Is *Leclercia adecarboxylata* a New and Unfamiliar Marine Pathogen?

Yaniv Keren,*a Doron Keshet,*a Mark Eidelman,*,a Yuval Geffen,*,b Ayelet Raz-Pasteur,*,c Khetam Hussein*c

Division of Orthopedic Surgery, Rambam Health Care Campus, Haifa, Israel; Clinical Microbiology Laboratory, Rambam Health Care Campus, Haifa, Israel; Infectious Diseases Unit, Rambam Health Care Campus, Haifa, Israel

*Leclercia adecarboxylata* infection is rarely reported in the context of human infections. In the scant cases reported in the literature, it usually involves individuals who are immunocompromised with infections of a polymicrobial nature. Recently, data have begun to accumulate suggesting that *L. adecarboxylata* is a pathogen associated with water environments. We review the literature regarding *L. adecarboxylata* infections and present a case of cellulitis and soft-tissue infection in the foot of a healthy surfer.

**CASE REPORT**

A 46-year-old male, with no notable prior medical history, was admitted to our hospital presenting with soft-tissue infection at the dorsum of his left foot. Two days prior to his admission, he was injured while surfing in the Mediterranean sea, with a laceration at the dorsum of his foot inflicted from a surfboard’s fin. The beach he was surfing at, Caesarea beach, is known to be often polluted, due to sewage overflow, especially after bad weather conditions in the winter. However, regular water inspections a week before and a week after the time of injury taken by the local environmental bureau found the water in that area to be clean and not polluted.

On admission, the patient had fever (up to 39°C) and chills. Physical examination revealed edema and erythema of the left foot up to the calf with a small puncture wound on the dorsum of his midfoot, with minimal serotic discharge. The rest of the physical examination was normal. Laboratory studies were significant for mild leukocytosis (white blood cell count of 11.8 × 10³ with a differential of 84.3% neutrophils), CRP (C-reactive protein) of 87, and ESR (erythrocyte sedimentation rate) of 15. Swab cultures were taken from the wound on admission and transferred to the microbiology laboratory. Swabs were inoculated onto 5% sheep blood agar and MacConkey agar plates and were incubated at 36 ± 1°C for 18 to 24 h.

Bacterial strain identification and analyses of susceptibility to antibacterial agents were performed using a Vitek-2 system (bioMérieux, Marcy l’Etoile, France) and Etest (AB Biodisk, Solna, Sweden) in accordance with the manufacturers’ instructions. Antibiotic susceptibility results were interpreted according to breakpoints defined by the Clinical and Laboratory Standards Institute (CLSI) (1).

X-rays demonstrated no bony involvement, and sonography of the foot showed no sign of abscess or foreign bodies. The patient was treated empirically with intravenous amoxicillin-clavulanate and ciprofloxacin.

Two days after his admission, frank pus was noted draining from the wound.

The patient underwent debridement and irrigation of the wound, and the empirical antibiotics were continued. On the third day to his admission, initial cultures grew two distinct colony morphotypes on both 5% sheep blood agar and MacConkey agar plates, with predominance of one of the isolates. Both isolates were positive for lactose fermentation and were identified as *Gram-negative bacilli upon Gram staining. Vitek-2 identified the two isolates as Leclercia adecarboxylata* (predominant isolate) and *Enterobacter cloacae* (minor isolate). The two isolates were sensitive to most antibiotics, including ciprofloxacin.

Amoxicillin-clavulanate therapy was stopped, and the patient was treated with oral ciprofloxacin for 14 days, with complete clinical resolution. Repeated cultures during the treatment period were negative.

*Leclercia adecarboxylata*, formerly identified as *Escherichia adecarboxylata*, is a motile, Gram-negative rod first described in 1962 by Leclerc (2). *Leclercia* isolates are distributed widely in nature and have been isolated from food, water, and other environmental sources and also from various clinical specimens, including blood, feces, sputum, urine, and wound pus (3). In addition, *Escherichia* species, particularly *E. coli*, are known to be critical indicators of fecal pollution of drinking water (4). Actually, *L. adecarboxylata* was reported to be isolated from drinking water in the United States (5).

In humans, *L. adecarboxylata* has been described in 24 case reports since 1991, in most of them as an opportunistic polymicrobial infection in immunocompromised patients (6). These organisms have been described as rare pathogens in endocarditis (7), catheter-related bacteremia (8), bacteremia and cellulitis in children suffering from leukemia (9, 10), and spontaneous bacterial peritonitis (11).

In rare cases, *L. adecarboxylata* was identified in otherwise healthy individuals. Davenport and Land reported isolation of *L. adecarboxylata* from a donated blood sample from a healthy, asymptomatic 61-year-old man (12). In addition, a few cases of bacteremia in healthy populations have been reported (13, 14, 15).

Inspecting the literature, we find a tendency of *L. adecarboxylata* to be involved in cutaneous infections in immunocompetent patients exposed to marine or water environments. Hess et al. described a slow-growing abscess in the heel of a healthy swimmer after swimming in a public pool (16). Recently, cellulitis caused by...
L. adecarboxylata was reported in a man 1 week after cleaning up floodwater in his basement after Hurricane Irene (17). Another clue linking L. adecarboxylata to marine or water environments is the isolation of this organism in the oral cavity of sharks involved in human attacks in Brazil (18).

The present case involved an immunocompetent patient who developed a wound infection caused by L. adecarboxylata and Enterobacter cloacae and provides additional evidence supporting the association between L. adecarboxylata cutaneous infection in immunocompetent patients and injuries in water environments.

REFERENCES