Is Leclercia adecarboxylata a new and unfamiliar marine pathogen?

**Running title:** Leclercia adecarboxylata- a new marine pathogen

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Abstract

_A. 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 immune compromised, with a poly microbial nature. Recently data begun to accumulate suggesting _L. adecarboxylata_ as a pathogen associated with water environments. We review the literature regarding _L. adecarboxylata_ infections, and presenting a case of cellulitis and soft tissue infection in the foot of a healthy surfer.

Case presentation

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 exam was normal. Laboratory studies were significant for mild leukocytosis (white blood cells count of 11.8 x 10^3 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 18-24 hours. Bacterial strain identification and susceptibility to antibacterial agents was performed using the VITEK-2 system (bioMérieux, Marcy l’Etoile, France) and by E-test (AB Biodisk, Solna, Sweden) in
accordance with the manufacturers’ instructions. Antibiotic susceptibility results were interpreted according to breakpoints defined by the Clinical and Laboratory Standard Institute (CLSI)\textsuperscript{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 morpho types 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 on Gram staining. VITEK-2 identified the two isolates as \textit{L. adecarboxylata} (predominant isolate) and \textit{Enterobacter cloacae} (minor isolate). The two isolates were sensitive to most antibiotics including Ciprofloxacin.

Amoxicillin-clavulanate 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.

Discussion

\textit{Leclercia adecarboxylata}, formerly identified as \textit{Escherichia adecarboxylata}, is a motile, Gram-negative rod, first described in 1962, by Leclerc\textsuperscript{2}. Leclerciae 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\textsuperscript{3}. In addition, Escherichia species, particularly \textit{E. coli}, are known to be critical indicators of fecal pollution of drinking water\textsuperscript{4}. Actually, \textit{L. adecarboxylata} was reported to be isolated from drinking water in the United States\textsuperscript{5}.

In humans, \textit{L. adecarboxylata} has been described in 24 case reports since 1991, most of them as an opportunistic poly-microbial infection in immune-compromised
patients\(^6\). These organisms have been described as rare pathogens in endocarditis\(^7\), catheter-related bacteremia\(^8\), bacteremia and cellulitis in leukemia ill children\(^9\),\(^10\) and in spontaneous bacterial peritonitis\(^11\).

In rare cases, \textit{L. adecarboxylata} was identified in otherwise healthy individuals. Davenport reported isolation of \textit{L. adecarboxylata} from a donated blood of a healthy, asymptomatic 61-year-old man\(^12\). In addition, few cases of bacteremia were reported in the healthy population\(^13\),\(^14\),\(^15\).

Inspecting the literature, we can find a tendency of \textit{L. adecarboxylata} to be involved in cutaneous infections in immune-competent 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 \textit{L. adecarboxylata} was reported in a man one week after cleaning up floodwater in his basement after Hurricane Irene\(^17\). Another clue linking \textit{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 involve an immune-competent patient who developed a wound infection caused by \textit{L. adecarboxylata} and \textit{Enterobacter cloace} and provides additional evidence supporting the association between \textit{L. adecarboxylata} cutaneous infection in immune-competent patients and injuries in water environment.


