

Fatal *Robinsoniella peoriensis* Bacteremia in a Patient With Metastatic Breast Cancer and Severe Liver Failure

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Abstract

Robinsoniella peoriensis is a rare anaerobic, Gram-positive, spore-forming bacillus that has been rarely reported as an opportunistic human pathogen. We report a fatal case of *R. peoriensis* bacteremia in a 58-year-old woman with newly diagnosed metastatic breast cancer, extensive hepatic involvement, severe liver failure, massive ascites, and sepsis. Two anaerobic blood cultures yielded Gram-positive bacilli subsequently identified as *R. peoriensis* by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS), with a confidence score of 99.9%. Disk diffusion testing under anaerobic conditions showed inhibition around imipenem, amoxicillin-clavulanic acid, and erythromycin disks, whereas no inhibition was observed around ciprofloxacin, levofloxacin, and ceftriaxone disks. Because no validated species-specific disk diffusion breakpoints are available for *R. peoriensis*, these findings were interpreted descriptively rather than as standardized susceptible or resistant categories. Despite antimicrobial and supportive therapy, the patient's clinical condition progressively deteriorated, and she died eight days after admission. Given the severity of the underlying metastatic disease and hepatic dysfunction, the fatal outcome cannot be attributed solely to *R. peoriensis* bacteremia. Severe hepatic dysfunction and impaired host defenses may have contributed to the development of invasive infection; however, the portal of entry could not be established, and gastrointestinal bacterial translocation remains a possible but unproven mechanism. This case also illustrates the contribution of MALDI-TOF MS to the identification of uncommon anaerobic organisms in clinical microbiology.

Categories: Infectious Disease

Keywords: anaerobic bacteria, bacteremia, liver failure, maldi-tof ms, metastatic breast cancer, robinsoniella peoriensis, sepsis

Introduction

Robinsoniella peoriensis is a rare anaerobic, Gram-positive, spore-forming bacillus that was initially isolated from swine manure and formally described as a novel bacterial species in 2009 [1]. Since its first identification, human infections caused by *R. peoriensis* have remained exceptionally uncommon, with only a limited number of cases reported worldwide [2]. The increasing use of modern microbiological techniques, particularly matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) and 16S rRNA gene sequencing, has improved the recognition of this previously underdiagnosed pathogen [2,3].

Reported human infections include bacteremia, infective endocarditis, peritonitis, osteomyelitis, soft tissue infections, prosthetic joint infections, and infections associated with implanted medical devices [2,4-6]. Most reported cases have occurred in patients with significant underlying comorbidities, including malignancies, immunosuppression, recent surgery, chronic debilitating diseases, or implanted medical devices, suggesting that *R. peoriensis* behaves predominantly as an opportunistic pathogen [2]. Although its pathogenic mechanisms remain poorly understood, a gastrointestinal origin has been proposed in previous reports, although the precise ecological niche and portal of entry in humans remain uncertain [2,7].

Bacteremia due to *R. peoriensis* is particularly rare but may be associated with severe clinical outcomes, especially in vulnerable patients [2,8]. Despite the increasing number of reported infections, the pathogenesis of *R. peoriensis* bacteremia remains poorly understood, particularly regarding the mechanisms of bloodstream invasion and the potential roles of underlying malignancy, impaired host defenses, and gastrointestinal bacterial translocation. We report a fatal case of *R. peoriensis* bacteremia in a 58-year-old woman with newly diagnosed metastatic breast cancer, diffuse hepatic metastases, severe hepatic dysfunction, massive ascites, and sepsis. This case adds to the limited literature by documenting invasive *R. peoriensis* infection in the setting of advanced malignancy and profound hepatic dysfunction and raises the possibility that impaired host defenses and severe hepatic dysfunction may contribute to the development of bacteremia. However, the portal of entry and the precise pathogenic mechanism remain uncertain. The case also emphasizes the diagnostic value of MALDI-TOF MS for the identification of uncommon anaerobic pathogens.

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Case Presentation

A 58-year-old married woman with no known history of diabetes mellitus, hypertension, or dyslipidemia was admitted to our department for progressive deterioration of her general condition associated with intense generalized jaundice.

