Leclercia adecarboxylata Infections: Case Report and Review

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Leclercia adecarboxylata has been rarely isolated from environmental and clinical specimens. On review of the world literature, we found two reports of L. adecarboxylata infection: one report described a patient with hepatic cirrhosis, and the other described a child dependent on total parenteral nutrition. L. adecarboxylata was isolated from five infected patients who were evaluated at our institution. Three patients had lower-extremity wound infections in which L. adecarboxylata was part of a mixed microbial growth. One patient had pneumonia due to multiple bacteria, including L. adecarboxylata, which were isolated from sputum. L. adecarboxylata was isolated from the blood of one patient with neutropenia and from the blood of the two patients reported in the literature. All patients except one had fever and leukocytosis. L. adecarboxylata isolates were susceptible to all the antimicrobials tested. L. adecarboxylata is most frequently isolated as part of a mixed microbial growth. Its role in these infections is not clear. However, the organism caused bacteremia in three patients.

The introduction of new techniques such as DNA-DNA hybridization and species- or genus-specific bacteriophages has led to the recognition of new genera, species, and biogroups of Enterobacteriaceae [1–4]. Leclercia adecarboxylata, first described by Leclerc in 1962 [5], is a motile, gram-negative bacillus, formerly designated enteric group 41 and Escherichia adecarboxylata [6, 7]. On reviewing the world literature, we found only two case reports of L. adecarboxylata infection [8, 9]. We also describe five patients who were evaluated at our institution and who had infections from which L. adecarboxylata was isolated.

Methods

A case was defined as the isolation of L. adecarboxylata from culture of a specimen from any body site in a patient evaluated at the Mayo Clinic (Rochester, MN) during the period 1984–1995. Cases were identified through a review of a computerized database, which contains the results for all cultures performed by the clinical microbiology laboratory at the Mayo Clinic for the period 1984–1995. The medical records of each patient from whom L. adecarboxylata was isolated during this period were reviewed for age, sex, clinical presentation, presence of underlying illnesses, co-morbidity conditions, treatment, and outcome.

Relevant articles were identified by review of the medical literature on L. adecarboxylata through a MEDLINE search of papers published from 1962 through 1995. Secondary references in the retrieved articles were also reviewed.

Identification and Susceptibility Testing of L. adecarboxylata

All L. adecarboxylata isolates were identified by colonial and microscopic morphology and by an array of biochemical tests. An initial group of tests was performed by use of the CARP (Computer Assisted Replica Plate) system, a semiautomated microbial identification system developed in-house at the Mayo Clinic [10]. These tests and their characteristic reactions included citrate (negative), lysine decarboxylase (negative), ornithine decarboxylase (negative), DNase (negative), hydrogen sulfide (negative), esculin hydrolysis (positive), arginine dihydrolase (negative), D-glucose (positive), lactose fermentation (positive), D-mannitol fermentation (positive), and L-arabinose fermentation (positive).

A second group of biochemical tests was also performed using a manual tube set. These tests and their characteristic results included indole production (positive), methyl red (positive), Voges-Proskauer (negative), malonate utilization (positive), adonitol fermentation (positive), inositol fermentation (negative), D-sorbitol fermentation (negative), and nitrate reduction (positive).

Antimicrobial susceptibility testing was performed using an agar dilution method previously described [10]. The results for susceptibility testing were interpreted according to 1995 guidelines published by the National Committee for Clinical Laboratory Standards (NCCLS) [11].

Case Reports

Patient 1. A 43-year-old woman fell down on a rocky path while camping and sustained an injury to the lateral aspect of her right calf; cellulitis and soft-tissue infection developed.
She was afebrile but had an elevated WBC count of 14.6 × 10⁹/L. Her medical history was remarkable for depression, a personality disorder, and retinitis pigmentosa. Cultures of the wound yielded \textit{L. adecarboxylata} and \textit{Staphylococcus aureus}. The \textit{L. adecarboxylata} isolate was susceptible to all the antimicrobial agents tested including gentamicin, amikacin, cefazolin, ciprofloxacin, trimethoprim-sulfamethoxazole, imipenem, and ampicillin. The patient was treated with oral ciprofloxacin, and her wound and cellulitis resolved.

