

Coral, Coop, or Colonoscopy? First Reported Case of *Clostridium sordellii* Bacteremia in Australia

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ABSTRACT

Clostridium sordellii (*C. sordellii*) is an uncommon human pathogen associated with a high mortality rate. Initially manifesting as nausea, lethargy, and persistent absence of fever, it progresses rapidly to a marked leukocytosis, refractory hypotension, severe tachycardia, and profound capillary leak syndrome. Risk factors include exposure to contaminated soil, animal feces, or human gut flora. With only five cases of pleuropulmonary infection documented worldwide, we report the first known case in Australia of *C. sordellii* bacteremia of suspected pleuropulmonary focus in a previously healthy man, presenting with rigors, vomiting, and generalized pain. Good clinical response was achieved with intravenous (IV) metronidazole, which was chosen based on blood culture sensitivities.

INTRODUCTION

Clostridium sordellii (*C. sordellii*) is an uncom-

mon human pathogen associated with a high mortality rate of 70%.^{1,2} Initially manifesting as nausea, lethargy, and persistent absence of fever, it progresses rapidly to a marked leukocytosis, refractory hypotension, severe tachycardia, and profound capillary leak syndrome.^{1,2} Risk factors include exposure to contaminated soil, animal feces, or human gut flora.^{1,3}

CASE PRESENTATION

A 67-year-old previously healthy male was brought in by ambulance to a hospital in Tasmania, Australia, with a 24-hour history of vomiting, rigors, and generalized aches including chest discomfort and abdominal pain. Rigors commenced spontaneously the day beforehand and worsened in severity prior to admission. Associated symptoms included diaphoresis, chest discomfort, headache, abdominal pain, and six episodes of vomiting. Significant negatives included no shortness of breath or cough; however, the patient reported a mild respiratory tract infection three weeks prior, which was treated with antibiotics.

The patient reported three significant preceding events as potential sources of infection. Firstly, the patient identified a traumatic incident involving exposure to coral, which potentially introduced *C. sordellii* into an open wound via

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water contaminated with animal feces or soil. The patient had a resolving laceration on his right foot that occurred secondary to abrasion with coral in Fiji one week prior to onset of symptoms. Three days prior to his hospital admission, the patient reported inhaling dust while cleaning out his chicken coop following the unexplained death of two of his chickens. The dust may have introduced contaminated soil or feces directly into the patient's respiratory tract. Thirdly, the patient underwent colonoscopy and gastroscopy with gastric polypectomy and removal of perianal skin tags on the day prior to the onset of presenting symptoms. If the patient was already a carrier of *C. sordellii* in his normal bowel flora, this procedure had the potential to create cross-contamination from the patient's bowel flora to the blood stream.

Other past medical history included hiatal hernia and untreated *Helicobacter pylori*-associated gastritis, hypertension, depression, chronic obstructive pulmonary disease, benign prostatic hypertrophy, and chronic neck pain. His current medications included salbutamol and budesonide/formoterol inhalers, pregabalin, oxycodone, diclofenac, prazosin, pantoprazole, duloxetine, and mirtazapine.

On admission the patient was flushed and diaphoretic but appeared well hydrated. The patient's temperature was 37.4°C, pulse was 70 beats/min, blood pressure was 105/60 mmHg (systolic dropping to below 100mmHg while in the emergency department, which is significant for this patient as he is usually hypertensive). Respiratory rate, oxygen saturation, and Glasgow Coma Scale were within normal limits.

On palpation of the abdomen, there was mild tenderness over the upper quadrants. On auscultation, the heart sounds were normal but soft, and he had decreased breath sounds present in the right lung base with scattered wheezing. Air entry was greater in the left lung when compared

to the right. A small healing wound over the base of the fifth right metatarsal with surrounding erythema was noted. Findings from the general examination were otherwise normal. An electrocardiogram demonstrated widespread T-wave inversions. Bedside urinary dipstick was unremarkable and bedside ultrasound showed no obvious pericardial effusions.

Haematological investigations found an elevated white blood cell count of $20.9 \times 10^9/L$, neutrophils at $18.1 \times 10^9/L$, estimated glomerular filtration rate (eGFR) of 46 mL/min/1.73m², high sensitivity troponin level of 23 ng/L, C-reactive protein (CRP) of 166mg/L rising to 236mg/L over the following six hours, and procalcitonin level of 2-10 micrograms/L. Three sets of blood cultures were taken, the second set of which grew *Clostridium sordellii*, sensitive to metronidazole. Toxin strain was not tested for. The wound swab of the coral laceration on the right foot revealed moderate growth of *Streptococcus pyogenes* (Group A) and light growth of *Staphylococcus aureus*. Chest x-ray demonstrated bronchial pneumonia changes in the posterobasal segment of the left lung. Mild cardiomegaly was noted, with no pleural effusion. All other studies including venous blood gas findings were unremarkable. A formal echocardiogram was not requested.

