Erwinia billingiae as Unusual Cause of Septic Arthritis, France, 2017

Isabelle Bonnet, Baptiste Bozzi, Eric Fourniols, Stéphane Mitrovic, Olivia Soulier-Escrichuela, Florence Brossier, Vladimir Sougakoff, Jérôme Robert, Stéphane Jaurégui-Berry, Alexandra Aubry, on behalf of the Pitié-Salpêtrière Infection Ostéo-articulaire group

Author affiliations: Assistance Publique–Hôpitaux de Paris, Hôpitaux Universitaires Pitié Salpêtrière–Charles Foix, Paris, France (I. Bonnet, B. Bozzi, E. Fourniols, S. Mitrovic, O. Soulier-Escrichuela, F. Brossier, W. Sougakoff, J. Robert, S. Jaurégui-Berry, A. Aubry); Sorbonne Université, Cimi-Paris, U1135, Paris (I. Bonnet, F. Brossier, W. Sougakoff, J. Robert, A. Aubry)

DOI: https://doi.org/10.3201/eid2508.181073

In 2017 in France, we treated a patient with knee septic arthritis caused by Erwinia billingiae after trauma involving a palm tree. This rare pathogen could only be identified through 16S rRNA gene sequencing. For bacterial infections after injuries with plants, 16S rRNA gene sequencing might be required for species identification.

The prevalence of acute septic arthritis in Western Europe is ≈4–10 cases/100,000 inhabitants (1). We report a case of posttraumatic knee septic arthritis in an immunocompetent patient in France that was caused by Erwinia billingiae, a gram-negative environmental bacterium of the family Enterobacteriaceae. We also review the characteristics of Erwinia species and infections.

On April 9, 2017, a 65-year-old man with an unremarkable medical history was admitted to an emergency unit in Nice, southern France, for painful right knee swelling that occurred a few hours after a Phoenix palm tree needle pierced the area. The foreign body was partly removed, and the wound was sutured. The patient was discharged with a prescription for amoxicillin/clavulanic acid (1 g 3×/d for 6 d).

On April 22, the patient was admitted to the emergency unit of our hospital in Paris because of sudden right knee pain and fever. Synovial fluid collected by knee puncture the day of his admission to the orthopedic unit (April 23) contained 118 × 10⁹ leukocytes/L, consisting of 64% polymorphonuclear cells, 33% lymphocytes, and 3% other leukocytes; no microorganisms could be identified after Gram staining and cultures. A second knee puncture was performed 3 days after admission, and gram-negative rods grew within 2 days solely within the anaerobic blood culture vial (BacT/ALERT SN; bioMérieux, https://www.biomerieux.com). Subcultures of the blood culture vial were positive after 24 hours of incubation at 37°C on blood agar (Trypticase Soy agar + 5% horse blood and Mueller Hinton 2 agar + 5% sheep blood; bioMérieux) and Drigalski agar (BD, https://www.bd.com) under aerobic conditions and chocolate agar (BD) under microaerobic conditions.

Matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry (Bruker Daltonik, https://www.bruker.com) was performed on colonies and failed to correctly identify the species. Therefore, we performed species identification by 16S rRNA amplification and sequencing with primers RNA-S (16S, 5′-AGAGTTTGACTCCTGGGYTCAG-3′) and RNA-AS (16AS, 5′-CTCACGCCCCARTAAWTCCG-3′) at a hybridization temperature of 52°C. We amplified a 521-bp sequence that matched the E. billingiae genome of 2 isolates with 99.4% similarity (GenBank accession nos. JQ929658 and JN175337). Other closely related species displayed lower similarities: Pantoea rwandensis (99.0%), Erwinia persicina (98.9%), Pantoea coffeiphila (98.7%), Erwinia tasmaniensis (98.5%), and Erwinia aphidicola (98.3%). Following guidelines of the Antibiotic Committee of the French Society for Microbiology (https://www.sfm-microbiologie.org/2019/01/07/casfm-eucast-2019), we tested the E. billingiae isolate with the antimicrobial drugs recommended for Enterobacteriaceae; the isolate was susceptible to all these drugs, including ampicillin.

