

First description of an *Anaerobiospirillum succiniciproducens* prosthetic joint infection

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Abstract

Anaerobiospirillum succiniciproducens belongs to the normal flora of cats and dogs and can rarely infect humans. Here, we report the first case of an *A. succiniciproducens* prosthetic joint infection.

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Introduction

The genus *Anaerobiospirillum* was first described in 1976 and consists of *Anaerobiospirillum thomasi* and *Anaerobiospirillum succiniciproducens* [1]. They are Gram-negative, anaerobic, motile, spiral-shaped rods and are part of the normal gastrointestinal flora of dogs and cats. Animals are suspected to be the source of infections in humans [2]. So far, 61 infections (e.g. gastrointestinal, bacteraemia) have been reported. The mortality from *Anaerobiospirillum* sp. bacteraemia can reach up to 30% [3].

Here, we report the first case of a prosthetic joint infection by *A. succiniciproducens*.

Case report

A 71-year-old man with multiple co-morbidities (coronary heart disease, chronic kidney disease, morbid obesity, hyperlipoproteinaemia, atrial fibrillation) was admitted with a peri-prosthetic joint infection of the right knee.

The total knee arthroplasty was implanted 14 years ago and was replaced twice (12 and 7 years ago) due to periprosthetic *Escherichia coli* and *Pseudomonas aeruginosa* infections. The patient reported several cat bites in the past. On admission, the patient was afebrile (36.5°C); the pulse (90/min) and blood pressure (112/64 mmHg) were normal. Leucocytes (14 800/μL) and C-reactive protein (44 mg/dL) were elevated.

The infected prosthesis was removed including the infected tissue (distal femur, proximal tibia). An antimicrobial-coated spacer (vancomycin, gentamicin, clindamycin) was implanted and three samples of the periprosthetic tissue were sent for microbiological culture.

The specimen showed no growth before and after enrichment in brain–heart infusion broth for 10 days. After enrichment in thioglycollate medium (with vitamin K1 and haemin, BBL™; BD, Sparks, MD, USA), anaerobic culture at 37°C on Columbia blood agar and Schaedler agar (both containing 5% sheep blood; BD) yielded small, white, flat, irregular, entire colonies in two of the three tissue samples after 48 h. Gram-staining revealed irregular, screw-shaped Gram-negative rods of different sizes. Species identification with matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS; Bruker Daltonics, Bremen, Germany) failed with and without formic acid extraction (identification scores were 1.4 and 1.2, respectively). *Anaerobiospirillum succiniciproducens* was identified using 16S rRNA gene sequencing and The Ribosomal Database Project (RDP) (<http://rdp.cme.msu.edu>,

similarity score: 100%, reference strain: ATCC 29305, GenBank accession number: U96412.1) [4]. Despite the screw-shaped morphology, *Anaerobiospirillum* sp. are related to the genera *Aeromonas*, *Tolomonas* and *Ruminobacter* rather than to *Campylobacter*, *Borrelia* or *Treponema* (see Supplementary material, Fig. S1).

Empirical therapy with vancomycin (750 mg intravenous, twice daily), rifampicin (450 mg intravenous, twice daily) and clindamycin (600 mg intravenous, thrice daily) was switched to oral amoxicillin/clavulanic acid (875/125 mg, twice daily) for 4 weeks according to antimicrobial susceptibility testing (Table 1).

Two blood cultures taken immediately after admission showed no growth after 7 days.

The patient gave oral informed consent to report his case. Our institutional review board does not request ethical approval to report clinical cases.

TABLE 1. Susceptibility of an *Anaerobiospirillum succiniciproducens* isolate to different antibiotics using a gradient diffusion method

Antibiotic	Median MIC ^a , g/L	Category ^b
Benzylpenicillin	0.5	I ^c /S ^d
Ampicillin	0.38	S ^{c,d}
Ampicillin/sulbactam	0.38	S ^{c,d}
Piperacillin	8	S ^c
Piperacillin/tazobactam	6	S ^{c,d}
Cefoxitin	0.38	S ^d
Cephalothin	2	
Cefuroxime	0.38	
Ceftriaxone	0.064	S ^d
Cefepime	0.38	
Ceftobiprole	0.125	
Ceftaroline	0.75	
Ceftolozane/tazobactam	16	
Imipenem	0.064	S ^{c,d}
Meropenem	0.012	S ^{c,d}
Moxifloxacin	0.38	S ^d
Levofloxacin	0.5	
Ciprofloxacin	0.25	
Metronidazole	8	R ^c /S ^d
Clindamycin	24	R ^{c,d}
Chloramphenicol	0.38	S ^{c,d}
Tetracycline	1	S ^d
Tigecycline	0.032	
Rifampin	1	
Linezolid	24	
Trimethoprim/sulfamethoxazole	0.38	

Note: Susceptibility was tested using Etest (bioMérieux, Marcy l'Etoile, France), performed on Brucella blood agar with vitamin K and haemin according to the manufacturer's instructions. The results were read after a 24-h incubation and confirmed after a 48-h incubation at 35°C under anaerobic conditions.

^aMIC, minimum inhibitory concentration. The median value of three independent tests performed on different days is presented.

^bS, susceptible; I, intermediate; R, resistant (for antibiotics with available breakpoints).

^cInterpretation according to the European Committee on Antimicrobial Susceptibility Testing. Breakpoint tables for interpretation of MICs and zone diameters. Version 6.0, 2016.

^dInterpretation according to the Clinical and Laboratory Standards Institute (CLSI). Performance Standards for Antimicrobial Susceptibility Testing. M100-S26. 2016.

Discussion

Anaerobiospirillum succiniciproducens is a rare cause of a potentially zoonotic invasive disease (e.g. bacteraemia, abdominal infection) and mainly affects immunocompromised patients [3,5]. Here, we report the first case of an *A. succiniciproducens* prosthetic joint infection. Frequent cat bites in the past could have been the source of infection. The mainstay of the definite diagnosis is 16S rRNA gene sequencing. Evidence-based therapeutic recommendations do not exist but ampicillin/sulbactam and cephalosporins were shown to be effective in several reports [6].

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.nmni.2017.03.001>.

Conflict of interest

The authors declare no conflicts of interest.

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