



# Bacillus Cereus Catheter-Related Bacteremia in a Patient Diagnosed with Neuroblastoma

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## ABSTRACT

*Bacillus* species can be found in air, water, soil, feces, and particularly in the normal flora of patients with a prolonged length of hospitalization. Therefore, isolation of these microorganisms from clinical samples is a common condition and usually regarded as contaminants. Previously, *Bacillus cereus* has been rarely associated with infections, but in the last few years, it has been reported with increasing frequency as the bacterial pathogen in patients with intravenous drug abuse, trauma, immunodeficiency syndrome, immunosuppressed patients with a history of underlying malignancy and granulocytopenia. In this study, we present a 3-months-old baby girl who was presented to a private health center with a complaint of not sucking well enough. After clinical examination she was diagnosed with neuroblastoma stage 4 S, metastasis was detected in the liver and bone marrow and surrenalectomy and 14 cures of chemotherapy were applied to the patient. Patient was discharged from the hospital with a permanent tunneled catheter, but she returned to the pediatric emergency department with high fever. After laboratory tests she was diagnosed with febrile neutropenia and ceftazidime and amikacin treatment was started. Ceftazidime treatment was stopped after the isolation of *B. cereus* from peripheral and catheter blood cultures of the patient and teicoplanin treatment was started. Permanent tunneled catheter was removed under anesthesia, and this suggested the case as a catheter-originated bacteremia after reducing fever of the patient. As a result, we suggest that *B. cereus* isolation in blood cultures could not everytime mean contamination, and *B. cereus* may cause catheter-related infections in immunosuppressed patients. (JAREM 2015; 5: 75-7)

**Keywords:** *Bacillus cereus*, catheter, bacteremia

## INTRODUCTION

*Bacillus cereus* is a gram-positive aerobic, spore-forming, rod-shaped bacterium that is widely distributed environmentally and is generally regarded as a contaminant (Figure 1). Therefore, isolation of these microorganisms from clinical samples is a common practice. *B. cereus* is a well-known cause of food poisoning, which is generally benign and self-limiting in a normal host. However, recently, it has been increasingly reported to be a cause of serious and potentially fatal infections in immunosuppressed patients with neutropenia. *B. cereus* has been reported to be a cause of systemic infections such as bacteremia, septicemia, meningitis, respiratory tract infections, surgical wounds, panophthalmitis, pneumonia, and endocarditis among parenteral drug abusers, patients with a suppressed immune system or intraventricular shunt, and newborns (1-5).

In this article, we present a 2-year-old female patient diagnosed with catheter-originated *B. cereus* bacteremia with neuroblastoma stage 4S.

## CASE PRESENTATION

A 3-month-old baby girl patient whose date of birth was 06/09/2010 who had been admitted to a private health center with a complaint of crying and not sucking well enough and had an abdominal ultrasonography showing a left adrenal-originated mass and then admitted to İstanbul University Cerrahpaşa

School of Medicine (I.U.C.S.M.) Pediatric Hematology and Oncology Unit for further examination upon the detection of disseminated metastases in the liver in the abdominal MRI. In the abdominal ultrasonography performed on December 9, 2010, a relatively smooth contoured hyperechoic mass (46×53×32 mm in size) on the left adrenal gland and metastases in the liver and bone marrow were detected, and the patient was diagnosed with neuroblastoma stage 4S. In 2011, left surrenalectomy was performed at the Pediatric Surgery Unit of I.U.C.S.M., and 14 cures of chemotherapy were applied to the patient in the Pediatric Hematology and Oncology Unit.

The patient with a permanent tunneled catheter was admitted to the Pediatric Emergency Department of I.U.C.S.M. with high fever on September 6, 2012. Her vital parameters on admission were as follows: blood pressure, 90/60 mmHg; fever, 38.5°C; WBC, 2300/mm<sup>3</sup>; PNL, 300/mm<sup>3</sup>; PLT, 21300/mm<sup>3</sup>; and hemoglobin, 10.8 g/dL. The patient was diagnosed with febrile neutropenia. The patient's throat, urine, and blood cultures were collected, and 150 mg/kg/day of ceftazidime and 15 mg/kg/day of amikacin were administered. There was no pathogenic bacterium in the throat and urine cultures. Upon the aerobic and gram-positive spore-forming bacillus growth in the blood cultures (BACTEC 9120, Becton Dickinson Diagnostic Systems, Sparks, MD) collected from the three peripheral veins and the catheter, ceftazidime treatment was tapered and 10 mg/kg/day of teicoplanin was administered (Figure 2). The permanent tunneled catheter

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**Table 1. *B. cereus* susceptibility test: zone diameters and MIC values of various antibiotic**

