Rev Argent Microbiol. 2020;52(2):115–117

asociación argentina de microbiología

REVISTA ARGENTINA DE MICROBIOLOGÍA

www.elsevier.es/ram

BRIEF REPORT

Bacillus cereus bacteremia in a patient with an abdominal stab wound

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Received 3 November 2018; accepted 19 July 2019
Available online 29 November 2019

KEYWORDS
Bacillus cereus;
Bacteremia;
Intensive care unit;
Stab wound

Abstract *Bacillus cereus* is a gram positive microorganism commonly involved in gastrointestinal infection but capable of causing severe infections and bacteremia. We describe here a case of bacteremia caused by *B. cereus* in a previously healthy young woman admitted to the intensive care unit following emergency surgery due to a penetrating abdominal stab wound and subsequent hepatic lesion. She developed fever during admission and cultures were taken. *B. cereus* was isolated in blood and hepatic fluid collection cultures. Treatment was adjusted according to the isolate, with good clinical results. It is important to highlight the pathogenic potential of this microorganism and not underestimate it as a contaminant when it is isolated from blood samples.

PALABRAS CLAVE
Bacillus cereus;
Bacteriemia;
Unidad de cuidados intensivos;
Herida por arma blanca

Bacteriemia por *Bacillus cereus* en paciente con herida de arma blanca abdominal

Resumen *Bacillus cereus* es un microorganismo gram positivo comúnmente involucrado en infecciones gastrointestinales, pero capaz de causar infecciones graves y bacteriemia. Presentamos un caso de bacteriemia por *B. cereus* en una mujer joven previamente sana que ingresa en la unidad de cuidados intensivos luego de una cirugía de emergencia, debido a una herida abdominal por arma blanca con lesión hepática. La paciente desarrolla fiebre durante la internación, por lo que se toman cultivos. Se aísla *B. cereus* en hemocultivos y material de colección hepática. Se ajusta el tratamiento según los hallazgos, con buena evolución clínica. Esta

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https://doi.org/10.1016/j.ram.2019.07.003

comunicación ilustra una fuente poco común de bacteriemia por *B. cereus*. Asimismo, destaca el potencial patogénico de este microorganismo, cuyo hallazgo en muestras de sangre no siempre debe conducir a su rápida desjerarquización como contaminante.

Introduction

Bacillus cereus is a gram positive, facultatively anaerobic, spore-forming rod widely distributed environmentally, with no substantial pathogenic potential despite its great capacity of surviving adverse conditions[1]. This microorganism is frequently associated with gastrointestinal infections, mostly related to rice ingestion, and is characterized by vomiting and diarrhea in the immunocompetent host[1,3]. It belongs to the genus *Bacillus* that comprises seven closely related species: *Bacillus cereus sensu lato, Bacillus anthracis, Bacillus thuringiensis, Bacillus mycoides, Bacillus pseudomycoides*, *Bacillus weihenstephanensis* and *Bacillus cytotoxicus*. These strains share a highly conserved genome, and their 16S rRNA gene sequences show high levels of similarity[2]. Extraintestinal infections due to *B. cereus* are rare; however, when present they could manifest as bacteremia, endocarditis, meningitis, endophthalmitis, pneumonia, and soft tissue infections[3]. Therefore, the isolation of this microorganism from blood culture samples is often regarded as contamination, which delays diagnosis and the choice of appropriate treatment[4].

There have been many reports of hospitals outbreaks of *B. cereus* bacteremia, mainly among immunocompromised patients attributable to contaminated medical equipment, alcohol-based hand wash solutions, linens, reused towels, intravenous catheters and other implantable devices[4,8,5].

We present here a case of *B. cereus* bacteremia due to an abdominal stab wound. This work was approved by the Research and Teaching Committee of the ''Eva Perón'' Hospital.

Case report

An otherwise healthy 32 year-old- female was admitted to the intensive care unit (ICU) after exploratory laparotomy for a penetrating abdominal stab wound and hepatic lesion. Remarkable laboratory findings included, white cell blood count 16 900 (91% neutrophils), pH 7.19 (PCo_2 42 Hco_3 19) and ASAT 378 mUI/ml ALAT 388 mUI/ml. As the patient reached a temperature of 38.6 °C in the next 48 h, blood, urine and BAL cultures were taken.