Because of the lack of clinical improvement, the joint was washed on day 6 after admission. After this intervention, an empiric antimicrobial drug treatment was started with amoxicillin/clavulanic acid (2 g 3×/d intravenously). Once results of drug susceptibility testing became available (i.e., 10 days after admission), his treatment was switched to cefotaxime (2 g 3×/d intravenously) and ciprofloxacin (500 mg 2×/d orally for 8 d), followed by ciprofloxacin (500 mg 2×/d alone for 38 additional days). Total duration of treatment was 45 days. The clinical evolution of this patient was favorable; he fully recovered and had no relapses up to 1 year after treatment completion.

In the past, some members of the Erwinia genus were reassigned to the genera Enterobacter or Pantoea. Erwinia spp. are ubiquitous in the environment, especially in water ecosystems and soils. Plant-associated Erwinia species comprise epiphytic nonpathogenic (i.e., E. billingiae and E. tasmaniensis) and pathogenic (i.e., E. amylovora and E. pyrifoliae) species. The MALDI-TOF mass spectrometry system failed to identify the bacterium, even though E. billingiae is contained in the database for either method used (direct deposit or on-plate formic acid treatment). Future expansion of the database with more spectra will likely improve the performance of the MALDI-TOF mass
| Patient age, y/sex | Type of infection | Inoculated | Published (actual species name) | Identification method† | Antimicrobial drug; treatment duration | Surgery | Clinical evolution | Ref |
|-------------------|------------------|------------|---------------------------------|------------------------|----------------------------------------|---------|-------------------|-----|
| 65/F              | SSTI             | Yes        | *Erwinia* sp.                   | Biochemical            | Penicillin, then penicillin and sulfisoxazole; NA | Yes     | Recovered         | (2) |
| Adult/F           | Peritoneal dialysis fluid infection | No         | *Erwinia* strains of the lathyri-herbicola group | Biochemical            | NA; NA | No     | NA (3) |
| Adult/F           | SSTI             | Yes        | *Erwinia* strains of the lathyri-herbicola group | Biochemical            | Chloramphenicol; NA | No     | Recovered         | (3) |
| Adult/M           | SSTI             | Yes        | *Erwinia* strains of the lathyri-herbicola group | Biochemical            | Ampicillin; NA | No     | Recovered         | (3) |
| Adult/M           | Brain abscess    | No         | *Erwinia* strains of the lathyri-herbicola group | Biochemical            | NA; NA | Yes    | NA (3) |
| 17/F              | Bacteremia       | Yes        | *Erwinia* herbicola; (Pantoea agglomerans) | Biochemical            | Streptomycin and penicillin; NA | No     | Recovered         | (4) |
| 17/M              | Bacteremia       | Yes        | *E. herbicola* (P. agglomerans) | Biochemical            | Cephalothin; NA | No     | Recovered         | (4) |
| 28/M              | Bacteremia       | Yes        | *Erwinia* sp.                   | Biochemical            | Ampicillin then ampicillin and kanamycin; NA | Yes    | Recovered         | (4) |
| 57/M              | Brain abscess    | No         | *Erwinia* sp.                   | Biochemical            | Penicillin and streptomycin, then ampicillin, then chloramphenicol, then gentamicin; NA | Yes    | Recovered         | (5) |
| 70/M              | Endophthalmitis  | Yes        | *E. herbicola* (P. agglomerans) | Biochemical            | Cefazolin and gentamicin; 37 d until surgery (NA after surgery) | Yes    | Recovered         | (6) |
| 66/F              | UTI              | No         | *E. herbicola* (P. agglomerans) | Biochemical            | NA; NA | No     | Died (7) |
| 69/F              | UTI              | No         | *E. herbicola* (P. agglomerans) | Biochemical            | NA; NA | No     | Recovered (7) |
| 62/F              | UTI              | No         | *E. herbicola* (P. agglomerans) | Biochemical            | NA; NA | No     | Recovered (7) |
| 46/M              | Endocarditis     | No         | *E. herbicola* (P. agglomerans) | Biochemical            | Cefotaxime and netilmicin; 6 weeks | No     | Recovered (8) |
| 79/F              | Cervical lymphadenitis | No       | *Erwinia tasmaniensis* (E. tasmaniensis) | 16S rRNA‡ | Ciprofloxacin; 2 weeks | Yes    | Recovered (9) |
| 40/M              | Dermohypodermitis | Yes        | *Erwinia billingiae* (E. billingiae) | NA | Ciprofloxacin; 14 d | No     | Recovered (10) |

