

Letters to the Editor

Enteric Fever-Like Syndrome Caused by *Raoultella ornithinolytica* (*Klebsiella ornithinolytica*)[∇]

Raoultella ornithinolytica (formerly *Klebsiella ornithinolytica*) is a gram-negative aerobic bacillus in the family *Enterobacteriaceae*. This species has been related to histamine-producing bacteria causing subsequent fish poisoning (5). *R. ornithinolytica* has also been isolated from dentin of infected root canals (8). However, human infections caused by bacteria of the genus *Raoultella* are infrequent, and spontaneously occurring bacteremia cases have not been reported. Here, we present a case of enteric fever-like syndrome and bacteremia caused by *R. ornithinolytica*.

An 82-year-old woman with a history of arterial hypertension and degenerative arthropathy presented at the emergency service suffering from a fever (38°C) and hypotension (84/48 mm Hg). Previously, she had been complaining of subjective fever, hypogastric pain, dizziness, and profuse sweating. The patient's white blood cell count was 11,500 cells/mm³, her erythrocyte sedimentation rate was 30 mm/h, and her C-reactive protein level was 0.95 mg/ml. During her stay, she had a diarrheic episode. Blood and fecal samples were cultured, and antimicrobial therapy with 500 mg ciprofloxacin twice a day orally for 10 days was begun. After 24 h, blood cultures became positive, and a gram-negative bacillus was isolated. The isolated bacterium from blood was lactose, indole, and ornithine positive and was identified by the Wider system (Francisco Soria Melguizo S.A., Madrid, Spain) as *R. ornithinolytica*, biotype 77755370. Stool cultures yielded mucous colonies of a lactose-positive, gram-negative bacillus identified as *R. ornithinolytica* by an API-20E strip (bioMérieux, Marcy l'Etoile, France) with the code 5355773. CLSI standards were used for microdilution testing. Nalidixic acid and ciprofloxacin MICs were >16 mg/liter and 1 mg/liter, respectively. Treatment was changed to oral doses of amoxicillin-clavulanic acid (875 mg and 125 mg, respectively) every 8 h for 10 additional days. Four days after her admittance, symptoms resolved, the patient was considered cured, and antibacterial treatment was completed at home.

R. ornithinolytica has been isolated from the gut of fish, ticks, and termites and from estuarine water (2, 4, 7), and it has been shown to produce histamine, contributing to fish poisoning (1, 5, 6). Fish poisoning (scombroid syndrome) has been associated with the consumption of scombroid fish, such as tuna, bonito, sardine, and mackerel. *Klebsiella pneumoniae* and *Klebsiella oxytoca* are the best-known histamine-producing bacteria in fish. However, many of the histamine-producing bacteria from fish first identified as *K. pneumoniae* or *K. oxytoca* by commercialized systems were later correctly identified as *Raoultella planticola* by additional tests (5). *R. planticola* and *R. ornithinolytica* strains were equal in their histamine-producing capabilities and were determined to have the *hdc* genes, encoding histidine decarboxylase (5). Histamine (scombroid toxin) poisoning occurs when persons ingest fish in which the bacteria have converted histidine to histamine, a process that usually can be controlled by storage at low temperatures (1, 9). Scombroid syndrome has an incubation period of 1 min to 3 h after eating tuna or other fish and manifests with facial flushing, dizziness, vomiting, diarrhea, other gastrointestinal symp-

toms, dyspnea, headache, burning of the mouth, urticaria, and generalized pruritus (1, 9), but the symptoms usually resolve in a few hours. The patient could have presented with scombroid syndrome, as dizziness, hypogastric pain, and profuse sweating were present in the previous 48 h to admittance in the hospital and diarrhea appeared during her stay at the emergency room. Although fish is normally part of the Spanish diet, a direct relationship between ingestion of fish and the symptoms was not proved in this case.

In patients with the enteric fever-like syndrome, it is advisable to consider empirical antimicrobial therapy for typhoid fever before the diagnosis is confirmed by culture. *R. ornithinolytica* has been shown to be resistant in vitro to ampicillin and other commonly used antibiotics (3). This resistance can be associated with the presence of β -lactamases (10). The isolates in this study showed in vitro resistance to nalidixic acid (MIC, >16 mg/liter) and a marked decrease in sensitivity to ciprofloxacin (MIC, 1 mg/liter).