A computerized tomography (CT) was performed revealing bilateral pulmonary consolidation, in addition to a segment IV hepatic fluid collection. CT-guided percutaneous drainage was performed and treatment with ampicillin/sulbactam was initiated. Blood samples were processed with the BacT/ALERT 3D automated microbial detection system for five days. These samples became positive after 8 h of incubation showing gram positive bacilli. A small volume of this material was inoculated onto blood, chocolate, Cysteine Lactose Electrolyte Deficient (CLED) agar, and thioglycolate broth. Blood agar with hemin and vitamin K1 was the non-selective medium used for anaerobic bacteria and Wilking-Chagren agar was chosen as selective medium. A gram positive bacillus surrounded by wide beta hemolysis was isolated from blood on the fourth day, and from the hepatic samples after 24 h of incubation. After micro and macro observation of the morphological characters, the microbe was assumed to belong to the *Bacillus* spp. and finally the isolate was finally confirmed as *B. cereus* using MALDI-TOF mass spectrometry (Bruker, Daltonics) with a score value >2.

This *Bacillus* spp. was susceptible to vancomycin assessed by the Etest according to the Clinical and Laboratory Standards Institute (CLSI) guidelines (M45, 3rd Edition) obtaining a MIC value of 2 μg/ml.

Samples from the liver abscess were obtained during CT-guided drainage and were again inoculated onto blood, chocolate, Cysteine Lactose Electrolyte Deficient (CLED) AGAR, a selective medium for anaerobic bacteria and thioglycolate broth. Again, abundant gram positive bacilli developed.

MiniBAL cultures and the urine sample turned negative by using quantitative methods.

Vancomycin was added to the antibiotic treatment, and since the patient's condition failed to improve, surgical removal of the remaining liver collection was performed.

The patient had a favorable clinical evolution after fourteen days of regular dose of intravenous ampicillin/sulbactam plus vancomycin treatment, and required vasopressors for three days and twelve days of mechanical ventilation. She was discharged from hospital after 24 days.

Discussion

Bacillus spp. bacteremia in the immunocompetent host is mostly transient and resolves spontaneously, which is perhaps the reason why most *Bacillus* species (except *B. anthracis*) isolated from blood cultures are often considered contaminants[9].

There are many case reports of severe infections caused by *B. cereus* in the literature[1,4,9], the majority of which take place in immunocompromised patients, intravenous drug addicts, or are associated with neoplastic processes or hospital outbreaks[8–10]. There are only a few reports of severe infection by this microorganism linked to trauma despite of the environmental ubiquity of this bacteria[1].

Our search only found one case report of *Bacillus* spp. bacteremia developed after trauma, and it occurred in patients who had suffered gunshot wounds[7]. We could not find infections associated with stab wounds, which gives relevance to our report, since it implies a young immunocompetent patient, without previous gastrointestinal symptoms, in whom the bacteremia could be secondary to the abdominal stab wound. Nevertheless, it is still possible that the infection had occurred during the surgical act, although this option was dismissed given the absence of similar cases at the time of the microorganism isolation.

The study published by Ikeda et al.[6] attempted to characterize the antibiotic susceptibility and the impact of the correct treatment choice and showed that all the isolates of *B. cereus* were sensitive to gentamicin, carbapenems and vancomycin, according to Walkaway system and the standard criteria of CLSI guidelines. Between 48.3% and 100% of isolates were resistant to cephalosporins, 65.5% were resistant to clindamycin, and 10.3% were resistant to levofloxacin[6]. In the mentioned study the appropriateness of the empirical antibiotic therapy was not related to survival. However, it was still beneficial because early defervescence was significantly linked to the correct choice of empirical antibiotic treatment[6].

In the case we present in this study, the antibiotic treatment was adjusted 72 h after the patient developed a fever, in accordance with the microbiological findings, with a favorable outcome.

In the article written by Veysseyre et al. presenting 57 cases of *B. Cereus* infection, the presence of bacteremia was identified as a factor related to poor prognosis, contrary to our results, although it was a single patient[10].

We finally insist on highlighting the importance of considering *B. cereus* as a pathogen capable of causing severe infections in all types of patients, due to its extensive environmental presence, multiple and complex virulence factors and resistance mechanisms. It is worth insisting on the fact that this microorganism should not be considered a simple contaminant, a situation that continues to occur despite the ongoing documentation of cases of extraintestinal infection[3,10,6].

Conflict of interest

The authors declare that they have no conflicts of interest.

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