Case Report
Comamonas kerstersii Bacteremia of Unknown Origin

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1.Introduction
Comamonas kerstersii (C. kerstersii) is a nonfermenting, Gram-negative bacillus widely distributed in the environment. It belongs to a genus first described in 1985 as including the single species Comamonas terrigena [1]. In 2003, the identification of genotypic and phenotypic differences led to the separation of C. terrigena into three distinct species: C. terrigena, C. aquatica, and C. kerstersii [2]. The genus now includes 22 species [3], most of which were isolated from environmental sources [4]. C. kerstersii is known to be motile, urease negative, and oxidase positive and can reduce nitrate. Although C. kerstersii is found abundantly in soil and water, it has rarely been implicated in human infections. Cases may be underreported due to the difficulty of identifying and differentiating members of Comamonas by phenotypic tests [5] and due to some microbial identification databases not containing the species [6]. In recent years, matrix-assisted laser desorption ionization-time of flight (MALDI-TOF) mass spectrometry (MS) has enabled the rapid and accurate diagnosis of C. kerstersii infections [7]. Following the first report of severe infection in 2013, several others have emerged, with most cases involving peritoneal infection. Here, we present a rare case of C. kerstersii bacteremia in an 82-year-old male patient. With no clear predisposing conditions, the source of his infection is unclear. We accompany this report with a review of C. kerstersii bacteremia cases found in the literature.

2. Case Presentation
An 82-year-old gentleman presented to the emergency department in March 2021 with chief complaints of chills and rigours. His medical history included type 2 diabetes with diabetic neuropathy and dyslipidemia. He is not known to have HIV. He had previously been diagnosed with colonic tubular and tubulovillous adenomas and invasive moderately differentiated squamous cell cancer of the right upper malar cheek, which had been completely excised. His home medications included tamsulosin, metformin, and ezetimibe.

At presentation, the patient reported no cough, urinary symptoms, or abdominal pain. However, he had been constipated for a few days, which was unusual for him. While in the ER, he spiked a fever of 38.6°C and became tachycardic at 120 bmp. He was stabilized and sent home after blood and urine samples were collected. On March 6, the patient was called back to the hospital due to a positive
blood culture for Gram-negative bacilli. At readmission, he was awake and alert with no acute distress. Cardiovascular examination showed bilateral mild pitting edema. His blood pressure was 160/87 mmHg. The patient’s abdomen was soft and distended but nontender in all quadrants, with no masses or organomegaly and no guarding or peritoneal signs. Chest X-rays showed clear lungs and pleural spaces and stable cardiomedialisternal contour. Abdominal X-rays showed no free air, no significant bowel dilatation or air-fluid levels, and a moderate fecal load throughout his large bowel. SARS-CoV-2, influenza A, influenza B, and RSV PCRs were done, and all were negative. Two blood culture sets were collected from two different sites. Both sets have aerobic and anaerobic bottles. Growth was detected at 1 and 2 days on the BACTEC system. Bacteria from the patient’s blood culture were identified by MALDI-TOF as Comamonas kerstersii. His urine culture was negative. MicroScan antibiotic susceptibility test results are presented in Table 1. In addition to the table, C. kerstersii was susceptible to amikacin, ceftriaxone, cefotaxime, cepfime, and aztreonam based on CLSI M100 breakpoints for other non-enterobacterales [8]. The patient was diagnosed with bacteremia of unknown origin and admitted to internal medicine. Piperacillin-tazobactam was started for broad-spectrum coverage before the final susceptibility report.

The patient’s bloodwork showed leukocyte count of 7.7 × 10^9/L with 7.1 × 10^9/L neutrophils, 1.3 × 10^9/L lymphocytes and 0.1 × 10^9/L for both monocyte and eosinophil. Sodium and potassium levels were normal. CRP was not done. He was prescribed one week of intravenous ceftriaxone (1 g/day) at home. The treating team elected to follow that with oral amoxicillin-clavulanic acid for one week as the patient was doing well and the organism was susceptible to piperacillin and ticarcillin-clavulanate (tested in the lab but not reported). At a follow-up appointment one week after discharge, the patient appeared to be doing well, and repeated blood cultures were negative. Cardiovascular examination was normal except for mild edema in the lower extremities, and abdominal examination was benign. His blood pressure was 148/82 mmHg. He was seen again at a two-week follow-up after discharge and was doing well clinically with no complaints.

