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Case report

Bloodstream co-infection with *Turicibacter sanguinis* and *Desulfovibrio desulfuricans* in a patient with a flare of ulcerative colitis – A case report and review of the literature

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ABSTRACT

Turicibacter sanguinis was isolated in 2002 from the blood of a patient with appendicitis. We report a bacteremia with *T. sanguinis* and *Desulfovibrio desulfuricans* in a patient with ulcerative colitis. *T. sanguinis* grew in thioglycolate media and identification was confirmed with 16S rRNA sequencing.

Introduction

Polymicrobial bloodstream infections (BSIs) commonly arise from the gastrointestinal tract and are associated with a 15 % higher mortality rate than monomicrobial BSIs [1,2]. BSIs due to anaerobic bacteria constitute about 5 % of all cases (range 0.5–13 %) and also arise mostly from the gastrointestinal tract [3]. Patients with inflammatory bowel disease, including ulcerative colitis (UC), demonstrate a higher risk of BSI due to an impaired gastrointestinal mucosal barrier [4]. The genus *Desulfovibrio* consists of anaerobic gram-negative rods that rarely cause BSI in humans, mostly of gastrointestinal origin [5]. *Turicibacter sanguinis* is an anaerobic gram-positive bacillus first isolated in 2002 from the blood of a patient with appendicitis and no further BSI have been reported since [6]. We report the first polymicrobial BSI with *Turicibacter sanguinis* and *Desulfovibrio desulfuricans*, occurring in the setting of a flare of UC. The organisms were eradicated from the blood with piperacillin-tazobactam and metronidazole therapy.

Case report

A 76-year-old female patient with history of UC and cirrhosis secondary to primary sclerosing cholangitis presented with one day of abdominal pain and bloody diarrhea. Home medications included adalimumab and prednisone.

Vital signs demonstrated a blood pressure of 140/95, heart rate 150 beats/min, temperature 97 F, and SpO2 97 %. On physical examination, there was tenderness in the epigastric abdomen. Laboratory testing demonstrated a leukocytosis of 45,800 cells/mm3 with 93 % neutrophils. Computed tomographic (CT) imaging of the abdomen and pelvis revealed chronic findings of colonic diverticulosis and cirrhosis.

The patient was empirically started on intravenous (IV) piperacillin-tazobactam and corticosteroids for her UC flare. Two sets of peripheral blood cultures were collected, each consisting of one BacT Alert® aerobic and one anerobic bottle (bioMérieux, Marcy-l'Étoile, France) incubated with carbon dioxide. Four days into incubation, one of the anaerobic bottles flagged positive. Gram stain of the anaerobic blood culture bottle demonstrated curved gram-negative bacilli, and the broth was sub-cultured to agar media. After four days of incubation, colonies in pure culture were isolated from the Brucella blood agar anaerobic media (Remel™, Lenexa, KS) incubated under anaerobic conditions. This isolate was identified as *Desulfofibrio desulfuricans* with 99.9 % confidence via matrix-assisted laser desorption ionization time of flight mass spectrometry (MALDI-TOF) with the VITEK MS (bioMérieux, Marcy-l'Étoile, France). Five days into incubation, the other anaerobic bottle flagged positive, and gram stain showed filamentous gram-variable bacilli (Fig. 1). However, this bacillus failed to grow on solid media under aerobic or anaerobic conditions. An aliquot of the anaerobic blood culture bottle was inoculated to thioglycolate broth (Remel™, Lenexa, KS) under anaerobic conditions. Forty-eight hours later, the broth was cloudy and gram stain of the broth redemonstrated the bacilli (Fig. 2). The thioglycolate media underwent Sanger sequencing of the 16S rRNA gene and results revealed greater than 99 %

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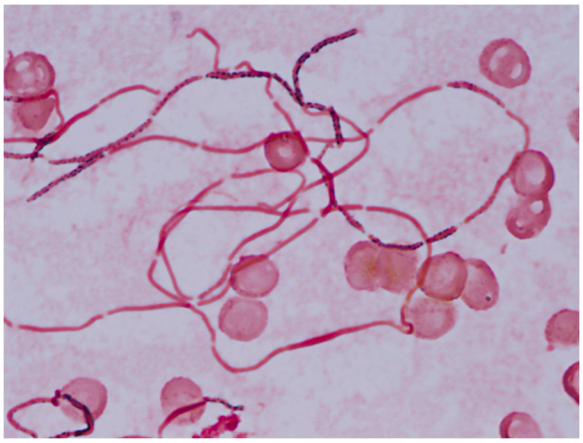

Fig. 1. Gram stain of *Turicibacter sanguinis* from the anaerobic blood culture bottle.