**Patient 2.** A previously healthy 35-year-old male sustained a severe crush injury to his right foot, causing compound wounds and fracture dislocation of all metatarsal bones. On initial presentation, he had a temperature of 39.0°C. The WBC count was 18.0 × 10⁹/L with a normal differential. Wound cultures yielded \textit{L. adecarboxylata} in addition to \textit{Enterobacter cloacae}, \textit{Citrobacter freundii}, \textit{Enterococcus species}, \textit{Klebsiella pneumoniae}, \textit{Stenotrophomonas maltophilia}, and \textit{Corynebacterium, Acренциум, Penicillium, Macor,} and \textit{Geotrichum} species. Antimicrobial susceptibility testing of the \textit{L. adecarboxylata} isolate was not performed. The patient underwent amputation of his foot and completed a 24-day course of intravenous therapy, which included one or more of the following antimicrobials at any one time: cefazolin, ampicillin-sulbactam, ticarcillin-clavulanic acid, and ceftazidime.

**Patient 3.** A 23-year-old otherwise healthy male was punctured by a nail in the plantar aspect of his left third toe while working in a barnyard. He experienced fever (temperature to 38.3°C) and chills. His WBC count was 12.6 × 10⁹/L. Culture of his wound yielded \textit{Actinobacter calcoaceticus, Enterobacter agglomerans}, as well as \textit{L. adecarboxylata}. Antimicrobial susceptibility testing for the \textit{L. adecarboxylata} isolate was not performed. The patient was treated with oral ciprofloxacin, which resulted in the complete healing of his wound.

**Patient 4.** A 35-year-old woman underwent allogeneic bone marrow transplantation for acute nonlymphocytic leukemia. She subsequently developed fever (temperature to 38.8°C) while neutropenic. Pure growth of \textit{L. adecarboxylata} was isolated in one of two sets of blood cultures. The isolate was susceptible to all the antimicrobials tested, including amikacin, gentamicin, cefazolin, aztreonam, ciprofloxacin, trimethoprim-sulfamethoxazole, imipenem, ampicillin, mezlocillin, and chloramphenicol. The patient was treated with vancomycin and ceftazidime and the bacteremia cleared, but she died of her underlying disease.

**Patient 5.** A 54-year-old male with a history of reflux esophagitis, degenerative arthritis, and adult Still’s disease developed a fever (temperature, 38.6°C) and right lower lobe pneumonia while in the hospital following repair of an inguinal hernia. The WBC count was elevated. Culture of sputum yielded \textit{L. adecarboxylata} as well as \textit{Escherichia coli, Klebsiella oxytoca,} and \textit{Haemophilus influenzae}. The \textit{L. adecarboxylata} isolate was susceptible to amikacin, gentamicin, cefazolin, aztreonam, ciprofloxacin, trimethoprim-sulfamethoxazole, imipenem, ampicillin, mezlocillin, and chloramphenicol. The patient was treated with iv aztreonam in the hospital, followed by oral ciprofloxacin as an outpatient.

**Case one from the literature.** A 45-year-old male with a history of alcoholic cirrhosis presented with severe abdominal pain, hypotension, tachycardia, and diaphoresis 6 hours after undergoing paracentesis for the removal of ascitic fluid [8]. He was found to have hemoperitoneum and underwent a laparotomy. Four days later, he developed fever (temperature to 38.6°C). Three blood cultures were performed, from which \textit{L. adecarboxylata} was later identified. Despite the provision of antibiotic therapy, the patient developed oliguric renal failure and died.