The patient's symptoms had begun approximately two months before admission and were characterized by anorexia, progressive dorsal pain, and jaundice. On admission, she presented with marked asthenia and signs of severe systemic illness.

Thoraco-abdomino-pelvic computed tomography revealed bilateral pleural effusions and a suspicious lesion located in the upper outer quadrant of the right breast, associated with bilateral axillary lymphadenopathy and left internal mammary lymph node enlargement. Histopathological examination of the breast lesion confirmed the diagnosis of breast carcinoma, while histopathological examination of a hepatic lesion confirmed metastatic involvement of breast origin. A peritoneal biopsy was subsequently performed and demonstrated fibrous tissue infiltrated by inflammatory cells without evidence of malignancy.

Laboratory investigations revealed severe hepatic dysfunction with marked cholestasis and an inflammatory response. The main laboratory findings at admission are summarized in Table 1.

Laboratory parameter	Patient value	Reference range	Interpretation
Aspartate aminotransferase (AST)	584 U/L	0-40 U/L	Increased
Alanine aminotransferase (ALT)	188 U/L	0-41 U/L	Increased
Alkaline phosphatase (ALP)	761 U/L	40-130 U/L	Increased
Gamma-glutamyl transferase (GGT)	837 U/L	5-40 U/L	Increased
Total bilirubin	296.66 mg/L	0-10 mg/L	Increased
Direct bilirubin	199.54 mg/L	0-2 mg/L	Increased
Prothrombin time/activity	47%	70-100%	Decreased
C-reactive protein (CRP)	120 mg/L	<5 mg/L	Increased
Procalcitonin	Positive	<0.5 ng/mL	Positive
Hemoglobin	10 g/dL	12-16 g/dL	Decreased
White blood cell count	12,000 cells/mm ³	4,000-10,000 cells/mm ³	Increased
Serum creatinine	5.48 mg/L	6-11 mg/L	Below reference range
CA15-3	148 U/mL	<30 U/mL	Increased

TABLE 1: Laboratory findings at admission

Abdominal ultrasonography demonstrated a dysmorphic liver with irregular contours and heterogeneous echotexture containing multiple nodular lesions consistent with diffuse hepatic metastases. The intrahepatic and extrahepatic bile ducts were of normal caliber. The pancreas, spleen, and kidneys showed no significant abnormalities. Large-volume ascites was present in the perihepatic, perisplenic, interloop, and pelvic spaces. No abdominal lymphadenopathy was identified. Analysis of ascitic fluid revealed an inflammatory exudate without cytological evidence of malignancy.

Overall, clinical, biological, and radiological findings were highly suggestive of metastatic breast cancer with extensive hepatic involvement resulting in severe liver failure and massive ascites.

Given the presence of fever and a marked inflammatory response suggestive of sepsis, two sets of blood cultures were obtained before the initiation of antimicrobial therapy. Both sets yielded *R. peoriensis*, with growth detected in the anaerobic blood culture bottles. Subculture under anaerobic conditions demonstrated bacterial growth on Columbia colistin-nalidixic acid (CNA) agar supplemented with 5% blood. Direct Gram staining of the positive blood cultures revealed Gram-positive bacilli (Figures 1-2).