Table 1: Antibiotic susceptibility of Comamonas kerstersii.

| Drug             | Interpretation | MIC (microgram/ ml) |
|------------------|----------------|---------------------|
| Cefazidime       | S              | ≤1                  |
| Ciprofloxacin    | R              | >2                  |
| Gentamicin       | S              | 2                   |
| Imipenem         | S              | ≤0.5                |
| Meropenem        | S              | ≤1                  |
| Piperacillin/tazobactam | S | ≤4                  |
| Tobramycin       | S              | 2                   |

MIC, minimal inhibitory concentration. S, susceptible. R, resistance.

In the published literature, we found 25 cases of C. kerstersii infection, among which the main predisposing conditions were appendicitis [6, 7, 11, 12], periitonitis (often secondary to perforated appendicitis) [12], and perforated colon [6, 12]. The site of infection was most often peritoneal [6, 7, 9, 11, 12], with only three reported cases of bacteremia [7, 10, 13] and one each of psoas abscess [12] and urinary tract infection [3]. A likely source of peritoneal infection is the translocation of bacteria from the gut following environmental exposure [7]. This may also be a possible source in cases of bacteremia as C. kerstersii is a versatile organism capable of thriving under a variety of conditions.

Table 2 summarizes this current patient along with the three cases of C. kerstersii bacteremia found in the literature. Previous reports suggest a possible source of infection to be translocation of bacteria from the intestinal tract. Opota et al. describe a patient diagnosed with diverticulosis who reported drinking river water, a possible environmental source of the pathogen [7]. Along with C. kerstersii, the gut commensal Bacteroides fragilis was also identified from the patient’s blood culture, supporting the theory of gut translocation. In two other reported cases of bacteremia, appendicitis was a predisposing condition, and the source of infection was likely appendicular [10, 13]. It has been posited that C. kerstersii may be commensal with bacteria in the appendix and digestive tract [10].

This current case is unusual as the patient had no identifiable predisposing conditions for his bacteremia. Neither his abdominal symptoms nor past medical history could be linked with a source of infection. Whether his constipation could have contributed to his bacteremia is not clear. Nevertheless, a complete recovery was achieved. Antimicrobial tests reveal that C. kerstersii is susceptible to a wide range of antibiotics. Based on this limited number of reports, the prognosis following infection is favourable. We emphasize that C. kerstersii infections may be underreported in literature due to past difficulties with its identification. While it was once thought nonpathogenic, the emergence of MALDI-TOF has enabled reliable identification of
C. kerstersii, and it is now considered a possible opportunistic bacterium [10, 12].

4. Review of Published Cases

Data Availability

No extra data available for this case report.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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### Table 2: Clinical and microbiologic characteristics of Comamonas kerstersii bacteremia in humans.

| Age | Sex | Clinical presentation | Underlying conditions | Predisposing conditions | Pathogens identified | Antibiotic treatment | Outcome | Reference |
|-----|-----|-----------------------|-----------------------|------------------------|----------------------|---------------------|---------|-----------|
| 65 | M   | Abdominal pain, vomiting, diarrhea, fever, chills | Diabetes            | Diverticulosis, ingested river water | Comamonas kerstersii, Bacteroides fragilis | Ciprofloxacin, then imipenem-clisatatin after identification | Recovered | [6]       |
| 31 | M   | Abdominal pain, nausea, vomiting | None reported | Perforated appendicitis with abdominal abscess, acute peritonitis | Comamonas kerstersii | Cefuroxime axetil, then cefuroxime and metronidazole at discharge | Complete recovery | [10]      |
| 16 | M   | Abdominal pain, fever, nausea, vomiting | None reported | Acute appendicitis, appendicular abscess | Comamonas kerstersii | Ampicillin-sulbactam and metronidazole, then piperacillin-tazobactam after identification Piperacillin-tazobactam, then ceftriaxone and amoxicillin-clavulanic acid at discharge | Recovered | [13]      |
| 82 | M   | Chills, rigours, constipation, fever | Type 2 diabetes, diabetic neuropathy, dyslipidemia, colon tubular adenoma, tubulovillous adenoma | None | Comamonas kerstersii | | Recovered | Present case |

**Table 2: Clinical and microbiologic characteristics of Comamonas kerstersii bacteremia in humans.**