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Polymicrobial Bacteremia Caused by *Ewingella americana* (Family *Enterobacteriaceae*) and an Unusual *Pseudomonas* Species

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Ewingella americana and a *Pseudomonas* species were isolated from three sets of blood cultures from a 41-year-old patient after coronary bypass surgery. This is the first well-described case of bacteremia due to *E. americana*. Based on data from 31 strains, a detailed description of *E. americana* is given.

Ewingella americana was recently described by Grimont and co-workers (3) as a new genus and species in the family *Enterobacteriaceae*. Previously, this organism had been called enteric group 40 by the Enteric Bacteriology Section at the Centers for Disease Control (CDC). The original strains of *E. americana* were from human clinical specimens: sputum, five isolates; blood, one isolate; throat, one isolate; thumb wound, one isolate; toe, one isolate; and unknown source, one isolate. The isolate from blood was reported to be from a patient with fever and pneumonia. Grimont et al. state that case studies are needed to determine the clinical significance of *E. americana* (3). In this report, we describe the isolation of *E. americana* from a patient who had polymicrobial bacteremia after coronary bypass surgery. This is the first clinical description of bacteremia caused by *E. americana*. In addition, we present biochemical reactions for 31 strains studied by the Enteric Bacteriology Section, CDC.

Case report. A 41-year-old male with atherosclerotic vascular disease and diabetes mellitus underwent coronary bypass surgery on 4 February 1982. Postoperatively, he had a fever of 102.6°F (39.2°C), despite having received prophylactic cefamandole on 4 to 6 February. His peripheral leukocyte count rose to 16,600/dl, but the platelet count remained normal, with no evidence of disseminated intravascular coagulation. Two sets of blood cultures were taken on 6 February, and one set was taken on 7 February. For each blood culture, 5 ml of blood was inoculated in vented and unvented 50-ml bottles of brain heart infusion broth with 0.25% sodium polyanetholesulfonate. Blood cultures were subcultured routinely on chocolate agar at 6 and 48 h. When gram-negative bacteremia was reported, the patient was started on gentamicin (120 mg) every 8 h and trimethoprim-sulfamethoxazole (80 mg-400 mg) intravenously every 4 h. The patient remained febrile for 6 days, but then became afebrile for the remainder of his 3-week hospitalization. The source of the gram-negative bacteremia was not determined, although a contaminated intravascular Swan-Ganz catheter was suspected. However, we were unable to culture gram-negative bacteria from the catheter, sputum, urine, or mediastinal wound sites.

All six blood culture bottles were positive, and on subculture, each bottle yielded two different gram-negative bacteria. One organism was an oxidase-positive, catalase-positive nonfermentative rod which was nonhemolytic on sheep blood agar. By the agar overlay disk diffusion method (1), this isolate was susceptible to ampicillin, carbenicillin, cefamandole, cefoperazone, cefotaxime, cefoxitin, cephalothin, chloramphenicol, mezlocillin, moxalactam, piperacillin, tetracycline, thienamycin, and trimethoprim-sulfamethoxazole, but resistant to gentamicin, amikacin, and tobramycin. The strain was referred to the Special Bacterial Reference Laboratory of CDC (isolate 82-045593). Studies indicated that the organism was a gram-negative rod and motile, as determined by flagellar stain (the majority of flagellated bacteria had one or two polar flagella; a few organisms had three polar flagella). Colonies on rabbit blood agar had a slightly sticky consistency. There was no hemolytic reaction around individual colonies, but there was lysis in the areas of confluent growth. Oxidase was positive by the Kovac method (0.5% tetramethyl-*p*-phenylenediamine dihydrochloride). The triple sugar iron reaction indicated that glucose was not fermented. The following reactions were positive: catalase production, growth on MacConkey agar, citrate utilization (Simmons), urease production, β-ga-

lactosidase activity, and acid production in oxidase fermentation medium from D-glucose, D-xylose, D-mannitol, lactose (weak acid production), L-arabinase, adonitol, D-mannose, D-sorbitol, and erythritol. Negative results included the following: growth on salmonella-shigella agar, nitrate reduction, indole production, gelatinase production, esculin hydrolysis, lysine and

TABLE 1. Comparison of the blood isolate of the patient with 31 strains of *E. americana*