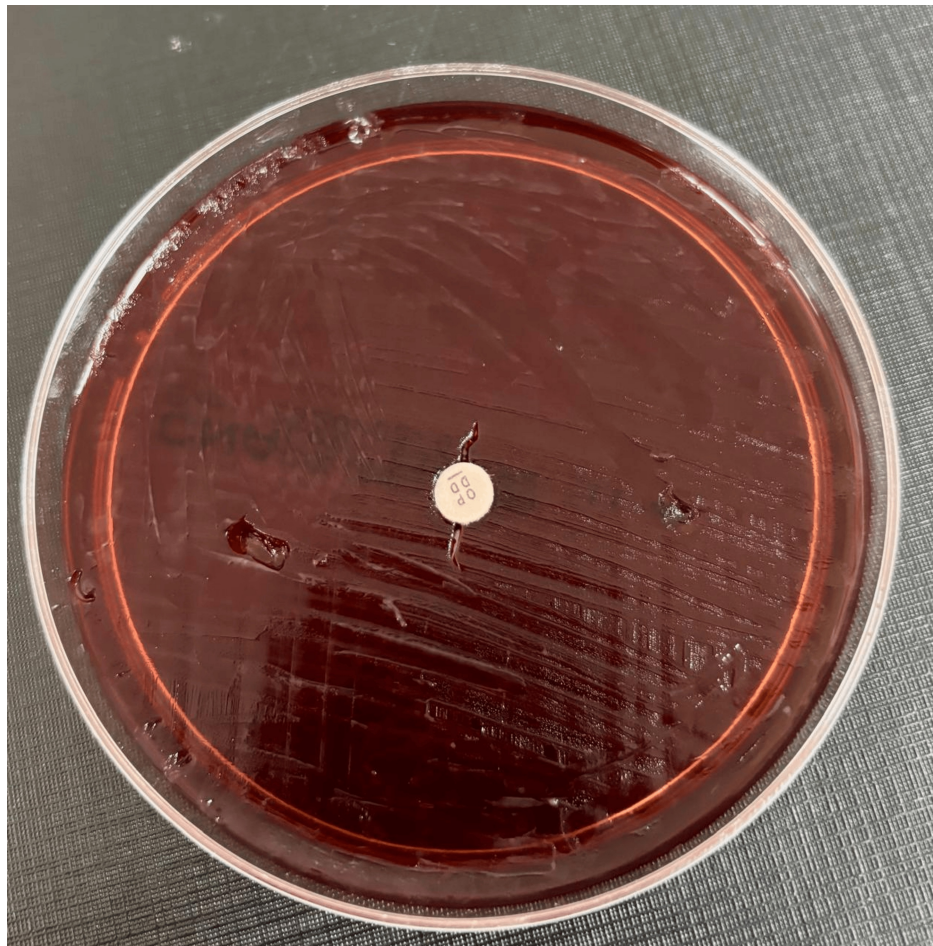


FIGURE 1: Bacterial growth following subculture of the positive blood culture on Columbia colistin-nalidixic acid (CNA) agar supplemented with 5% blood under anaerobic conditions. The optochin disk visible on the plate was placed during the initial microbiological workup when an alternative bacterial identification was considered and was not used for the identification of *Robinsoniella peoriensis*.