*NA: not available; ref: reference; SSTI, skin and soft tissue infection; UTI, urinary tract infection.
†Biochemical testing included Kligler iron agar (assess slant, butt, H₂S production), tests for carbohydrate fermentation (adonitol, fructose, galactose, glucose, inositol, lactose, maltose, mannitol, mannose, raffinose, ramnose, salicin, sorbitol, sucrose, xylose), ONPG (ortho-nitrophenyl-galactoside) test, gluconate test, gelatin hydrolysis test, tests for nitrate reduction and N₂ production, indole test, methyl red test, Voges–Proskauer test, casein hydrolysis test, citrate utilization test, urease test, catalase test, oxidase test, arginine dihydrolase test, lysine decarboxylase test, ornithine decarboxylase test, lipase test, amyrase test, pectinase test, deoxyribonuclease test, lecithinase test, salinity tests (2.5% NaCl, 10.0% NaCl [pH 5.6]), Tetrazolium-Formazan test (TTC [triphenyl tetrazolium chloride]), citrimide selection agar, tyrosinase test, and tests for carbohydrate assimilation (glucose, acetate, lactate, succinate).
‡E. tasmaniensis (98.9%), E. toletana (98.8%), and E. billingiae (98.1%) (EzTaxon Database, https://everipedia.org/wiki/lang_en/EzTaxon_Database).

spectrometry system for *E. billingiae* identification. Indeed, the database contains fewer spectra of *E. billingiae* (n = 4) than those of frequently encountered species in medical microbiological laboratories, such as *Escherichia coli* (n = 14) and *Staphylococcus aureus* (n = 10).

To further investigate *Erwinia* infections in humans, we reviewed reports available in PubMed published during 1967–2017 written in English by using the keywords “*Erwinia*” and “infection” (Table). Among the 17 cases reported, the sites of infection were diverse, and most (53%, 9/17) cases occurred after a direct inoculation during an injury with a plant (Table). We found no reports of osteoarticular infections with *Erwinia*; the only other *E. billingiae* case reported was a dermohypodermitis...
(Table). In that case, as in the case we report here, an injury with a plant was reported.

This case report illustrates the importance of the methods used for bacterial identification to correctly diagnose such infections. Biochemical methods (2–8) and MALDI-TOF mass spectrometry (as done in our investigation) could result in misidentification. This report highlights the usefulness of analyzing MALDI-TOF mass spectrometry scores before assigning a species identity and sequencing the 16S RNA gene for bacteria not identifiable by conventional methods.

Members of the Pitié-Salpêtrière Infection Ostéo-articulaire Group: Barut Nicolas, Calin Ruxandra, Clarençon Frédéric, Daas Georges, Fautrel Bruno, Fustier Anne, Gandjbakhch Frédérique, Haddad Elie, Khiami Frédéric, Lazennec Jean-Yves, Marchand Maxime, Mercy Guillaume, Metz Carole, Miu Mihaela, Monsel Gentiane, Monzani Quentin, Reubrecht Vanessa, and Zahr Noël.

About the Author
Dr. Bonnet is a clinical microbiologist in the Bacteriology Laboratory, Pitié Salpêtrière–Charles Foix University Hospital, in Paris, France. She is also part of research team 2 (Bacteriology), Centre d’Immunologie et des Maladies Infectieuses, Cimi-Paris, INSERM, U1135, Sorbonne Université, Paris, France. Her research interests relate to microbiology, especially antimicrobial drug resistance, mycobacteria, and infectious disease.