	Zone diameter (mm)	MIC (µg/mL)		Zone diameter (mm)	MIC (µg/mL)
Ampicillin	12	32	Amikacin	24	1.5
Cefazolin	13		Netilmicin	24	
Cefoxitin	11		Ciprofloxacin	30	0.94
Cefuroxime	6		Tetracycline	22	2
Ceftazidime	10	≥256	Teicoplanin	19	≤0.016
Cefotaxime	12	128	Vancomycin	19	6
Ceftriaxone	11	≥256	Linezolid	30	
Cefepime	12		Levofloxacin	25	
Amoxicillin-clavulanate	13	3	Trimethoprim-sulfamethoxazole	10	
Piperacillin-tazobactam	26	0.75	Clarithromycin	23	≤0.016
Imipenem	25	0.94	Erythromycin	27	
Meropenem	26		Clindamycin	27	0.064
Ertapenem	28				

MIC: minimal inhibitory concentrations

**Figure 1.** The gram-staining image of *B. cereus*

was removed under general anesthesia, and the patient was discharged because her fever dropped and did not recur, and her general condition was good. This suggested that the bacteremia was a catheter-originated infection.

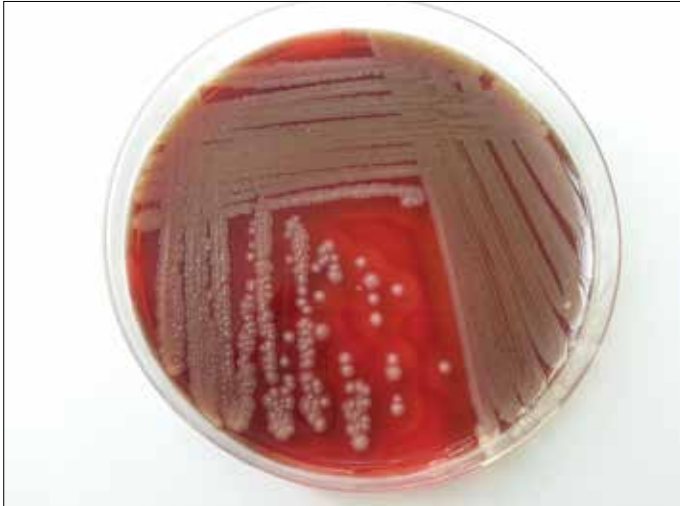
For bacteria typing in blood cultures, a gram-positive rod panel on an automated identification system Phoenix (Becton Dickinson Diagnostic Systems, Sparks, MD) was used. The result showed a 99% probability of *B. cereus*. Antibiotic susceptibility test was performed using the Kirby-Bauer method. Because the sensitivity limit values for *B. cereus* were not determined by the Clinical and Laboratory Standards Institute (CLSI) criteria, the zone diameters were expressed only in millimeters (Table 1) (6).

## DISCUSSION

*Bacillus* species can be found in air, water, soil, feces, and particularly, in the normal flora of patients with a prolonged hospi-

talization. Despite its low pathogenicity, it may cause local and systemic infections in addition to food poisoning because of toxins or tissue invasion (1). Previously, *B. cereus* was rarely associated with infections; however, recently, it has been reported with increasing frequency as the bacterial pathogen in patients with intravenous drug abuse, trauma, immunodeficiency syndrome, immunosuppression and a history of underlying malignancy, and granulocytopenia (7-9). It has been reported that although bacteremia that is caused by *B. cereus* is mostly transient, particularly in patients with a diagnosis of leukemia, it can lead to severe, even fatal, infections such as the fulminant septicemic syndrome (10, 11). These infections are mostly catheter-originated. The biofilm layer produced by *B. cereus* is substantially responsible for its adhesion to the catheters; in addition, this layer is the cause of the limited effect of antibiotics by creating a more secure zone for bacteria. Therefore, in *B. cereus* catheter-originated infections, antibiotic therapy alone is generally not sufficient and withdrawal of the catheter is also required (12, 13).

*B. cereus* produces beta-lactamases and is resistant to penicillin, cephalosporin, and trimethoprim-sulfamethoxazole. It is generally sensitive to aminoglycosides, clindamycin, vancomycin, teicoplanin, chloramphenicol, imipenem, and erythromycin. However, despite optimal antibiotic therapy with vancomycin and amikacin, "refractory" *B. cereus* bacteremia and constantly developing fulminant meningeal infection have been reported in hosts with an immunocompromised immune system (11). In addition, despite being administered treatment comprising multiple antibiotics that included vancomycin, gentamicin, imipenem, and clindamycin, a fatal *B. cereus* infection has been reported in an immunocompromised newborn (14). Although in these cases they seem to be active in vitro against *B. cereus* strains, the selected antimicrobials do not have in vivo activity in some cases. Our female patient who was diagnosed with neuroblastoma stage 4S



**Figure 2.** The image of the colonies of *B. cereus* on blood agar plates

after developing bacteremia with *B. cereus* was discharged upon receiving teicoplanin treatment, and her permanent tunneled catheter was removed.

## CONCLUSION

Septicemia caused by *B. cereus* can be fatal in immunosuppressed patients, despite broad-spectrum antibiotic treatment. Thus, it should be considered that *B. cereus* may also be a factor for cases associated with suspected catheter-related infections.

**Informed Consent:** Written informed consent was obtained from the patient who participated in this case.

**Peer-review:** Externally peer-reviewed.

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