The patient was initiated on a five-day course of oral azithromycin and intravenous ceftriaxone, with a provisional diagnosis of bronchopneumonia with suspected bacteremia, and was admitted to internal medicine. Once blood culture results were received on day two of admission, intravenous metronidazole therapy was initiated. Over the course of his admission, the patient's condition gradually improved. He remained afebrile with stable vital signs within normal ranges. By day three of admission, the patient's white blood cell count and neutrophil count had decreased to normal values ($8.3 \times 10^9/L$ and $5.4 \times 10^9/L$, respectively). His CRP decreased to 89

mg/L, and his eGFR improved to 62 ml/min/1.73m². On day five, the patient's white blood cell count was 8.0 x10⁹/L, neutrophil count was 5.0 x10⁹/L, CRP was 38mg/L, and eGFR was 75 ml/min/1.73m².

In view of these results combined with the patient's clinical improvement, he was discharged with oral metronidazole for ongoing management of pneumonia, as well as amoxicillin in addition to his existing pantoprazole as part of triple therapy for known *Helicobacter pylori* infection associated with gastroesophageal reflux. Outpatient follow-up one-week post discharge showed some fatigue but otherwise overall clinical improvement. Further improvement in his lab values was noted: white blood cell count was 7.8 x10⁹/L, neutrophil count was 4.2 x10⁹/L, and CRP was 5 mg/L. His eGFR remained low at 65 ml/min/1.73m².

DISCUSSION

To our knowledge, this is the first reported case of *C. sordellii* bacteremia in Australia. This patient's possible risk factors for acquiring this infection included the recent colonoscopy and gastroscopy, contact with dust and other environmental contaminants from cleaning out a chicken coop, as well as a foot laceration secondary to coral acquired in Fiji. The patient was not previously identified as being immunocompromised, and reported being in good health prior to this infection. Based on clinical findings, a pulmonary focus as the source of bacteremia seems most likely in this case. However, with no sputum cultures or other direct pleuropulmonary specimens (e.g., pleural aspiration) for culture, we acknowledge it is possible a different organism was responsible for the subject's pneumonia. Although *C. sordellii* infection is more commonly associated with trauma and ob-

stetric and gynecological patients,⁴ our case did have some characteristic features associated with *C. sordellii* infection including nausea, lack of fever, rapid progression to hypotension, and leucocytosis^{1,2}.

We only have evidence to support a *C. sordellii* bacteremia in this patient, without knowledge of toxin status and pathogenicity. However, although only one blood culture grew *C. sordellii*, evidence suggests that non-*C. perfringens* *Clostridium* species isolated from blood cultures are pathogens in 80% of cases.⁵ If indeed *C. sordellii* was the culprit behind the pulmonary symptoms, this is potentially only the sixth case of pleuropulmonary *C. sordellii* infection to be documented in the literature.

C. sordellii, first identified in 1922,⁶ is a gram positive, anaerobic, spore-forming rod¹ which is ubiquitous in the environment, found in soil and animal feces³. *C. sordellii* is predominantly an animal pathogen, mainly found in sheep and cattle, and found in only 0.5% of human gastrointestinal tracts.¹ The authors were unable to find reports of *Clostridium sordellii* isolated from chicken feces, however other *Clostridium* species (such as *C. perfringens*⁷ and *C. difficile*⁸) have been found in chicken feces.

C. sordellii has been identified as a rare human pathogen,⁴ particularly in regards to pleuropulmonary infection, with only five cases worldwide reported in the literature,^{3,4,9-11} none of which occurred in Australia (Table 1). However, it has also been noted based on case reports (from Germany,⁴ Canada,¹³ and the USA¹⁴) that the incidence of *C. sordellii* infection is increasing, although exact numbers are uncertain^{6,12}.