References
1. Mathews CJ, Weston VC, Jones A, Field M, Coakley G. Bacterial septic arthritis in adults. Lancet. 2010;375:846–55. http://dx.doi.org/10.1016/S0140-6736(09)61595-6
2. Slotnick IJ, Tulman L. A human infection caused by an Erwinia species. Am J Med. 1967;43:147–50. http://dx.doi.org/10.1016/0002-9343(67)90157-X
3. Gilardi GL, Bottone E, Bibbaum M. Unusual fermentative, gram-negative bacilli isolated from clinical specimens. I. Characterization of Erwinia strains of the “lathyri-herbicola group”. Appl Microbiol. 1970;20:151–5.
4. von Graevenitz A. Erwinia infection from environmental sources. JAMA. 1971;216:1485. http://dx.doi.org/10.1001/jama.1971.03180350061029
5. Wechsler A, Bottone E, Lasser R, Korenman G. Brain abscess caused by an Erwinia species: report of a case and review of the literature. Am J Med. 1971;51:680–4. http://dx.doi.org/10.1016/0002-9343(71)90294-4
6. Mason GI, Bottone EJ, Podos SM. Traumatic endophthalmitis caused by an Erwinia species. Am J Ophthalmol. 1976;82:709–13. http://dx.doi.org/10.1016/0002-9394(76)90007-6
7. Umenai T, Saitoh Y, Takano S, Shoji E, Tanaka K, Ishida N. Significance of Erwinia in the vagina as causative agents of urinary tract infections. Tohoku J Exp Med. 1979;129:103–4. http://dx.doi.org/10.1620/tjem.129.103
8. Williams AJK, Scott RJD, Lightfoot NF. Erwinia herbicola as a cause of bacterial endocarditis. J Infect. 1986;12:71–3. http://dx.doi.org/10.1016/S0140-6736(86)94978-9
9. Shin SY, Lee MY, Song J-H, Ko KS. New Erwinia-like organism causing cervical lymphadenitis. J Clin Microbiol. 2008;46:3156–8. http://dx.doi.org/10.1128/JCM.00716-08
10. Prod’homme M, Micol LA, Weitsch S, Gassend JL, Martinet O, Bellini C. Cutaneous infection and bacteraemia caused by Erwinia billingiae: a case report. New Microbes New Infect. 2017;19:134–6. http://dx.doi.org/10.1016/j.nmni.2017.07.006

Address for correspondence: Alexandra Aubry, AP-HP, Hôpitaux Universitaires Pitié Salpêtrière–Charles Foix, Bactériologie-Hygiène, 47-83 Boulevard de l’Hôpital, Paris 75013, France; email: alexandra.aubry@sorbonne-universite.fr

![Image]

Chikungunya Fever Outbreak, Zhejiang Province, China, 2017

Junhang Pan, Chunfu Fang, Juying Yan, Hao Yan, Bingdong Zhan, Yi Sun, Ying Liu, Haiyan Mao, Guoping Cao, Lei Lv, Yanjun Zhang, Enfu Chen

Author affiliations: Zhejiang Provincial Center for Disease Control and Prevention, Hangzhou, China (J. Pan, J. Yan, H. Yan, Y. Sun, Y. Liu, H. Mao, Y. Zhang, E. Chen); Quzhou Center for Disease Control and Prevention, Quzhou, China (C. Fang, B. Zhan, G. Cao, L. Lv)

DOI: https://doi.org/10.3201/eid2508.181212

We report a disease outbreak caused by chikungunya virus in Zhejiang Province, China, in August 2017. Phylogenetic analysis indicated that this virus belonged to the Indian Ocean clade of the East/Central/South African genotype and was imported by a traveler returning from Bangladesh.

Chikungunya fever is an arboviral disease transmitted between humans and through the bites of infected Aedes mosquitoes, specifically the species Ae. aegypti and Ae. albopictus (1). High fever, myalgia, polyarthralgia, and maculopapular rash are typical clinical symptoms of chikungunya fever. However, some chikungunya virus (CHIKV) infections have led to severe clinical symptoms, such as neurologic signs or fulminant hepatitis, which have had a serious effect on human health (2).

These authors contributed equally to this article.