First Report of *Nocardia asiatica* Olecranon Bursitis in an Immunocompetent Traveler Returning to Austria

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***Nocardia* spp. are rarely isolated in extrapulmonary clinical specimens. We describe the first case of olecranon bursitis caused by *Nocardia asiatica*. The patient, a traveler returning from Thailand, was successfully treated with linezolid.**

CASE REPORT

A 66-year-old previously healthy male patient presented to the department of traumatology at the Medical University of Graz because of painful swelling on his left elbow. Four weeks prior to admission, the patient was involved in a motorbike accident in Thailand and suffered from an open wound on his left elbow. Wound care was performed in a hospital in Thailand. Initially the wound had healed well, but shortly before presentation, the painful swelling occurred. Blood work on admission revealed a C-reactive protein (CRP) level of 26.4 mg/liter (normal range, <8) and a white blood count (WBC) of 11.45×10^3 /liter with 64% neutrophils. Olecranon bursitis was clinically diagnosed. The patient underwent bursectomy and was empirically treated with oral amoxicillin-clavulanic acid (875 mg/125 mg) twice daily.

Histology from the resected bursa revealed putrid bursitis. Intraoperative specimens were obtained for microbiological workup. After 48 h of incubation at 35°C, small chalky white colonies emitting an earthy odor appeared on blood and chocolate agar. Gram stain showed filamentous branching Gram-positive rods. Further modified Kinyoun acid-fast stain using weak acid (1% sulfuric acid) showed partially acid-fast filamentous branching rods identified due to their morphological and staining properties as *Nocardia* spp. For species identification, 16S rRNA gene sequencing using universal eubacterial primers was carried out. A BLAST search (www.ncbi.nlm.nih.gov/BLAST) of the sequence obtained (1,500 bp) was performed by using the taxonomy browser of the National Center of Biotechnology Information (www.ncbi.nlm.nih.gov). Homology of 99% (1,499/1,500 bp) was achieved with the sequence of *Nocardia asiatica* published by Kageyama et al. (1). Additionally, susceptibility testing was performed with the Etest method (bioMérieux, Marcy l'Étoile, France) according to the manufacturer's instructions. The *Nocardia asiatica* isolate was subcultured twice on sheep blood agar plates and, after 72 h, inoculated into broth to a turbidity of 1.0 McFarland standard as measured with the densitometer (Densimat; bioMérieux, Marcy l'Étoile, France) (1,2). The inoculum was spread on Mueller-Hinton (MH) agar with 5% sheep blood containing various antimicrobial agents, including benzylpenicillin, amoxicillin, amoxicillin-clavulanic acid (ratio of 2:1), ceftriaxone, imipenem, meropenem, ciprofloxacin, moxifloxacin, clarithromycin, clindamycin, tetracycline, tobramycin, trimethoprim, trimethoprim-sulfamethoxazole (ratio of 1:19), amikacin, and lin-

ezolid. The MICs were read after 72 h of incubation at 35°C in ambient air and interpreted according the CLSI guidelines, although the Etest method is a non-CLSI-recommended method (2, 3, 4). The MIC results are shown in Table 1.

After susceptibility testing was available, the antimicrobial treatment was modified to oral trimethoprim-sulfamethoxazole (160 mg/800 mg) twice daily and amoxicillin-clavulanic acid was discontinued after a total of 4 days. Over the next 10 days, renal function constantly decreased and treatment was switched from trimethoprim-sulfamethoxazole to oral linezolid (600 mg) twice daily. Linezolid was chosen because it was the only available agent for oral outpatient treatment. After that, the renal function tests normalized. Because the pain persisted, a second operation was performed, revealing a glass splinter measuring 0.5 by 1.2 cm. After the splinter was removed, the pain disappeared, and antimicrobial treatment was discontinued after a total of 30 days (10 days of trimethoprim-sulfamethoxazole and 20 days of linezolid). To date, the patient has had no relapse.