Test	% Positive for 31 strains of *E. americana*	Patient isolate of *E. americana* (0311-82)
Indole production	0[a]	−[b]
Methyl red	84	+
Voges-Proskauer	97	+
Citrate (Simmons) utilization	97	+
H_2S production (triple sugar iron agar)	0	−
Urea (Christensen)	0	−
Phenylalanine deaminase	3	−
Lysine decarboxylase (Moeller)	0	−
Arginine dihydrolase (Moeller)	0	−
Ornithine decarboxylase (Moeller)	0	−
Motility	61	−
Gelatin liquefaction at 22°C	0	−
KCN, growth in the presence of	7	−
Malonate utilization	0	−
D-Glucose—acid production	100	+
D-Glucose—gas production	0	−
Acid production from:		
Lactose	68	+
Sucrose	0	−
D-Mannitol	100	+
Dulcitol	0	−
Salicin	90	+
Adonitol	0	−
i-(*myo*)-Inositol	0	−
D-Sorbitol	0	−
L-Arabinose	0	−
D-Raffinose	0	−
L-Rhamnose	23	−
Maltose	16	−
D-Xylose	13	−
Trehalose	100	+
Cellobiose	7	−
α-Methyl-D-glucoside	0	−
Erythritol	0	−
D-Melibiose	0	−
D-Arabitol	100	+
Glycerol	24	−
D-Mannose	100	+
D-Galactose	100	+
Mucate	0	−
Tartrate (Jordan)	36	+
Esculin hydrolysis	52	−
Acetate utilization	10	−
Citrate (Christensen)	100	ND
Lipase (corn oil)	0	−
DNase at 25°C	0	−
Oxidase (Kovacs)	0	−
Nitrate reduction to nitrite	97	+
o-nitrophenyl-β-D-galactopyranoside test	96	+[3]
Pectate hydrolysis	0	ND
Pigment production	0	−
Tyrosine clearing	11	−

[a] Based on reactions after 48 h of incubation at 36°C.

[b] Symbols: +, positive at 48 h; −, negative at the end of the incubation period; +[3], positive at 3 days; ND, not done.

ornithine decarboxylase activities, arginine dihydrolase activity, and acid production in oxidase fermentation medium from sucrose, maltose, salicin, dulcitol, *i*-(*myo*)-inositol, cellobiose, and melibiose.

The characteristics of this oxidase-positive nonfermenter were similar to those of *Pseudomonas marginata* ATCC 102348. Because of differences in the cellular fatty acid profiles of isolate 82-045593 and *P. marginata*, as well as differences in the acid production from dulcitol, inositol, erythritol, and melibiose, isolate 82-045593 was not identified as *P. marginata*. A specific identification could not be made, although the general characteristics of the organism indicated that it was a *Pseudomonas* species. Isolate 82-045593 appeared to be the same as the respiratory isolates described by Knuth et al. (4), with identical biochemical characteristics and cellular fatty acid profiles. CDC has received three other cultures of this bacterium from dialysate in three hospitals.

The oxidase-negative organism was also recovered from all six blood culture bottles. This bacterium was catalase positive, reduced nitrate to nitrite, and fermented glucose, properties typical of members of the family *Enterobacteriaceae*. By the agar overlay disk diffusion method (1), the isolate was susceptible to amikacin, ampicillin, carbenicillin, cefamandole, cefoperazone, cefotaxime, chloramphenicol, gentamicin, mezlocillin, piperacillin, thienamycin, tetracycline, and trimethoprim-sulfamethoxazole, but resistant to cephalothin and cefoxitin. The strain was sent to the enteric bacteriology laboratories at CDC, where it was given the number 0311-82 and studied by previously described biochemical tests (2). The isolate was identified as a typical strain of enteric group 40 and recently named *E. americana* (3). Table 1 compares the properties of this strain to 31 isolates collected by the Enteric Bacteriology Section, CDC. Because the isolate did not ferment L-rhamnose or D-xylose, it was identified as *E. americana*, biogroup 1 (3).

Based on detailed studies of 10 American clinical isolates of enteric group 40, Grimont et al. proposed that *Ewingella* is a new genus in the family *Enterobacteriaceae* (3). Members of the genus are lipase and DNase negative, produce acetyl methyl carbinol, and are negative for lysine and ornithine decarboxylases and arginine dihydrolase. These bacteria produce acid and gas from glucose, but not from L-arabinose, D-melibiose, D-raffinose, D-sorbitol, or sucrose. DNA relatedness studies (S1 nuclease method) showed that the 10 *Ewingella* strains formed a single hybridization group that is less than 21% related to other members of the family *Enterobacteriaceae* (3).

In conclusion, we present a patient who developed polymicrobial bacteremia from two unusual gram-negative rods. This septicemia occurred in a patient who was immunocompromised from diabetes mellitus, recent open heart surgery, and multiple intravascular catheters.

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