

Case Report

Anaerobiospirillum succiniciproducens bacteraemia in a patient with acute lymphoblastic leukaemiaM. N. Fadzilah,¹ L. J. Faizatul,¹ M. S. Hasibah,¹ I.-C. Sam,¹
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Accepted 21 September 2008A 17-year-old man with acute lymphoblastic leukaemia had fever and diarrhoea during a febrile neutropenic episode. A spiral-shaped, Gram-negative anaerobic bacterium was isolated from blood, and confirmed as *Anaerobiospirillum succiniciproducens* by 16S rRNA sequencing. The patient responded to imipenem.

Introduction

The species *Anaerobiospirillum* was described for the first time by Davis *et al.* (1976), and comprises a group of spiral-shaped, Gram-negative anaerobic bacteria. They are motile, with bipolar tufts of flagella, and are present in the faeces of healthy cats and dogs (Rossi *et al.*, 2008). *Anaerobiospirillum succiniciproducens* has been reported as a rare cause of bacteraemia, particularly in immunocompromised hosts (Tee *et al.*, 1998; Pienaar *et al.*, 2003), and diarrhoeal illness (Malnick *et al.*, 1990). As gastrointestinal symptoms are the most common accompanying symptoms of bacteraemia, the gastrointestinal tract is believed to be the portal of entry (McNeil *et al.*, 1987). We describe a case of *A. succiniciproducens* bacteraemia in a 17-year-old Chinese man with acute lymphoblastic leukaemia.

Case report

The patient, who was on chemotherapy, presented with generalized weakness and an erythematous rash over his arms. His blood count showed pancytopenia, with a total white count of $<0.1 \times 10^9 \text{ l}^{-1}$. On the third day of his admission, he developed a fever of 38.8 °C and diarrhoea, and was empirically treated with piperacillin–tazobactam. Three sets of blood cultures (BACTEC 9240; Becton Dickinson), but no stool sample, were collected.

A spiral-shaped, Gram-negative bacillus was grown from a single anaerobic bottle, drawn from the white lumen of an intravascular catheter (Fig. 1). The isolate only grew after 48 h under anaerobic conditions at 37 °C on 5% sheep blood agar and fastidious anaerobic agar (Oxoid). Colonies were translucent and non-haemolytic, with a feathery

swarming appearance. There was no growth on Skirrow supplemented plates (Oxoid) incubated under microaerophilic conditions for *Campylobacter*. Antibiotic susceptibility testing of anaerobes is not routinely performed in our laboratory due to lack of suitable media, but the metronidazole disc used to screen for anaerobes showed no zone of inhibition. The isolate was negative for oxidase and catalase. Rapid ID 32A (bioMérieux) identified the isolate as *A. succiniciproducens*.

To confirm the identity of the isolate, 16S rRNA sequencing was performed, as previously described (Misbah *et al.*, 2005). Sequences were aligned and edited with Sequencher 4.0.5 (Gene Codes). The resulting consensus sequence of the partial 16S rRNA gene, containing 1427 nucleotides, was compared to other sequences in the GenBank database. The closest match was with the type strain *A. succiniciproducens* ATCC 29305^T (99.8%), followed by two unidentified *Anaerobiospirillum* species isolated from dogs (96.3%) and *Anaerobiospirillum thomasi* (92.6%). The *A. succiniciproducens* sequence from this study has been deposited in GenBank under the accession number EU863654. The patient improved only

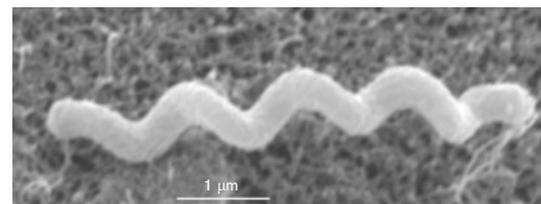


Fig. 1. Scanning electron micrograph of *A. succiniciproducens* showing a spiral shaped organism with polar multitrichous flagella.

The GenBank/EMBL/DBJ accession number for the 16S rRNA sequence of the *A. succiniciproducens* described is EU863654.

after therapy was switched to imipenem and vancomycin. He was discharged after a total hospital stay of 13 days.

Discussion

Two species of *Anaerobiospirillum*, *A. succiniciproducens* and *A. thomasi*, are known to infect humans and are associated with diarrhoea (Malnick, 1997). *Anaerobiospirillum* species are part of the normal intestinal flora of cats and dogs, but apparently not of humans (Malnick *et al.*, 1990; Rossi *et al.*, 2008). It has been suggested that *Anaerobiospirillum* species are zoonotic bacteria transmitted to humans from animals, and that they are underdiagnosed because human stool samples are not routinely screened for these organisms (Malnick *et al.*, 1990). The patient had no direct contact with animals, although he reported that his neighbour had a cat.

A. succiniciproducens is also rarely associated with bacteraemia, with about 30 case reports from USA, Europe, Africa and Asia, suggesting a global distribution. Almost all reported bacteraemia cases have occurred in patients with underlying medical conditions such as alcoholic liver disease, atherosclerosis, recent surgery and malignancies (McNeil *et al.*, 1987; Goddard *et al.*, 1998; Pienaar *et al.*, 2003).

Screening of the isolate in this case with a metronidazole disc suggested resistance to this drug. Other studies have found that *A. succiniciproducens* is often resistant to metronidazole and erythromycin (McNeil *et al.*, 1987; Yuen *et al.*, 1989; Tee *et al.*, 1998; Pienaar *et al.*, 2003), antibiotics that are empirically used for suspected infections with anaerobes and *Campylobacter* species, respectively. Thus, it is important for diagnostic laboratories to identify *A. succiniciproducens*, and especially to distinguish it from *Campylobacter* species, which have a similar Gram stain and colony appearance, but are oxidase and catalase positive. Isolation on Skirrow media is not specific for *Campylobacter* species, as some strains of *A. succiniciproducens* may grow (Malnick *et al.*, 1990). Commercial identification systems using biochemical tests may help, and 16S rRNA sequencing is definitive.

The optimal treatment for *A. succiniciproducens* is not yet known, with some reported patients dying despite treatment with antibiotics to which the bacteria showed *in vitro* susceptibility, and some recovering without specific

treatment (McNeil *et al.*, 1987; Tee *et al.*, 1998). Our patient did not respond to piperacillin–tazobactam, but did respond to imipenem, to which *A. succiniciproducens* has shown *in vitro* susceptibility in the few studies that have tested for it (Tee *et al.*, 1998; Pienaar *et al.*, 2003).

In conclusion, we have described what is believed to be the second Asian case of *A. succiniciproducens* bacteraemia. Improved awareness and diagnosis of this rarely encountered organism will help further understanding of its epidemiology and treatment.

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