The genus *Nocardia* is a member of the family *Nocardiaceae* belonging to the order *Actinomycetales*. More than 50 species of these environmental bacteria are described, which can be found in soil and other organic matter. *Nocardia* spp. are Gram-positive filamentous branching bacteria that grow aerobically, have a typical earthy odor, and show partial acid fastness when stained with modified Kinyoun stain (5, 6). Identification to the species level is challenging, although a battery of tests have been established, including resistance profiles and biochemical characteristics (7). Sequencing of the 16S rRNA gene has become a valuable tool for the identification of clinical isolates (6). In this case, *Nocardia asiatica* was identified after 16S rRNA sequencing. Further phenotypic testing of the isolate was done as described by Kiska et al. and led to

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TABLE 1 Antimicrobial susceptibilities of *Nocardia asiatica*

Antimicrobial agent	Etest MIC range (μg/ml)	MIC (μg/ml)	Tentative interpretation ^a
Benzylpenicillin	0.016–256	>32	NA
Amoxicillin	0.016–256	1	NA
Amoxicillin-clavulanic acid (2:1) ^b	0.016–256	>256	R
Ceftriaxone	0.016–256	0.5	S
Imipenem	0.002–32	0.25	S
Meropenem	0.002–32	0.75	NA
Ciprofloxacin	0.002–32	>32	R
Moxifloxacin	0.002–32	>32	R
Clarithromycin	0.016–256	>256	R
Clindamycin	0.016–256	>256	NA
Tetracycline	0.016–256	2	NA
Tobramycin	0.016–256	4	S
Trimethoprim	0.002–32	32	NA
Trimethoprim-sulfamethoxazole (1:19) ^b	0.002–32	0.5	S
Amikacin	0.016–256	0.5	S
Linezolid	0.016–256	0.5	S

^a Interpretation is according to Clinical and Laboratory Standards Institute document M24-A2, 2011. R, resistant; S, susceptible; NA, interpretation not available.

^b Ratio of the components.

the following findings (7): susceptibility testing by disk diffusion with gentamicin, tobramycin, amikacin, and erythromycin led to the profile S-S-S-R (S, susceptible; R, resistant) for the respective drugs; for biochemical characteristics, the Coryne Api (bioMérieux) was applied, and the bio number obtained after 72 h of incubation at 35°C was 3042321; growth was detected at 35°C but not at 45°C; and the culture stayed chalky white after 5 days of incubation.

Nocardia spp. are in general described as opportunistic pathogens causing mainly pulmonary nocardiosis in immunocompromised patients. The most-common extrapulmonary location of infections is the central nervous system. Skin and soft tissue nocardiosis can result from traumatic injury to the skin involving contamination with soil (5, 8). This is the second case of a *Nocardia* bursitis but the first case with *Nocardia asiatica* identified as the infectious agent. In 1988, Chowdhary et al. described the first case, which was an olecranon bursitis caused by *Nocardia asteroides* in an immunocompetent patient (9).

Nocardia asiatica was first described by Kageyama et al., who reported five cases, three from Thailand and two from Japan (1). We report for the first time *Nocardia asiatica* as a cause of olecranon bursitis in an immunocompetent patient. Furthermore, this is only the third report of the isolation of *Nocardia asiatica* in Europe, even if the source of infection was Thailand. The first European case was reported from Italy in 2007, describing an isolate from a cutaneous ulcer in an immunocompromised gardener; the second, from Belgium, described a pulmonary nocardiosis in an asthmatic immunocompetent patient living in Belgium for 1.5 years and originating from Colombia (10, 11). Furthermore, there is a case from Lebanon describing an infection with *Nocardia asiatica* presenting as an anterior mediastinal mass in a patient with myasthenia gravis and a history of medical treatment in Iraq and India (12).

In this case, empirical antimicrobial therapy with amoxicillin-clavulanic acid failed. Antimicrobial susceptibility testing showed resistance to this agent, as well as to quinolones and to macrolides, which seems to be a characteristic profile for *Nocardia asiatica* as recently reported (2, 11, 13). For the treatment of nocardiosis, trimethoprim-sulfamethoxazole is the most commonly used antimicrobial agent (5, 8, 13). Due to renal complications, therapy was successfully switched to linezolid, as described previously (14).