**Case two from the literature.** An 8 ½-month-old boy with a history of congenital gastroschisis and intestinal atresia presented to the emergency department with shaking chills and fever, which started ~1 hour after receiving total parenteral nutrition through a central line catheter [9]. On initial examination, he was febrile (temperature, 103°F) and his blood pressure was 103/71 mm Hg. His WBC count was 12,500/mm³ with a differential of 67 segmented neutrophils, 15 band forms, 12 lymphocytes, and 6 monocytes. Two blood cultures were performed; one specimen was from the central line and one was obtained peripherally by venipuncture.

After 24 hours, the culture of blood from the central line yielded \textit{L. adecarboxylata} that was susceptible to amikacin, ampicillin, cefazolin, ceftazidime, gentamicin, mezlocillin, piperacillin, tobramycin, and trimethoprim-sulfamethoxazole. Initial treatment with iv vancomycin, ceftazidime, and gentamicin was modified to ceftazidime and gentamicin, and the patient completed a 14-day course of this regimen. Fever and leukocytosis resolved promptly following initiation of antimicrobial therapy. The central catheter was not removed or replaced. There was no bacterial growth in either the initial culture of blood drawn by venipuncture or subsequent blood cultures performed after antimicrobial therapy had been started.

**Results**

Three of the seven patients had lower extremity wound infections associated with trauma. One of the remaining four patients had nosocomial pneumonia, the second had fever while neutropenic, the third had hemoperitoneum and liver cirrhosis, and the fourth had a central line–associated infection. With the exception of the three patients with positive blood cultures, \textit{L. adecarboxylata} was isolated as part of a mixed flora. All patients except one had fever and leukocytosis. When in vitro antimicrobial susceptibility testing was performed, \textit{L. adecarboxylata} was susceptible to all the antibiotics tested, including amikacin, gentamicin, cefazolin, aztreonam, mezlocillin, piperacillin, cefoperazone, ciprofloxacin, trimethoprim-sulfamethoxazole, imipenem, ampicillin, and chloramphenicol.
Discussion

To our knowledge, this is the first report in the literature of a relatively large series of patients from whom *L. adecarboxylata* was isolated; this organism may have produced infection. Previous reports, with the exception of the two clinical reports reviewed above, have dealt mainly with the isolation, identification, and classification of the organism.

There may be several explanations for the lack of reports of *L. adecarboxylata*–associated infections in humans. First, until recently, clinical microbiology laboratories may have been limited in their ability to identify and report Enterobacteriaceae and other bacteria. Until the early 1970s, visual analysis of biochemical and serological test results formed the basis of enteric bacteriology. In addition, there was an ongoing debate about the classification and taxonomic status of these and other microorganisms. The availability of computer-based commercial identification systems and the development of newer methods, such as DNA-DNA hybridization and species-specific bacteriophages, have resolved some of the answers and eased the controversy.

For the current study, we identified the organisms by tests using a large array of biochemical reactions, many of which are performed only in referral laboratories. Even with this large group of phenotypic tests, one cannot be assured that the identification is 100% accurate. Nucleic acid analysis, especially of 16s ribosomal DNA, should be more accurate; although we have the capability of performing this procedure, the isolates were not saved so it could not be done. Second, even in those circumstances where *L. adecarboxylata* has been isolated from clinical specimens, it has been difficult in many cases to clearly understand the role it may have played, if any, in producing or contributing to infection in the sites from which these specimens were obtained. Third, in many centers, every gram-negative bacillus in a complex contaminated wound may not be identified.

In summary, *L. adecarboxylata* is a ubiquitous gram-negative bacteria, a member of the family Enterobacteriaceae. In our experience, this organism has most frequently been isolated from lower extremity wounds as part of a mixed flora. The clinical significance in this setting remains unclear. In three other patients (one we have reported, two reported by others), it was the only microorganism isolated from cultures of blood that was obtained while the patients had suspected sepsis. In these cases, the organism appeared to produce clinical disease; however, additional studies in animals and humans are required to determine the true pathogenic potential of this organism.

References