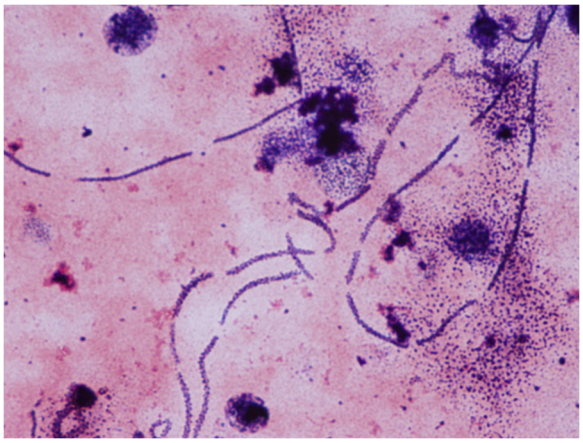

Fig. 2. Gram stain of *Turicibacter sanguinis* from the thioglycolate broth culture.

similarity to *Turicibacter sanguinis*. The patient was treated with 9 days of intravenous piperacillin-tazobactam and clinically improved with resolution of leukocytosis. Follow up blood cultures resulted as no growth after five days of incubation. On day 10 she was transitioned to oral metronidazole to complete at 14-day course, was discharged home, and suffered no recurrence of bacteremia due to these organisms.

Discussion

Desulfovibrio species are motile, strictly anaerobic, sulfate reducing, curved gram-negative bacilli that have been isolated from animal and human gastrointestinal tracts, sewage, and water sources [5]. These organisms rarely cause BSI in humans, but have been associated with appendicitis, cholecystitis, abdominal abscess, peritonitis, respiratory infections, brain abscess, liver abscess, and septic arthritis [7–13]. Polymicrobial BSI with *Desulfovibrio* species has been described with other gastrointestinal flora [14,15]. Identification of *Desulfovibrio* organisms in clinical microbiology laboratories has been successful with MALDI-TOF due to updated libraries for both VITEK MS (bioMérieux, Marcy-l'Étoile, France) and Bruker MALDI Biotyper System (Bruker, Billerica, Massachusettes) [16]. Susceptibility testing methods have not been established for *Desulfovibrio* by the Clinical and Laboratory Standards Institute (CLSI), but *in vitro* susceptibility testing has shown low minimum inhibitory concentrations (MICs) for ampicillin-sulbactam, metronidazole, clindamycin, and meropenem, and higher MICs for piperacillin-tazobactam [17]. Unfortunately, susceptibility testing was not performed on our isolate due to poor growth on our anaerobic susceptibility testing media (CDC anaerobic laked blood agar, BD BBL™, Franklin Lakes, New Jersey). Successful treatment regimens have included metronidazole, doxycycline, clarithromycin, and piperacillin (despite higher MICs) [5,10,11,15].

Turicibacter sanguinis is a strictly anaerobic gram-positive bacillus first described in 2002 from the blood of patient with appendicitis [6]. In that case, a 35-year-old male with acute appendicitis developed a BSI with an organism whose 16S rRNA sequence did not match any known bacteria, and thus the novel genus was proposed within the Erysipelotrichaceae family [6]. The bacteria were low GC content, non-spore forming, catalase and oxidase negative, and grew on sheep blood agar and thioglycolate media [6]. *In vitro* susceptibility testing for *T. sanguinis* showed susceptibility to penicillin, vancomycin, and kanamycin, but resistance to colistin [6]. Since its discovery, the whole genome of *Turibacter* species have been sequenced and it has been isolated from the gastrointestinal tract of humans, mice, and pigs [18–20]. No further human infection case reports have been published. MALDI-TOF and rapid anaerobic identification systems libraries are currently unable to identify this genus, but one study reported successful use of 16S rRNA sequencing [21].

We report the second case of a human BSI with *Turicibacter sanuinis* and the first co-infection with *Desulfovibrio desulfuricans*, emphasizing the importance of polymicrobial anaerobic BSIs, particularly in patients with inflammatory bowel disease. Our case was unique in that the *T. sanguinis* failed to grow on solid agar media, but did grow in thioglycolate media. Direct 16S rRNA sequencing of the turbid thioglycolate media yielded successful identification. We urge clinical microbiology laboratories to suspect *T. sanguinis* upon isolation of a strictly anaerobic gram-positive bacillus that fails to identify with MALDI-TOF or grow on solid media. Our study supports the use of 16S rRNA sequencing for identification of *T. sanguinis*. Our patient demonstrated clinical and microbiologic cure with piperacillin-tazobactam and metronidazole therapy. Expansion of MALDI-TOF libraries and biochemical panels to include the emerging genus *Turicibacter* could, in the future, aid clinical microbiology laboratories in more rapid identification.

CRediT authorship contribution statement

Chao Qi: Conceptualization, Investigation, Methodology, Supervision, Writing – review & editing. **Teresa Zembower:** Conceptualization, Writing – review & editing. **Vivek Paul:** Conceptualization, Investigation, Methodology, Writing – review & editing. **Kendall Kling:** Conceptualization, Data curation, Formal analysis, Methodology, Supervision, Writing – original draft, Writing – review & editing.

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Declaration of Competing Interest

We have no competing interests to report.

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Authors contribution statement

Kendall Kling contributed to conceptualization, supervision, literature review, and writing and editing the manuscript. Vivek Paul contributed to writing the manuscript. Teresa Zembower contributed to supervision and editing of manuscript. Chao Qi contributed to supervision and editing of the manuscript.

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