This is the first report of an olecranon bursitis in an immunocompetent patient caused by *Nocardia asiatica*. This case highlights that clinicians should consider atypical agents in travelers and the importance of microbiological diagnostic procedures.

Nucleotide sequence accession number. The 16S rRNA gene sequence of the isolate was deposited in GenBank under accession number [KC333452](#).

REFERENCES

- Kageyama A, Poonwan N, Yazawa K, Mikami Y, Nishimura K. 2004. *Nocardia asiatica* sp. nov., isolated from patients with nocardiosis in Japan and clinical specimens from Thailand. *Int. J. Syst. Evol. Microbiol.* 54: 125–130.
- Glupczynski Y, Berhin C, Janssens M, Wauters G. 2006. Determination of antimicrobial susceptibility patterns of *Nocardia* spp. from clinical specimens by Etest. *Clin. Microbiol. Infect.* 12:905–912.
- Clinical and Laboratory Standards Institute (CLSI). 2011. Susceptibility testing of *Mycobacteria*, *Nocardiae*, and other aerobic *Actinomycetes*; approved standard—second ed. CLSI document M24-A2. CLSI, Wayne, PA.
- Lowman W, Aithma J. 2010. Antimicrobial susceptibility testing and profiling of *Nocardia* species and other aerobic actinomycetes from South Africa: comparative evaluation of broth microdilution versus the Etest. *J. Clin. Microbiol.* 48:4534–4540.
- Wilson JW. 2012. Nocardiosis: updates and clinical overview. *Mayo Clin. Proc.* 87:403–407.
- Brown-Elliott BA, Brown JM, Conville PS, Wallace RJ, Jr. 2006. Clinical and laboratory features of the *Nocardia* spp. based on current molecular taxonomy. *Clin. Microbiol. Rev.* 19:259–282.
- Kiska DL, Hicks K, Pettit DJ. 2002. Identification of medically relevant *Nocardia* species with an abbreviated battery of tests. *J. Clin. Microbiol.* 40:1346–1351.
- Minero MV, Marin M, Cercenado E, Rabadan PM, Bouza E, Munoz P. 2009. Nocardiosis at the turn of the century. *Medicine (Baltimore)* 88: 250–261.
- Chowdhary G, Wormser GP, Mascarenhas BR. 1988. Nocardia bursitis. *J. Rheumatol.* 15:139–140.
- Iona E, Giannoni F, Brunori L, de Gennaro M, Mattei R, Fattorini L. 2007. Isolation of *Nocardia asiatica* from cutaneous ulcers of a human immunodeficiency virus-infected patient in Italy. *J. Clin. Microbiol.* 45: 2088–2089.
- Verfaillie L, De Regt J, De Bel A, Vincken W. 2010. *Nocardia asiatica* visiting Belgium: nocardiosis in an immunocompetent patient. *Acta Clin. Belg.* 65:425–427.
- El-Herte RI, Kanj SS, Araj GF, Chami H, Gharzuddine W. 2012. First report of *Nocardia asiatica* presenting as an anterior mediastinal mass in a patient with myasthenia gravis: a case report and review of the literature. *Case Rep. Infect. Dis.* 2012:325767. doi:10.1155/2012/325767.
- Lai CC, Liu WL, Ko WC, Chen YH, Tan HR, Huang YT, Hsueh PR. 2011. Multicenter study in Taiwan of the *in vitro* activities of nemonoxacin, tigecycline, doripenem, and other antimicrobial agents against clinical isolates of various *Nocardia* species. *Antimicrob. Agents Chemother.* 55: 2084–2091.
- Moylett EH, Pacheco SE, Brown-Elliott BA, Perry TR, Buescher ES, Birmingham MC, Schentag JJ, Gimbel JF, Apodaca A, Schwartz MA, Rakita RM, Wallace RJ, Jr. 2003. Clinical experience with linezolid for the treatment of nocardia infection. *Clin. Infect. Dis.* 36:313–318.