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Bacteremia caused by *Clostridium sporogenes* in an oncological patient

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Sir,

Clostridium sporogenes is a Gram-positive anaerobic bacillus firstly described by Metchnikoff E. in 1908 [1]. This pathogen is a member of the normal microbiota of the gastrointestinal tract, and it has been implicated in some human infections such as septic arthritis and myonecrosis [2,3]. This bacterium rarely causes bloodstream infections, which are mainly caused by *C. perfringens*. We recently observed an uncommon case of bacteremia due to *C. sporogenes* isolated in pure culture in a patient with a clinical history of cancer.

A 70-year-old man was admitted to the Emergency Department of our hospital after 2 weeks with diarrhea, vomiting, and abdominal pain. His clinical history was remarkable for a lung cancer currently in treatment with radiotherapy and chemotherapy (TAXOL + CARBOPLATINE), and for a type II diabetes mellitus. The physical exam only showed an abdominal pain without other signs. Blood analysis showed increased levels of glucose (157 mg/dL) and C-reactive protein (341.2 mg/L) and decreased levels of red cells blood count ($2.83 \times 10^6/\text{mm}^3$). The patient was then admitted to the Oncology Department for study. Three days after admission, the patient developed fever (38.4° C) and low blood pressure (106/68 mmHg). Two sets of blood cultures were taken and sent to the microbiology laboratory, while empirical treatment was started with meropenem (1 g/12 h./i.v.). Due to the persistence of abdominal pain and the presence of rectal bleeding, an abdominal CT scan was performed appearing signs of intestinal perforation due to acute diverticulitis.

In the microbiology laboratory, samples were inoculated onto the BACTEC FX 40 (Becton Dickinson, Franklin Lakes, NY) monitorization system for culture. On day 1 of incubation, the two anaerobic bottles from two blood culture sets were pos-

itive. The samples were subcultured on aerobic or anaerobic blood agar (BD Columbia Agar with 5% Sheep Blood, Becton Dickinson, Franklin Lakes, NY). All media were incubated at 37 °C. The AnaeroGen Compact anaerobic system (Oxoid Ltd, Wide Road, Basingstoke, England) was used. Gram staining of the blood cultures revealed abundant Gram-positive bacilli; on 24 hours of incubation, abundant colonies of these microorganisms were observed in pure culture on anaerobic blood agar alone. MALDI-TOF MS version 9 (8468 msp) (Bruker Biotyper, Billerica, MA) was employed, identifying the strain as *C. sporogenes* (score 2.35). The strain was sent to the Centre of Genomic and Oncologic Research (GENYO, Granada, Spain) for 16S rRNA gene sequence analysis using a previously reported method [4]. A fragment of 1,329 bp was obtained, yielding 99.85% similarity with the *C. botulinum* type strain Mfbjulcb5 GenBank sequence (accession number CP027776.1) and *C. sporogenes* strain CDC 1632 GenBank sequence (accession number CP013243.1). Subsequently, the sequence was compared using another database (IeBIBI IV 16s Automated ProKaryotes Phylogeny) confirming the strain as *C. sporogenes*. The 16S sequence was submitted to the GenBank (accession number: OP431824).

The E-test was used for antimicrobial susceptibility testing based on 2022 EUCAST criteria [5]. The following MIC values were obtained: benzylpenicillin (0.032 mg/L), piperacillin-tazobactam (0.064 mg/L), clindamycin (16 mg/L), meropenem (0.023 mg/L), and metronidazole (0.064 mg/L).

The patient was submitted to an abdominal surgical intervention. After 34 days hospitalized, the patient was discharged. His general condition remains good at 3 months of follow-up.

Bacteremia caused by *C. sporogenes* is an uncommon disease; until now, only 13 cases of bacteremia isolated in pure culture due to this bacterium have been published in the literature [6-11]. Table 1 shows the main characteristics of patients with bacteremia due to *C. sporogenes*.

