cheddar cheese [1], and are considered to have low pathogenic potential for human infections. However, there have been some reports of infection in immunocompromised adults, which presented as peritonitis, liver abscess, endocarditis, and cerebellar abscesses [2-5]; however, to the best of our knowledge, these bacteria have rarely caused bacteremia in adults, especially catheter-related infections that progressed to septic shock. Cases of bacteremia, sepsis, or catheter-related infection are very rarely reported in infants [6-8]. Most cases in humans are caused by *L. lactis* subsp. *cremoris* [9, 10]. Herein, we report a case of *L. lactis* subsp. *lactis* induced septic shock resulting from catheter-related infection, in an adult. Furthermore, we reviewed cases of *L. lactis* subsp. *lactis* infection, and the results are shown in Table 1.

To date, the pathogenesis of *L. lactis* infection is not well understood [6, 11]. Generally, most bacteria in dairy products are killed during pasteurization. However, outbreaks related to the use of unpasteurized dairy products have been reported [12]. In this case, the lactococci could remain viable after transit through

Table 1. Cases of *L. lactis* subsp. *lactis*-associated infections reported to date

Year	Age	Sex	Site of infection	Exposure to unpasteurized milk products	Treatment	Outcome	Immune status
2006 [15]	55	M	Endocarditis	Not reported	Amoxicillin-clavulanic acid with surgery	At 3 months of follow-up, symptom free	Normal
2010 [7]	1	F	Catheter-related bacteremia	None	Vancomycin	Improved after 2 days; clearance of bacteremia without removal of catheter	Preterm with small gestational age; short bowel syndrome
2014 [8]	1	M	Catheter-related bacteremia	None	Vancomycin	Continued to improve without removal of the central venous catheter	Down's syndrome and Hirschprung's disease

Abbreviations: M, male; F, Female

the gastrointestinal tract [13]. Therefore, exposure to unpasteurized dairy products and damaged mucosa could be risk factors [9]. In this case, the patient had a PICC and had received long-term hospital care. Hence, we could not check diet or parenteral supplements used before his visit to our outpatient clinic. In addition, we could not determine the source of infection or related risk factors, except for ileus with ileostomy that could be considered as mucosal damage.

The antimicrobial susceptibility of *L. lactis* subsp. *lactis* is well known in animal infections [14], with susceptibility to widely used beta-lactams such as penicillin, ampicillin, and amoxicillin. In humans, there is limited data. In a case of catheter-related bacteremia in an infant, the strain showed MIC values for vancomycin, ceftriaxone, and penicillin as 0.5, 0.125, and 0.25 µg/mL, respectively [7]; our finding was similar to these. There have been rare antibiograms of *L. lactis* subsp. *lactis* in human infection and thus we thought more data would be needed.

This study represents a very rare report of septic shock resulting from catheter-related bacteremia caused by *L. lactis* subsp. *lactis*. This occurred despite the low pathogenicity of this species. Thus, clinicians should consider *L. lactis* subsp. *lactis* as a pathogen, especially when the patient is immunocompromised and has risk factors such as gastrointestinal problems, or exposure to unpasteurized dairy products.

요약

*Lactococcus lactis*는 유산균의 발효에 광범위하게 이용되는 그람양성구균으로 특히 5개의 아종 중 *L. lactis* subsp. *lactis*에 의한 감염은 매우 드물게 보고되어 있다. 이에 저자들은 성인에서 발견된 *L. lactis* subsp. *lactis*에 의한 카테터감염 후 패혈쇼크로 진행한 증례를 보고하는 바이다. 요양병원에 입원하고 있던 64세 남성 환자가 일주일간 지속되는 발열, 오한을 주소로 외래를 경유하여 입원하였다. 환자는 이전에 받았던 수술에 의한 심한 장폐색증 이외에 특이소견은 없었으며, 요양병원에서 삽입하고 있던 말초삽입 중심정맥관을 즉시 제거하였다. 말초혈액 2쌍 및 말초삽입 중심정맥관의 카테터팁 배양을 실시한 결과, *L. lactis* subsp. *lactis*로 동정(Vitek 2, bioMérieux Inc., USA)되었고, 16S rRNA 유전자 염기서열 분석결과도 일치하였다. 환자는 경험적 항생제인 ciprofloxacin을 투여하여 성공적으로 치료되었다.

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