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Scientific letter

Posttraumatic arthritis in a 13-year-old male



Artritis postraumática en un paciente de 13 años

Dear Editor:

Osteomyelitis and septic arthritis can cause significant morbidity in children. Most of these infections occur due to hematogenous dissemination of microorganisms. A small proportion occurs after a trauma and differs from hematogenous cases in their clinical presentation and microbial etiology, as a consequence of a direct inoculation.¹ *Staphylococcus aureus*, *Enterobacter cloacae*, *Acinetobacter* spp. and *Pseudomonas aeruginosa* are the most reported posttraumatic arthritis pathogens in the literature.^{1–3} We report a posttraumatic arthritis caused by infrequent microorganisms.

A 13-year-old male arrived at the emergency department suffering from pain and right knee swelling. He fell down over a rocky terrain in a rural area two days before, causing a wound in his right knee.

Right knee examination showed warmth around the wound and loss of the range of motion. Radiographic findings were normal. The blood count showed a normal leukocyte count (WBC) but a high C-reactive protein (CRP) of 104.8 mg/l (normal range, <1.0 mg/l) and an erythrocyte sedimentation rate of 68 mm/h (<15.0 mm/h). The suspected diagnosis was post-traumatic septic arthritis. The patient was empirically treated with cefazolin (2 g/12 h).

A right knee arthrocentesis was performed. The fluid analysis showed 40,500 cells/mm³ with 82% neutrophils, 39.9 mg protein/dl and presence of Gram variable bacilli in the specimen's Gram stain. The same day, an arthroscopic debridement and irrigation was carried out.

Part of the fluid was inoculated onto chocolate and 5% sheep blood agars (bioMérieux, France). The plates were incubated at 37 °C with 5% CO₂. In 24 h, it grew up green, pale colonies. Additionally, in the following 48 h, it grew up mucoid colonies that became shade of salmon pink 5 days later.

The matrix-assisted laser desorption ionization-Time of flight mass spectrometry (MALDI-TOF MS) (Bruker Corporation, USA) identified the isolates as *Paenibacillus barcinonensis* and *Rhodococcus equi* (both log score values: 1.9). Identification was supported by Gram stain, colony characteristics and biochemical tests (CAMP-test). Antibiotic treatment was changed to vancomycin (950 mg/6 h).

P. barcinonensis showed susceptibility to vancomycin, sulfamethoxazole-trimethoprim and fluoroquinolones (CLSI criteria).⁴ *R. equi* showed susceptibility to vancomycin, erythromycin and fluoroquinolones (no-approved standards criteria).⁵ The treatment was switched to levofloxacin (500 mg/12 h) after a week of vancomycin.

The boy was discharged after 22 days in hospital with a full mobility recovery.

P. barcinonensis is a Gram-variable microorganism. This species takes its name from Barcelona, a city of Spain where it was first isolated.⁶ It is a saprophytic inhabitant of a large variety of sources (soil, water, etc.).⁷ In general, is considered a contaminant. Only three bone infection cases have been described by species of the genre *Paenibacillus* spp. (Table 1). As we can observe, skin and tissue disruption were underlying in these three bone infection cases. Telluric microorganisms, like *Paenibacillus* spp., are opportunistic pathogens that can cause infections when our natural barriers are broken.⁷ *Paenibacillus* spp. is resistant to ampicillin and susceptible to fluoroquinolones, gentamicin and vancomycin.^{7,8}

The second agent was *R. equi*. Its name derives from a pigment that grants a salmon-pink shade. *R. equi* is a Gram-positive coccobacillus and a well-known pathogen in veterinary medicine. It is microorganism widespread in the environment also. Its transmission is due to inhalation and usually causes a subacute pulmonary disease.⁹ The infection in immunocompetent people is uncommon.¹⁰ The highest prevalence of disease coincided with the HIV epidemic. Nowadays, thanks to the introduction of HAART, the incidence has changed substantially.⁹ To our knowledge, only few bone infections cases by *R. equi* have been reported in the literature, frequently in immunocompromised patients (Table 1). *R. equi* is susceptible to vancomycin, macrolides, aminoglycosides, fluoroquinolones and carbapenems.^{5,9}

In summary, both microorganisms are environmental and sometimes they are considered contaminant. However, we should know that in non-hematogenous osteoarticular infection, there is a larger variety of microorganisms than in the hematogenous one. This microbiology diversity highlights the importance of performing a detailed anamnesis, microbiologic diagnosis and adequate treatment. This case report emphasizes the importance of having a robust and rapid tool for routine identification. The correct antimicrobial treatment of the patient can be initiated early if the laboratory is provided of fast and accurate methods for microbiology identification, such as MALDI-TOF MS.

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Declarations of interest

None.