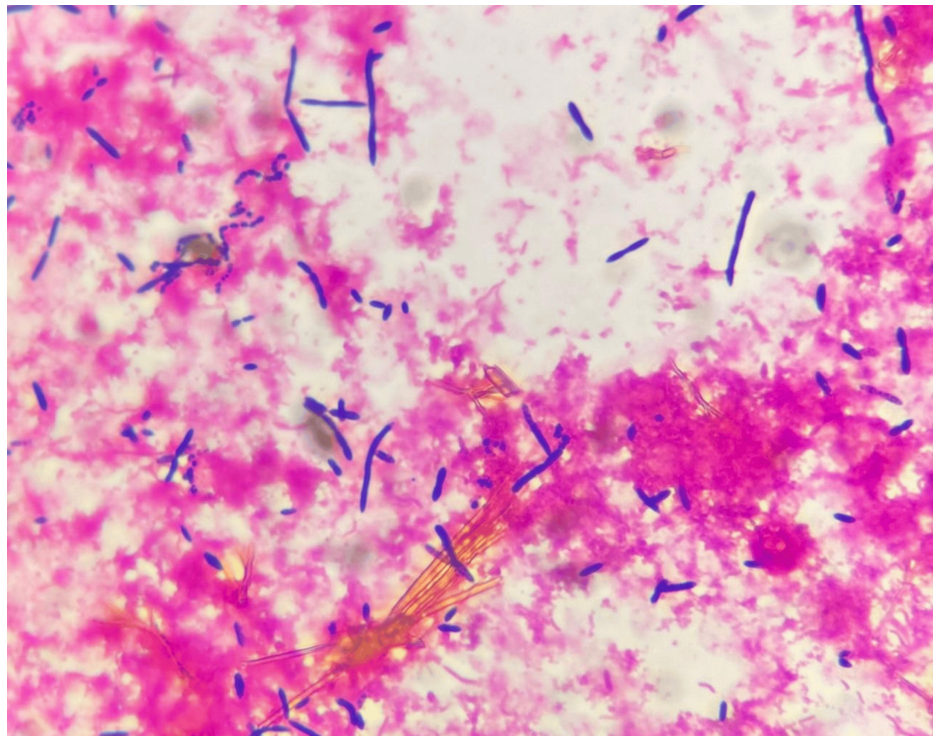


FIGURE 2: Gram staining performed from the positive blood culture showing Gram-positive bacilli.

Species-level identification was performed using MALDI-TOF MS, which identified *R. peoriensis* with a confidence score of 99.9%. Antimicrobial testing was performed by disk diffusion on Columbia CNA agar supplemented with 5% blood under anaerobic conditions. Inhibition was observed around imipenem, amoxicillin-clavulanic acid, and erythromycin disks, whereas no inhibition was observed around ciprofloxacin, levofloxacin, and ceftriaxone disks. As no validated species-specific disk diffusion breakpoints are available for *R. peoriensis*, these findings were reported descriptively and were not interpreted using standardized susceptible or resistant categories (Figure 3, Table 2).

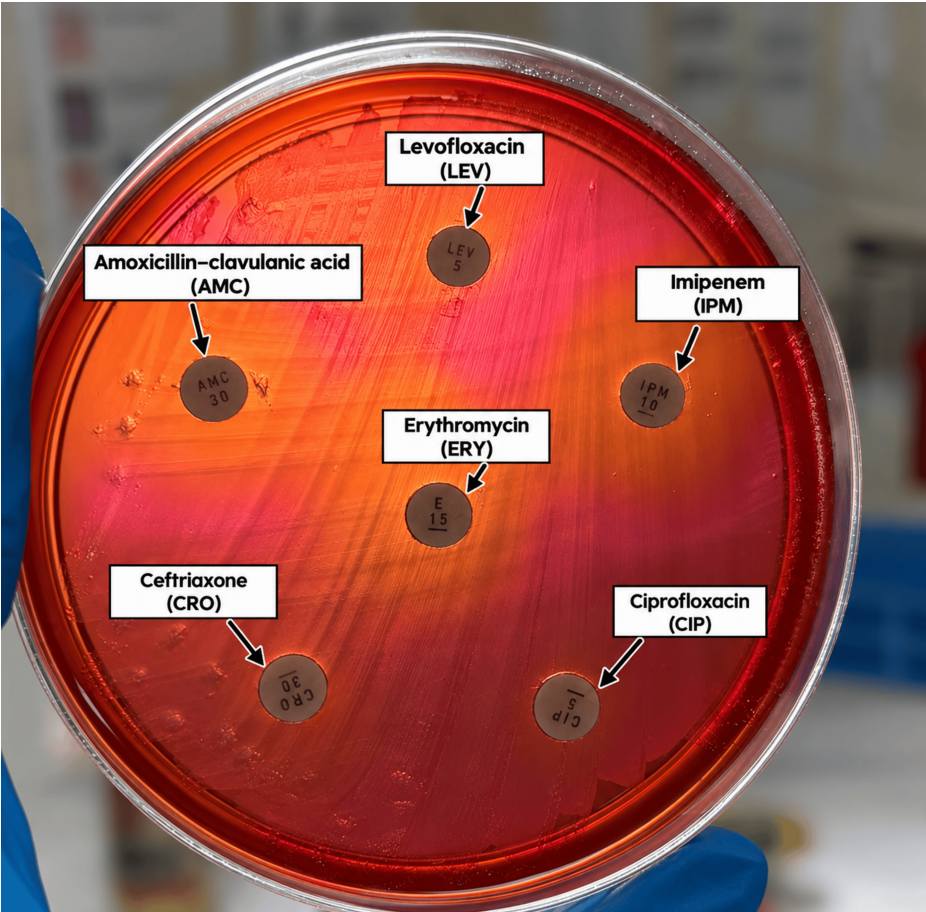


FIGURE 3: Antimicrobial disk diffusion testing of the *Robinsoniella peoriensis* isolate under anaerobic conditions. Digital labels indicate the antimicrobial agents tested.

