Case Report

*Anaerobiospirillum succiniciproducens* sepsis in an autopsy patient: A troublesome diagnostic workup

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**Abstract**

*Anaerobiospirillum succiniciproducens* is an uncommon yet potentially lethal gram-negative bacterium typically affecting patients with comorbidities. We report a case of *A. succiniciproducens* infection in an autopsy patient who had hepatitis C and type 2 diabetes and describe the difficulties in the laboratory identification of this pathogen.

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**Case report**

A 58-year old African American female presented to the emergency department with a chief complaint of sudden onset lower left abdominal pain described as cramping, sharp and stabbing in nature. She noted soft stools for the two previous days and some associated nausea. Abdominal examination revealed positive bowel sounds, diffuse abdominal tenderness greatest in the left lower quadrant, but no rebound tenderness or guarding. In 2011, she was diagnosed with a left sided, cystic ovarian mass that measured 13.5 cm × 8.7 cm × 7.4 cm with benign radiographic features. Other past medical history included chronic hepatitis C infection, type 2 diabetes mellitus, congestive heart failure, and morbid obesity. She had a hysterectomy in 1993 and had no other gynecologic history. On this admission, about 2 years after her initial diagnosis, a CT scan of her abdomen and pelvis showed a left sided, cystic ovarian mass that now measured 17.7 cm × 13.6 cm × 10.9 cm. There was no overt radiologic evidence of rupture. Her admission white blood count was 14,400 WBC/μL with a left shift.

Venous blood samples were drawn into Bactec™ FX bottles (BD Diagnostics, Cockeysville, MD) at the bedside and submitted to the clinical microbiology laboratory for aerobic and anaerobic cultures. After 24 h incubation, the anaerobic blood culture bottle flagged positive for bacterial growth (BD Bactec™ FX Blood Culture System; BD Diagnostics, Cockeysville, MD). An enhanced gram stain (Remel, Lenexa, KS) was performed from the positive blood culture, which showed curved gram-negative bacilli. An aliquot of the positive blood culture was inoculated onto Trypticase™ Soy Agar with 10% Sheep Blood (BD, BBL™ Sparks, MD) and incubated aerobically at 37 °C. Brucella Agar with 5% sheep blood, Hemin and Vitamin K1 (BD, BBL™ Sparks, MD) was also inoculated and incubated anaerobically at 37 °C. Following incubation, scant bacterial growth was observed on only the Brucella Blood Agar plate, at 48 h. The anaerobic culture was re-incubated in a Bio-Bag™ Type A Environmental Chamber (BD Diagnostics, Cockeysville, MD) at 37 °C, which provided improved bacterial growth. An additional aliquot of the positive anaerobic blood culture was inoculated onto a second Brucella Blood Agar plate, to ensure that the same organism could be recovered. Gram stain morphology of the subsequent bacterial growth revealed the same curved, gram-negative bacilli seen from the enhanced gram stain of the positive anaerobic blood culture Fig. 1. Growth from this second anaerobic culture was inoculated into a Rapid™ ANA II System test panel (Remel, Lenexa, KS), in an effort to identify the isolate. Analysis by the Rapid™ ANA II System yielded no identification. The isolate was referred to the laboratory at the Centers for Disease Control and Prevention (CDC) in Atlanta, GA, where final identification of *Anaerobiospirillum succiniciproducens* was accomplished using 16S RNA sequencing.

The patient was treated with broad spectrum antibiotics for the bacteremia. Immediately after a ventilation perfusion scan which
motile bacterium native to the gastrointestinal tracts of both healthy and diarrheal cats and dogs [1]. Bacteremia with *A. succiniciproducens* in healthy humans is typically not seen. Seeding of an ovarian cyst by *A. succiniciproducens* via hematogenous spread has not been previously reported and is presented here.

Mortality of *Anaerobiospirillum* bloodstream infections is high, up to 30%. There are two known species of *Anaerobiospirillum* that are pathogenic to humans. The first is *A. succiniciproducens* which has been shown to cause diarrheal symptoms and bacteremia and the other is *A. thomassii* which only causes diarrhea [2]. Our patient complained of soft stools and mild nausea in the days prior to her emergency room visit which was likely the first clinical manifestation of infection. Patients with conditions that compromise the immune system, commonly liver disease, have been shown to be at greater risk for infection with this bacterium [3]. Common comorbidities seen with *A. succiniciproducens* sepsis include alcoholism, diabetes mellitus, atherosclerosis, malignancy, surgery and poor dentition [4]. Our patient had liver disease secondary to chronic hepatitis C infection as well as type II diabetes mellitus. Hematogenous infection of ovarian cysts by an enteric organism has been described, most commonly with *Salmonella* species [5,6]. We hypothesize that the patient developed bacteremia due to bacterial translocation across the gut wall, followed by hematogenous seeding of the ovarian cyst. It is possible that the ruptured cyst then led to purulent peritonitis. *Anaerobiospirillum* infection can be troublesome for the treating clinician due to the high mortality rate. A complicating factor in patient care is the difficulty in microbiological identification of this organism which can delay treatment with appropriate antibiotics. A curved, gram-negative bacillus was initially reported based on the gram stain of the blood culture. However, final identification of the organism could not be accomplished in our hospital laboratory. The specimen had to be referred out to a reference lab for identification via 16S RNA gene sequencing.

*Anaerobiospirillum* species can be easily confused with *Campylobacter* species due to its similar morphology on gram stain. Both bacteria are gram negative, curved rods that grow in anaerobic cultures. Electron microscopy of *A. succiniciproducens* showing tufts of flagella can distinguish between the two [7]. Other differentiating factors include oxidase and catalase tests which are negative in *Anaerobiospirillum* species but positive in *Campylobacter* [8].

Despite its well-known pathogenicity, there is still no consensus on the optimal treatment of *Anaerobiospirillum* infection. Amoxicillin-clavulanic acid, cephalosporins, and chloramphenicol have shown to be effective against *Anaerobiospirillum* infection, while resistance to vancomycin has been reported [8]. Throughout her two day hospitalization, our patient had been treated with an antibiotic regimen consisting of azithromycin, piperacillin/tazobactam, and vancomycin. Prompt identification of *Anaerobiospirillum* may have resulted in a better outcome for our patient. Antibiotic susceptibility was not performed on this isolate. However, this paper underscores the difficulties in the identification of this organism using standard phenotypic methods. Additionally, the almost universal existence of significant comorbidities makes treating and curing patients with this infection that much more difficult.

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