Table 1
Reported bone infections cases by *Paenibacillus* spp. and *Rhodococcus equi*.^{6–8,10}

Author (year)	Microorganism	Infection	Gender, age	Condition	ID method	Treatment (outcome)
Novak (1988)	<i>Rhodococcus equi</i>	Osteomyelitis Pneumonia	Men, 57	Renal transplant recipient	Biochemical tests	Erythromycin + sulfamethoxazole/trimethoprim (curation)
Antinori (1992)	<i>Rhodococcus equi</i>	Osteomyelitis Pneumonia Brain abscess	Women, 25	HIV/AIDS	Biochemical tests	Rifampicin + ciprofloxacin (curation)
Verville (1994)	<i>Rhodococcus equi</i>	Knee arthritis	Men, 4	Previous puncture wound	Biochemical tests	Cefazolin (curation)
Bouchou (1995)	<i>Rhodococcus equi</i>	Mandibular osteitis	Women, 73	Horse breeder	Biochemical tests	Ciprofloxacin + rifampicin (curation)
Barsotti (1997)	<i>Rhodococcus equi</i>	Osteomyelitis Pneumonia Subcutaneous abscess	Men, 48	Renal transplant recipient	Biochemical tests	Netilmicin + ceftriaxone (curation)
Fischer (1998)	<i>Rhodococcus equi</i>	Osteomyelitis Pneumonia	Men, 39	Liver transplant recipient	Biochemical tests	Erythromycin + imipenem (curation)
Ouyang (2008)	<i>Paenibacillus thiaminolyticus</i>	Osteomyelitis	Men, 80	Permacath for haemodialysis	Biochemical tests 16S rRNA	Vancomycin + levofloxacin (curation)
Calista (2008)	<i>Rhodococcus equi</i>	Osteomyelitis Subcutaneous abscess	Women, 48	HIV/AIDS	Biochemical tests	Clarithromycin + levofloxacin (curation)
Anikpeh (2010)	<i>Paenibacillus pasadenensis</i>	Mediastinitis	Men, 79	Recent coronary operation and multiple sternal revisions	16S rRNA	Vancomycin + clindamycin + ciprofloxacin (curation)
Quénard (2016)	<i>Paenibacillus turicensis</i>	Osteomyelitis	Men, 65	Recent post-fracture surgery	16S rRNA	Amoxicillin (curation)
Current (2018)	<i>Rhodococcus equi</i> <i>Paenibacillus barcinonensis</i>	Knee arthritis	Men, 13	Previous puncture wound	Biochemical tests MALDI-TOF MS	Vancomycin + levofloxacin (curation)

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References

- McNeil JC, Vallejo JG, Hulten KG, Kaplan SL. Osteoarticular infections following open or penetrating trauma in children in the post-community-acquired methicillin-resistant *Staphylococcus aureus* era: the impact of *Enterobacter cloacae*. *Pediatr Infect Dis J*. 2018;37:1204–10. <http://dx.doi.org/10.1097/INF.0000000000001991>
- Johnson EN, Burns TC, Hayda RA, Hospenthal DR, Murray CK. Infectious complications of open type III tibial fractures among combat casualties. *Clin Infect Dis*. 2007;45:409–15. <http://dx.doi.org/10.1086/520029>
- Peng J, Ren Y, He W, Li Z, Yang J, Liu Y, et al. Epidemiological, clinical and microbiological characteristics of patients with post-traumatic osteomyelitis of limb fractures in southwest China: a hospital-based study. *J Bone Jt Infect*. 2017;2:149–53. <http://dx.doi.org/10.7150/jbji.20002>
- CLSI. Methods for antimicrobial dilution and disk susceptibility testing of infrequently isolated or fastidious bacteria. 3rd ed. Wayne, PA: Clinical and Laboratory Standards Institute; 2016. CLSI guideline M45.
- Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica. Control de calidad de bacteriología (B-2/07). Control Calidad SEIMC; 2007. <https://seimc.org/contenidos/ccs/analisisderesultados/2007/Bacte207.pdf> [accessed 17.06.19].
- Sánchez MM, Fritze D, Blanco A, Spröer C, Tindall BJ, Schumann P, et al. *Paenibacillus barcinonensis* sp. nov., a xylanase producing bacterium isolated from

a rice field in the Ebro River delta. *Int J Syst Evol Microbiol*. 2005;55:935–9. <http://dx.doi.org/10.1099/ijs.0.63383-0>

- Anikpeh YF, Keller P, Bloemberg GV, Grünfelder J, Zinkernagel AS. Spacecraft bacterium, *Paenibacillus pasadenensis*, causing wound infection in humans. *BMJ Case Rep*. 2010. <http://dx.doi.org/10.1136/bcr.06.2010.3058>
- Quénard F, Aubry C, Palmieri M, Edouard S, Parola P, Lagier J-C. First case of bone infection caused by *Paenibacillus turicensis*. *New Microb New Infect*. 2016;11:45–6. <http://dx.doi.org/10.1016/j.nmni.2016.02.004>
- Yamshchikov AV, Schuetz A, Lyon GM. *Rhodococcus equi* infection. *Lancet Infect Dis*. 2010;10:350–9. [http://dx.doi.org/10.1016/S1473-3099\(10\)70068-2](http://dx.doi.org/10.1016/S1473-3099(10)70068-2)
- Lin WV, Kruse RL, Yang K, Musher DM. Diagnosis and management of pulmonary infection due to *Rhodococcus equi*. *Clin Microbiol Infect*. 2019;25:310–5 [in press].

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