Antimicrobial agent	Disk diffusion observation
Imipenem	Inhibition observed
Amoxicillin-clavulanic acid	Inhibition observed
Erythromycin	Inhibition observed
Ciprofloxacin	No inhibition observed
Levofloxacin	No inhibition observed
Ceftriaxone	No inhibition observed

TABLE 2: Disk diffusion findings for the *Robinsoniella peoriensis* isolate under anaerobic conditions.

Disk diffusion testing was performed on Columbia CNA agar supplemented with 5% blood under anaerobic conditions. Because no validated species-specific disk diffusion breakpoints are available for *Robinsoniella peoriensis*, the results are reported descriptively and should not be interpreted as standardized susceptible or resistant categories.

In addition, urine culture yielded *Escherichia coli*, consistent with a concomitant urinary tract infection. Empirical antimicrobial therapy with intravenous ceftriaxone (2 g every 24 hours) was initiated before antimicrobial testing results became available. Supportive management included vitamin K supplementation and corticosteroid therapy in the context of severe hepatic failure. The antimicrobial regimen could not be adjusted according to the subsequent disk diffusion findings because the patient died

before these results became available.

The patient's clinical condition progressively deteriorated in the setting of advanced metastatic disease, severe hepatic dysfunction, and sepsis. Despite antimicrobial and supportive therapy, the clinical course remained unfavorable, and the patient died eight days after admission.

The main clinical, microbiological, and therapeutic events from admission to the patient's death are summarized chronologically in Table 3.

Time point	Clinical events, investigations, and management
Day 1 - admission	Admission for marked asthenia and generalized jaundice in the setting of metastatic breast cancer with extensive hepatic involvement. Laboratory and imaging investigations showed severe hepatic dysfunction, marked cholestasis, large-volume ascites, and an inflammatory response.
During hospitalization	Two sets of blood cultures were obtained before antimicrobial therapy. Empirical intravenous ceftriaxone (2 g every 24 hours) was initiated. Supportive management included vitamin K supplementation and corticosteroid therapy.
Microbiological investigation	Both blood culture sets yielded <i>Robinsoniella peoriensis</i> , identified by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) with a confidence score of 99.9%. Urine culture also yielded <i>Escherichia coli</i> .
Clinical course	Despite antimicrobial and supportive management, the patient's clinical condition progressively deteriorated.
Day 8	The patient died before the antimicrobial testing results became available; therefore, antimicrobial therapy could not be adjusted according to the subsequent in vitro findings.

TABLE 3: Timeline of the clinical course.

Discussion

R. peoriensis is a rare, strictly anaerobic, Gram-positive, spore-forming bacillus first described by Cotta et al. following its isolation from swine manure storage pits [1]. Since its initial characterization, human infections caused by this microorganism have remained exceptionally uncommon. A 2024 narrative review by Ioannou et al. identified 17 patients with R. peoriensis infection [2], whereas a more recent literature review published in 2026 identified 22 previously documented cases [9]. Reported clinical manifestations include bacteremia, infective endocarditis, osteoarticular infections, peritonitis, soft tissue infections, and infections involving prosthetic material [2,9].

Most reported infections have occurred in patients with significant underlying comorbidities or predisposing conditions, including malignancy, immunosuppression, chronic debilitating diseases, recent surgery, or implanted medical devices [2,9]. These observations suggest that R. peoriensis may behave as an opportunistic pathogen capable of causing invasive disease in susceptible hosts. Our patient presented several potential predisposing factors, including advanced metastatic breast cancer, extensive hepatic involvement, severe hepatic dysfunction, inflammatory ascites, and marked deterioration of her general condition.