Among species of the genus *Clostridium* that have been

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Table 1		Main characteristics of <i>Clostridium sporogenes</i> bacteremia isolated in pure culture.				
Case [reference] (year of publication)	Age (years)/sex	Identification method	Underlying conditions and/or risk factors	Clinical manifestations	Treatment	Outcome
1 [10] (1991) Bodey GP	77/F	Biochemical method Gas-liquid chromatographic analysis	Colorectal cancer	Abdominal symptoms	Antibiotics	Successful
2 [10] (1991) Bodey GP	22/F	Biochemical method Gas-liquid chromatographic analysis	Sarcoma	Fever	Antibiotics	Successful
3 [10] (1991) Bodey GP	59/F	Biochemical method Gas-liquid chromatographic analysis	Breast cancer	Fever	Antibiotics	Successful
4 [10] (1991) Bodey GP	99/F	Biochemical method Gas-liquid chromatographic analysis	Genitourinary cancer	Abdominal symptoms	Antibiotics	Successful
5 [10] (1991) Bodey GP	22/M	Biochemical method Gas-liquid chromatographic analysis	Hodgkin's lymphoma	Fever	Antibiotics	Successful
6 [10] (1991) Bodey GP	70/M	Biochemical method Gas-liquid chromatographic analysis	Colorectal cancer	Abdominal symptoms	Antibiotics	Successful
7 [10] (1991) Bodey GP	58/F	Biochemical method Gas-liquid chromatographic analysis	Genitourinary cancer	Abdominal symptoms	Antibiotics	Died
8 [10] (1991) Bodey GP	45/F	Biochemical method Gas-liquid chromatographic analysis	Acute leukemia	Fever	Antibiotics	Successful
9 [6] (1996) Corbett CE	45/M	Biochemical tests	Renal transplantation	Pleuritic chest pain, fever, tachycardia, low blood pressure	Antibiotics	Died
10 [7] (2013) Shen DX	70/M	MALDI-TOF MS 16S rRNA gene sequencing	Colorectal cancer DM Abdominal surgery	Fever, tachypnea	Antibiotics	Died
11 [8] (2018) Abusnina W	66/F	NR	DM	Sepsis	Antibiotics	Died
12 [9] (2020) Vecchio MJ	81/M	NR	Abdominal surgery	Abdominal pain and distension	Antibiotics	Died
13 [11] (2020) Alataby HA	75/M	NR	Unknown	Low blood pressure, tachycardia, tachypnea, fever	Antibiotics	Successful
14 [PR] (2022) Cobo F	70/M	MALDI-TOF MS 16S rRNA gene sequencing	Lung cancer Type II DM	Diarrhea, vomiting, abdominal pain, fever	Antibiotics	Successful

M: male; F: female; PR: present report; DM: diabetes mellitus; NR: not reported

isolated in human infections, *C. sporogenes* is not frequently implicated in human infections and it is uncommon as a cause of bloodstream infections. Regarding the possible source of infection with this anaerobe, this patient showed an abdominal focus of the infection with diverticulitis. The most likely source of infection was therefore the gut, taking into account that *Clostridium* spp. form part of the normal microbiota of the gastrointestinal tract.

MALDI-TOF MS offers a rapid approach for the routine

analysis of bacteria in clinical laboratories. It can be highly useful for the final identification at both genus and species level and may help to detect new species of anaerobes. Nevertheless, this technique should be applied with care, evaluating the version of the database used, the log score obtained, and the consistency of the identification. When the log score indicates high confidence but the consistency is low (as in the present case), molecular methods should be used to confirm the result and avoid misidentification.

Most *in vitro* studies suggest that *Clostridium* spp. has increased resistance to a wide range of commonly used drugs. A study showed that resistance was observed for all antimicrobials tested except for imipenem [12]. Similar results have been reported by several surveys [13-16]. However, the resistance rates are not alarmingly high but monitoring of these resistances should be performed.

Among case reports, several of them did not perform antimicrobial susceptibility testing [6,8,9,11] and one found that *C. sporogenes* isolate was susceptible to all antimicrobials tested except clindamycin [7]. In the present study, only resistance to clindamycin was detected. Susceptibility testing of these strains is essential to develop the optimal therapeutic strategy against these infections.

In conclusion, this is an uncommon case of *C. sporogenes* bacteremia isolated in pure culture and confirmed by 16S rRNA gene sequencing, indicating that this pathogen can be responsible for severe infections. This case report and recent observations of antimicrobial susceptibility among *Clostridium* spp. highlight an increased resistance to various antimicrobials and emphasize the need for antimicrobial susceptibility testing of all isolates.

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CONFLICT OF INTEREST

Authors declare no conflict of interest

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