C. sordellii has also been reported in numerous human case studies to cause a variety of clinical manifestations, including myonecrosis, gynecological infections, septic arthritis, and bacteremia,¹⁵ with a high recorded mortality rate of 70%.⁴ Risk factors for developing infection in

Reference	Year Reported	Geographic Location	Clinical Data
3	1977	USA	55-year-old male presented with acute onset cough, hemoptysis, left pleuritic chest pain and shortness of breath; history of rheumatic heart disease; diagnosed with pneumonia and empyema; recovered 50 days post-admission after treatment with IV penicillin G and carbenicillin.
9	1987	USA	61-year-old male presented with congestive heart failure; history of valvular heart disease; diagnosed with empyema and infective endocarditis; recovered 57 days post-admission after treatment with IV penicillin.
10	1991	USA	95-year-old female presented with severe chest pain; diagnosed with empyema; died of unknown causes after failed treatment with IV metronidazole and clindamycin (later substituted with vancomycin).
11	2007	Greece	56-year-old male, diagnosed with left sided post-pneumonic empyema.
4	2009	Germany	59-year-old male presented with hypotension, abdominal pain and respiratory failure; history of metastatic colorectal cancer; diagnosed with empyema and bacteremia; outcome unreported after treatment with Piperacillin/Tazobactam.

Table 1. Previously Reported *C. sordellii* Pleuropulmonary Infections

clude surgical (including gynecological) procedures, injecting drug use, penetrating/crush/traumatic soft tissue injury, and comorbidities such as cirrhosis, malignancy, and immunosuppression.¹ The pathogenesis of *C. sordellii* infection is still being characterized, however studies have revealed that it produces several exotoxins, some which share similarities with those produced by *Clostridium difficile* (*C. diffi-*

cile).⁶ One study has identified the TcsL toxin in some strains of *C. sordellii* as possibly contributing to the high mortality rate associated with *C. sordellii* infection.⁶

Clinical manifestations of *C. sordellii* infection include initial presentation with nausea, lethargy, and dizziness, but the patient is usually afebrile.¹ There are distinctive features of the

rapid clinical progression associated with this infection, including a marked leukocytosis, refractory hypotension, severe tachycardia, profound capillary leak syndrome, hemoconcentration, and a persistent absence of fever.^{1,2} These features are consistent with the presentation of the subject of this case report, who had initial nausea, was afebrile, progressed to hypotension within hours of admission, and had a recorded leukocytosis.

Previous studies have been unable to determine a definitive mode of infection transmission and development for *C. sordellii*-induced pleuropulmonary infections, however aspiration of oropharyngeal flora or bacteremic seeding of the lung by contaminants have been proposed as possible mechanisms.¹⁰ In the case of this patient, it is possible that either aspiration or bacteremic seeding of the lung occurred during endoscopy, or inhalation whilst cleaning of the chicken coop, introducing *C. sordellii* as an infective agent in the lungs.

Due to the rapid clinical progression and unusual clinical presentation of *C. sordellii* infection, management can be challenging as little has been documented regarding what is appropriate.¹ Successful management of *C. sordellii* bacteremia has been reported with penicillin G (benzylpenicillin), metronidazole, cefoxitin, and clindamycin, depending on susceptibilities,¹⁵ however resistance to aminoglycosides and sulphonamides has been documented. Although limited data exists, in cases of pleuropulmonary *C. sordellii* infections IV penicillin G has achieved the best clinical outcomes to date (Table 1). The potential for adjunctive antibiotics to suppress toxin synthesis needs to be investigated.¹ In this case, the only antibiotic *C. sordelli* was reported susceptible to was metronidazole. In addition to medication, supportive measures such as intravenous fluids to control hypotension and tachycardia, as well as surgical removal of necrotic tissues where applicable,

are important components of management.¹

In conclusion, although it is a rare human pathogen, *C. sordellii* is an important consideration given the associated high mortality rate and its increasing incidence globally. This case report highlights a significant occurrence of *C. sordellii* infection in Australia. With no known documented Australian cases of human *C. sordellii* bacteremia to date, we hope that this case will serve as a stimulus for further research into the prevalence of *C. sordellii* in Australia. In addition, given that this is potentially only the sixth pleuropulmonary *C. sordellii* infection reported in the medical literature, further studies into the pathogenesis, mode of transmission, and management of this organism will help inform future clinical practice on a global scale.

LEARNING POINTS

- *Clostridium sordellii* is an uncommon human pathogen associated with a high mortality rate
- Clinically *C. sordelli* initially manifests as nausea, lethargy, and persistent absence of fever, progressing rapidly to a marked leukocytosis, refractory hypotension, severe tachycardia, and profound capillary leak syndrome.
- Risk factors include exposure to contaminated soil, animal feces, or human gut flora.

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