An important aspect of the present case is the potential portal of entry and the contribution of severe hepatic dysfunction to the development of bacteremia. The precise ecological niche and portal of entry of R. peoriensis in humans remain incompletely defined, although a gastrointestinal origin has been proposed in previous reports [2,3,9]. In advanced liver disease, particularly cirrhosis, impaired reticuloendothelial clearance, immune dysfunction, increased intestinal permeability, and bacterial translocation have been described as mechanisms predisposing to systemic infection [10,11]. In addition, Liang et al. reported R. peoriensis bloodstream infection following colorectal surgery complicated by anastomotic leakage, supporting the potential role of intestinal barrier disruption in invasive infection [9]. However, mechanisms described in cirrhotic populations cannot be directly extrapolated to severe hepatic failure secondary to metastatic liver involvement. In our patient, advanced malignancy, extensive hepatic involvement, profound hepatic dysfunction, and inflammatory ascites may have impaired host defenses and created a clinical setting favorable to invasive infection. Nevertheless, no definitive portal of entry was identified, and gastrointestinal bacterial translocation remains a plausible but unproven mechanism in this case.

Identification of R. peoriensis can be challenging because uncommon anaerobic Gram-positive bacilli may be difficult to accurately identify using conventional phenotypic methods [3]. Molecular techniques, particularly 16S rRNA gene sequencing, have historically played an important role in the identification of this organism, while MALDI-TOF MS has increasingly enabled rapid identification of uncommon anaerobic pathogens [3,5,9]. In the present case, MALDI-TOF MS identified R. peoriensis with a confidence score of 99.9%, supporting species-level identification.

Antimicrobial testing of the isolate represents another relevant microbiological finding. Disk diffusion testing showed inhibition around imipenem, amoxicillin-clavulanic acid, and erythromycin disks, whereas no inhibition was observed around ciprofloxacin, levofloxacin, and ceftriaxone disks. Because no validated species-specific disk diffusion breakpoints are available for *R. peoriensis*, these findings should be interpreted descriptively rather than as standardized susceptible or resistant categories. Published isolates have shown variability in their antimicrobial profiles, although β-lactam/β-lactamase inhibitor combinations and carbapenems have generally demonstrated favorable in vitro activity [2,8,9]. A limitation of the present report is that antimicrobial testing was performed by disk diffusion without minimum inhibitory concentration (MIC) determination. Therefore, the antimicrobial findings cannot be considered a standardized antimicrobial susceptibility profile. Further data based on standardized susceptibility testing and MIC determination are needed to better characterize the antimicrobial activity profile of *R. peoriensis*.

Regarding antimicrobial management, empirical intravenous ceftriaxone (2 g every 24 hours) was initiated before the antimicrobial testing results became available. Subsequent in vitro testing showed no inhibition around the ceftriaxone disk. However, the antimicrobial regimen could not be adjusted according to these findings because the patient died before the results became available. Therefore, the potential impact of an alternative antimicrobial regimen on the clinical outcome cannot be determined.

A concomitant *E. coli* urinary tract infection was also documented in our patient. Although this infection may have contributed to the overall infectious burden, recovery of *R. peoriensis* from an anaerobic blood culture in a patient with clinical and biological evidence of sepsis raises concern for a clinically significant bloodstream infection rather than an incidental finding. The patient had a marked inflammatory response, with a C-reactive protein level of 120 mg/L, severe hepatic dysfunction, and rapid clinical deterioration. Invasive *R. peoriensis* infections, including bacteremia, have previously been described in patients with severe underlying diseases [2-5,9].

Selected previously reported cases of *R. peoriensis* bacteremia and their clinical characteristics are summarized in Table 4.

