A Single Bulla Caused by *Bacillus cereus* in a Neutropenic Patient

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**ABSTRACT**

We reported a case of rapidly progressing bulla on a finger and fever, without other clinical signs, in a chemotherapy-induced neutropenic woman. Gram-positive bacilli were recovered on Gram stain and the culture yielded *Bacillus cereus*. Her clinical symptoms improved dramatically after appropriate antimicrobial treatment.  (*J Infect Dis Antimicrob Agents* 2010;27:135-8.)

**Note:** This case had been presented and discussed in the Interhospital Case Conference on Infectious Diseases (ICCID), 6 May 2010, Bangkok, Thailand.

**INTRODUCTION**

Neutropenic patients, especially chemotherapy induced, have both compromised skin barrier and cell mediated immune response defect. Therefore skin and soft tissue infections occur up to 20 percent in this group with various manifestations. The organisms included opportunistic pathogens that normally did not cause disease in normal host. This report presents a case with neutropenia and single skin bulla lesion caused by *Bacillus cereus*, an uncommon pathogen.

**CASE REPORT**

A 52-year-old Thai woman from Nakhon Pathom, former orchid planter, presented with a fever for 3 days. Three months ago, she was diagnosed with acute promyelocytic leukemia and had received induction chemotherapy. She subsequently developed febrile neutropenia and was treated with ceftazidime and amikacin. One week after the first consolidation chemotherapy, she developed fever and a black spot on the middle finger of the right hand. The lesion rapidly progressed to a bulla within 3 days. She denied any trauma or animal exposure.

Physical examination revealed a body temperature of 38.2°C, respiratory rate of 24/minute, pulse rate of 100/minute and blood pressure of 120/70 mmHg. The middle finger of the right hand showed a bulla on erythematous and swelling base at the middle...
phalanx (Figure 1). Physical examination of other systems was normal.

Complete blood count revealed a hematocrit of 25.7 percent, a white cell blood count of $0.3 \times 10^3$/mm$^3$, and a platelet count of $280 \times 10^3$/mm$^3$. Blood urea nitrogen and creatinine were 7.1 and 1.4 mg/dL, respectively. Liver function tests, urine analysis, and chest X-rays were within normal ranges. The Gram stain of fluid from the lesion showed large Gram-positive bacilli in chain with few inflammatory cells (Figure 2) and *Bacillus cereus* was grown on the culture.

She was treated with cefipime, amikacin, and clindamycin. Fever disappeared at 3 days of antimicrobial treatment and the lesion showed a dramatic improvement. At 8 days of antimicrobial treatment, the absolute neutrophil count increased, then antimicrobial agents were switched to oral cefditoren and clindamycin. These drugs were continued until the lesion dissolved.

Figure 1. The skin lesion on the day of admission showed a bulla on erythematous and swelling base at the middle phalanx.

Figure 2. Gram stain of the fluid from the lesion showed Gram-positive bacilli in chain.
DISCUSSION

Skin signs in immunocompromised hosts are important clinical manifestations of infections. They can present as a local infection of skin structures or disseminated infections, both as metastatic foci and primary sites. Therefore, attention should be paid to skin signs and early action should be applied to these warning signs. In chemotherapy-induced neutropenic patients, whose skin barriers are destroyed by intravenous catheters, occlusive dressing and tape, normal skin flora are changed by antibiotic pressure.\textsuperscript{1,2} In addition to barrier defects, these patients also have both quantitative and qualitative impairment of neutrophil function. Skin and soft tissue infections in this group of patients are not only more severe, but also vary in manifestations, both as “atypical presentation of common pathogens” and “common presentation of rare or opportunistic organisms”.

In neutropenic patients, skin and soft tissue infections can be classified as “initial infection” (less than 7 days of fever and neutropenia) and “subsequence infection” (with an onset after 7 days of neutropenia).\textsuperscript{1} The most common pathogens in initial infections are bacteria, both Gram-positive and Gram-negative, whereas those in subsequent infections are drug-resistant bacteria, yeasts, and fungi. The pathogenesis of this infection can be either direct inoculation or hematogenous spreading.

In this case report, a skin lesion began as a necrotic bulla and then progressed rapidly. At first, the differential diagnosis included bacterial infection, such as \textit{Streptococcus} spp., Gram-negative bacteria especially \textit{Pseudomonas aeruginosa}, due to the rapid onset. Gram stain of the lesion showed large Gram-positive bacilli correlate with a character of \textit{Bacillus} spp., hence, the selection of empirical antimicrobial agents should cover both \textit{B. antracis} and other \textit{Bacillus} spp., and \textit{P. auruginosa}. The granulocyte-stimulating factor was also given to the patient. The result of fluid culture from bulla yielded \textit{B. cereus}.

\textit{B. cereus} is spore-forming, aerobic to facultative, Gram-positive bacillus, with the spore commonly widespread in soil and food. Besides toxin mediated food poisoning, it has been recognized as opportunistic or procedure-related infections.\textsuperscript{3} Local \textit{B. cereus} infections are observed in postsurgical wound, burn, or ocular infection.\textsuperscript{4} Primary \textit{B. cereus} cutaneous infection has been reported in both immunocompromised and immunocompetent host.\textsuperscript{5-7} Henrickson et al. described the entity of primary cutaneous \textit{B. cereus} infection in neutropenic children that occurred without a history of trauma.\textsuperscript{5} The characteristic of lesion was single vesicle or pustule that often developed on digits or limb with rapidly spreading to cellulitis without systematic illness or bacteremia, clinically similar to a cutaneous anthrax lesion, as in this case report. The proposed pathogenesis was inoculums of \textit{B. cereus} spore from environment into micro-lacerated skin from micro-trauma in neutropenic patients. Source of \textit{B. cereus} of the present case might be from orchid farm near the patient’s house. All 14 cases in the previous report responded promptly to antimicrobial agents. \textit{B. cereus} has clinically beta-lactamase and cephalosporinase producing activity. It is usually susceptible to aminoglycosides, clindamycin, vancomycin, chloramphenicol, and erythromycin.\textsuperscript{3}

For decades, the epidemiology of infection in neutropenic patients shifted to Gram-positive bacteria. The explanations could be the increasing uses of catheter indwelling, high dose chemotherapy induced mucositis, and antibiotic prophylaxis.\textsuperscript{8} \textit{Bacillus} spp. especially \textit{B. cereus} is one of new increasing concern pathogens causing many forms of infection; the most severe forms are bacteremia and central nervous system infection.\textsuperscript{9,10} \textit{Bacillus} spp. are not only more
concerned as causative organisms in patients with hematologic malignancies, but also are reported as nosocomial outbreak. This might be caused by the contamination of its spores in air filter system, equipments, dressing, hands of health care workers, and even alcohol-based hand wash solution. Therefore, infection control has to emphasize in this setting.

In conclusion, the presentations of skin and soft tissue infections in neutropenic patients vary and can be caused by opportunistic pathogens. Active investigations and management are needed.

References