R. ornithinolytica bacteremia appeared to be limited and did not recur during therapy, and a course of antibiotic treatment for 10 to 14 days with amoxicillin-clavulanic acid seemed to be curative.

One limitation was that some of the less common *Enterobacteriaceae* species can probably be misidentified and the real importance of *R. ornithinolytica* as an enteric pathogen underestimated. Invasiveness associated with the presence of this bacterium in the bloodstream has not been described previously.

In conclusion, *Raoultella ornithinolytica* is an uncommon cause of enteric fever-like syndrome characterized by fever, headache, and abdominal pain that may be clinically indistinguishable from enteric fever caused by *Salmonella enterica* serovar Typhi or other salmonellae and should be included in the differential diagnosis of enteric fever.

Certain epidemiologic data, such as an association with fish consumption, may be of value in the diagnosis of enteric fever-like syndrome, since this syndrome is suspected to be a food-borne disease caused by microbial agents or their toxins.

REFERENCES

1. Becker, K., K. Southwick, J. Reardon, R. Berg, and J. N. MacCormack. 2001. Histamine poisoning associated with eating tuna burgers. *JAMA* **285**:1327–1330.
2. Henriques, I. S., F. Fonseca, A. Alves, M. J. Saavedra, and A. Correia. 2006. Occurrence and diversity of integrons and beta-lactamase genes among ampicillin-resistant isolates from estuarine waters. *Res. Microbiol.* **157**:938–947.
3. Hostacká, A., and Klokočniková. 2001. Antibiotic susceptibility, serum response and surface properties of *Klebsiella* species. *Microbios* **104**:115–124.
4. Kamanda Ngugi, D., M. Khamis Tsanuo, and H. Iddi Boga. 2007. Benzoic acid-degrading bacteria from the intestinal tract of *Macrotermes michaelseni* Sjöstedt. *J. Basic Microbiol.* **47**:87–92.
5. Kanki, M., T. Yoda, T. Tsukamoto, and T. Shibata. 2002. *Klebsiella pneumoniae* produces no histamine: *Raoultella planticola* and *Raoultella ornithinolytica* strains are histamine producers. *Appl. Environ. Microbiol.* **68**:3462–3466.
6. López-Sabater, E. I., J. J. Rodríguez-Jerez, M. Hernández-Herrero, and M. T. Mora-Ventura. 1996. Incidence of histamine-forming bacteria and histamine content in scombroid fish species from retail markets in the Barcelona area. *Int. J. Food Microbiol.* **28**:411–418.
7. Montasser, A. A. 2005. Gram-negative bacteria from the camel tick *Hyalomma*

- dromedarii* (Ixodidae) and the chicken tick *Argas persicus* (Argasidae) and their antibiotic sensitivities. J. Egypt. Soc. Parasitol. **35**:95–106.
8. Nakajo, K., F. Nakazawa, M. Iwaku, and E. Hoshino. 2004. Alkali-resistant bacteria in root canal systems. Oral Microbiol. Immunol. **19**:390–394.
9. Swaminathan, B., J. Beebe, and J. Besser. 1999. Investigation of food-borne and waterborne disease outbreaks, p. 174–190. In P. R. Murray, E. J. Baron, M. A. Pfaller, F. C. Tenover, and R. H. Tenover (ed.), Manual of clinical microbiology. American Society for Microbiology, Washington, DC.
10. Walckenaer, E., L. Poirel, V. Leflon-Guibout, P. Nordmann, and M. H. Nicolas-Chanoine. 2004. Genetic and biochemical characterization of the chromosomal class A β -lactamases of *Raoultella* (formerly *Klebsiella*) *plauticola* and *Raoultella ornithinolytica*. Antimicrob. Agents Chemother. **48**:305–312.

Victoria Pulian Morais*

Matilde Trigo Daporta

Alberto Fernandez Bao

Marta Garcia Campello

Microbiology Service

Complejo Hospitalario de Pontevedra

Pontevedra 36001, Spain

Guillermo Quindós Andrés

Department of Microbiology, Immunology, and Parasitology

Pais Vasco University

Bilbao, Spain

*Phone: 34-986-807087

Fax: 34-986-807088

E-mail: victoria.pulian.morais@sergas.es

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