Author	Year	Age/sex	Underlying condition	Clinical presentation	Treatment	Outcome
Gomez et al. [3]	2011	79/F	Multiple comorbidities	Bacteremia	Piperacillin-tazobactam, levofloxacin, and metronidazole	Death
Jeon et al. [4]	2012	76/M	Previous cerebral infarction; aspiration pneumonia	Bacteremia	Piperacillin-tazobactam and levofloxacin	Death
Lim et al. [5]	2017	63/M	Small-cell lung cancer undergoing chemotherapy; diabetes mellitus; multiple lacunar infarctions	Bacteremia associated with aspiration pneumonia	Imipenem	Death
Liang et al. [9]	2026	71/M	Rectal adenocarcinoma; postoperative anastomotic leakage	Bloodstream infection	Meropenem and source control	Recovery
Present case	2026	58/F	Metastatic breast cancer with diffuse hepatic involvement and severe hepatic dysfunction	Bacteremia and sepsis in the setting of severe hepatic failure	Ceftriaxone and supportive management	Death

TABLE 4: Selected previously reported cases of Robinsoniella peoriensis bacteremia and comparison with the present case.

Data were compiled and summarized from selected original reports [3-5,9] for comparison with the present case.

F: female; M: male

Comparison with previously published cases illustrates the severe clinical context of the present observation. In the 2024 review by Ioannou et al., seven patients with *R. peoriensis* bacteremia were identified; overall mortality among these patients was 57.1%, and infection-related mortality was 42.9% [2]. Among patients with bacteremia, 57.1% had active malignancy and were receiving chemotherapy [2]. Our patient shared several characteristics reported among these cases, including advanced malignancy, severe systemic illness, and a fatal outcome. In addition, extensive hepatic involvement resulting in profound hepatic dysfunction and massive ascites may have further impaired host defenses and increased susceptibility to invasive infection, although the precise portal of entry remains uncertain.

More recent data nevertheless suggest that prognosis should be interpreted in the context of the patient's underlying condition rather than attributed solely to *R. peoriensis* infection. The 2026 literature review reported an overall mortality of approximately 27% across the accumulated cases and noted that fatal outcomes frequently occurred in patients with severe underlying conditions, including advanced malignancy and multiorgan failure [9]. In contrast, favorable outcomes have been reported when effective antimicrobial therapy and, when required, source control were achieved [2,9]. In the present case, advanced metastatic malignancy, extensive hepatic involvement, severe hepatic dysfunction, sepsis, and progressive clinical deterioration were also present and likely contributed to the unfavorable outcome. Despite antimicrobial therapy and supportive management, the patient's condition deteriorated, and she died eight days after admission.

This case adds to the limited literature on invasive *R. peoriensis* infection and documents bacteremia occurring in a patient with metastatic breast cancer, extensive hepatic involvement, and severe hepatic dysfunction. It illustrates the potential clinical significance of this uncommon anaerobic bacterium in patients with major underlying comorbidities and highlights the importance of considering unusual anaerobic pathogens when anaerobic blood cultures obtained in patients with sepsis yield Gram-positive bacilli. The case also illustrates the value of MALDI-TOF MS for the identification of uncommon anaerobic organisms that may be difficult to characterize using conventional methods.

Conclusions

R. peoriensis is a rare anaerobic organism capable of causing clinically significant bloodstream infections, particularly in patients with severe underlying diseases. We report a case of *R. peoriensis* bacteremia in a patient with metastatic breast cancer, extensive hepatic involvement, severe hepatic dysfunction, and sepsis. Despite antimicrobial therapy and supportive management, the patient's clinical condition progressively deteriorated, and she died eight days after admission. Given the severity of the underlying metastatic disease and hepatic dysfunction, the fatal outcome cannot be attributed solely to *R. peoriensis* bacteremia.

Severe hepatic dysfunction and impaired host defenses may have contributed to the development of invasive infection; however, the precise portal of entry could not be established, and gastrointestinal bacterial translocation remains a possible but unproven mechanism. This case highlights the importance of considering uncommon anaerobic organisms as potential pathogens when isolated from blood cultures in an appropriate clinical context and illustrates the contribution of MALDI-TOF MS to their identification. Further reports incorporating molecular confirmation are needed to better characterize the clinical significance, antimicrobial susceptibility, and optimal management of *R. peoriensis* infections.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Rita Benyahia, Amina Benouda

Acquisition, analysis, or interpretation of data: Rita Benyahia

Drafting of the manuscript: Rita Benyahia

Critical review of the manuscript for important intellectual content: Rita Benyahia, Amina Benouda

Supervision: Amina Benouda

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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