

First case of bone infection caused by *Paenibacillus turicensis*

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Abstract

Paenibacillus spp. are bacteria present in the environment but are rarely isolated in humans. Here we report the first case of bone infection caused by *Paenibacillus turicensis* and a second case of human infection caused by this bacterium.

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Paenibacillus spp. have been isolated from various sources including soil, water, the plant rhizosphere, plant materials, food, fodder, faeces and diseased insect larvae [1], but they are not usually associated with clinical infection. Here we report the first case of bone infection caused by *Paenibacillus turicensis*, and we describe a second human infection due to this bacterium [2].

A 65-year-old man with a medical history of high blood pressure and arterial disease had a motorbike accident during a trip in Vientiane, Laos, in October 2014. He experienced fractures to both the tibia and fibula. He underwent surgical treatment in Vientiane (centromedullar nail), with 5 days' treatment with an unknown antibiotic agent. Late bone healing caused pain without fever, turgor or purulence. A second surgical procedure was performed in March 2015 in Marseille, France, with deep samples, ablation of the centromedullar nail and replacement with a new one. The culture was positive for Gram-positive bacteria, unidentified by conventional phenotypic methods (Vitek 2; bioMérieux, Marcy l'Étoile, France). The strain was sent to the La Timone laboratory in Marseille for 16S

rRNA gene amplification and sequencing. This isolate shared 99.7% sequence similarity with the reference sequence of *Paenibacillus turicensis* available in GenBank (HM069128.1). Antibiotic susceptibility testing by the diffusion method revealed susceptibility to amoxicillin, aminoglycosides, ciprofloxacin, rifampicin and vancomycin. Medical treatment was introduced for 6 months (amoxicillin 7 g per day) because of the impossibility of removing the osteosynthesis equipment. The outcome after 6 months' follow-up was favourable, with clinical and radiologic consolidation.

The name *turicensis* is an adjectival form of the word *Turicum*, the Latin name for Zurich, where the type strain was first isolated. This Gram-positive, facultative aerobic bacterium was first identified and described by Bosshard *et al.* [2] in 2002 from the valve of a cerebrospinal fluid shunt of a 48-year-old man with hydrocephalus. Since this discovery, *Paenibacillus turicensis* has not been cultured from another clinical sample. Nevertheless, this species was identified by 16S rRNA gene sequencing performed from unidentified growing colonies on samples from a paper mill environment in Finland (papermaking chemicals, broken plants and water) [3].

To our knowledge, only two cases of bone infections caused by *Paenibacillus* spp. have previously been described. One was a bone infection due to *P. thiaminolyticus* identified by 16S rRNA gene PCR on growing colonies from samples under anaerobic conditions, and the other was a case of sternitis caused by

P. pasadenensis identified by broad-range PCR on a culture-negative sample [4,5]. In their study, Siala *et al.* [6] used bacterial 16S rRNA gene primers in broad-range PCR to screen for the presence of bacterial DNA in culture-negative synovial fluid from patients with reactive and other forms of arthritis. *Paenibacillus* spp. was identified several times.

The increased number of recognized bacteria and of bacteria isolated in human samples is caused by two successive revolutions in the field of bacterial identification allowed by 16S rRNA amplification and sequencing [7] and more recently by the increasing use of matrix-assisted laser desorption/ionization time-of-flight mass spectrometry in clinical microbiology laboratories [8]. Online databases can help clinicians and microbiologists to assess the pathogenicity of unusual bacterial isolates (http://hpr.mediterranee-infection.com/arkotheque/client/ihu_bacteries/recherche/index.php) [9]. This case report reminds clinicians of the risk of bone infection from environmental bacteria.

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Conflict of Interest

None declared.

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