JOURNAL OF CLINICAL MICROBIOLOGY, May 1980, p. 511-514
0095-1137/80/05-0511/04$02.00/0

Vol. 11, No. 5

# Extraintestinal Human Infection Caused by *Edwardsiella tarda*

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*Edwardsiella tarda* is an uncommon enteric bacterium which has been found generally in animal hosts and occasionally in human feces. Three cases of extraintestinal infection caused by *E. tarda* which are described herein include a typhoid-like illness, peritonitis with sepsis, and cellulitis from a wound acquired while fishing. The microbiology of *E. tarda* and the previous reports of infection due to this organism are reviewed.

Human infections due to the bacterium *Edwardsiella tarda* have been reported only infrequently; cases of extraintestinal infection appear to be particularly rare (4, 6, 11, 12, 15, 17, 19, 23, 25, 27). Three cases of extraintestinal infection due to *E. tarda* were documented in an 8-month period at the Texas Medical Center. Two patients had sepsis, and one had a wound infection. These 3 cases are described, and 17 previously reported cases of extraintestinal infection with this organism are reviewed.

## Case Reports

**Case 1.** A 46-year-old Latin American male was hospitalized for fever and abdominal complaints. About 6 weeks earlier the patient had visited his wife in Mexico. At that time she had a typhoid-like illness. Five days before admission, the patient developed headache and cough, followed by lower abdominal pain, nausea, minimal diarrhea, and fever. On admission he was febrile and hypotensive. His abdomen was tender without rigidity. The hematocrit was 44%, and the leukocyte count was 2,400/mm$^3$ with a polymorphonuclear cell predominance. Liver function studies and urinalysis were normal. The presumptive diagnosis was typhoid fever, and the patient was treated with chloramphenicol and tobramycin with rapid improvement. Cultures of blood and feces grew *E. tarda*, and the antibiotic therapy was changed to ampicillin.

**Comment.** Infections caused by *E. tarda* may have been misdiagnosed in the past because (i) they simulate the spectrum of *Salmonella* infection clinically and (ii) the organism resembles *Salmonella* sp. on most enteric screening media. This patient had an illness which closely simulated enteric fever due to *S. typhi*.

**Case 2.** A 42-year-old alcoholic man sustained blunt trauma to the abdomen and immediately thereafter developed severe abdominal pain and vomiting. Eighteen hours later he was hospitalized in acute distress with blood pressure, 110/68; temperature, 94.4°F (ca. 34.7°C); pulse, 124; and respiration, 18. Physical findings were consistent with chronic liver disease. The abdomen was distended and diffusely tender, and bowel sounds were hypoactive. Stool guaiac was negative. Hematocrit was 41%, leukocyte count was 22,600/mm$^3$, bilirubin was 2.9, serum aspartate transaminase was 1,500 U, serum alanine ketoglutarate transaminase was 1,400 U, alkaline phosphatase was 475 U, amylase was 2,200 U, and calcium was 8.9 mg/dl. Ultrasound examination revealed an enlarged pancreas and free intraabdominal fluid believed to be consistent with acute pancreatitis. He developed a cardiac arrest; after resuscitation he had acute hepatic and renal failure, disseminated intravascular coagulation, and severe lactic acidosis. Chloramphenicol and gentamicin were administered. Exploratory laporatomy revealed hemorrhagic pancreatitis and infarcted small bowel which was resected. The patient died during closure. *E. tarda* was cultured from the peritoneal fluid; no other organisms were isolated by anaerobic or aerobic culture.

**Comment.** Bacterial peritonitis due to *E. tarda* has not been previously described. Presumably, this patient carried the organism in his gastrointestinal tract and developed peritonitis in association with intestinal ischemia.

**Case 3.** A 52-year-old diabetic male was admitted to the hospital because of cellulitis of the left foot. Five days before admission he had been fishing and had stepped on a catfish sustaining a penetrating wound. On admission his temperature was 100°F (ca. 37.8°C). The physical examination was normal with the exception of his left foot which was red, swollen, and very tender. The leukocyte count was 11,200 and the blood glucose 128 mg/dl. X ray showed soft tissue inflammation. Bone scan was negative. A specimen obtained by direct needle aspiration from the involved area and cultured aerobically and anaerobically grew a pure culture of *E. tarda*. He was treated with bed rest, local heat, and cephalothin with rapid defervescence and local improvement. After 1 week of therapy, he was asymptomatic and was discharged from the hospital. No stool cultures were obtained.

**Comment.** Trauma that occurs in the water, especially if related to fishing, may produce intense cellu-

litis due to a variety of gram-negative bacilli, including *Aeromonas* and *Vibrio* sp. (3, 13). Two previous cases of water-related skin infection caused by *E. tarda* have been described (6, 15). Interestingly, *E. tarda* is a common isolate from Texas catfish (30) and can cause necrotizing soft tissue lesions in fish, especially catfish (21).

## RESULTS

The biochemical identification pattern as indicated by the API system was identical for the isolates from our three cases (API 4544000, analytical profile index of Analytab Products, Plainsville, N.J.) and conforms to published criteria for the identification of *E. tarda* (8). These motile gram-negative bacilli were oxidase negative and nitrate positive. They decarboxylated ornithine and lysine, fermented glucose but not other tested carbohydrates, and formed $H_2S$ and indole; the tests for growth on citrate, urea deaminase, and acetoin formation were negative. The biochemical reactions for *E. tarda* and some *Salmonella* sp. on commonly used screening media for enteric pathogens (e.g., triple sugar iron, lysine iron, or urea agars) are similar, as is their appearance on differential enteric media. It may be significant that the isolations were made from specimens for which a complete identification is routinely performed. None of the strains reacted in the *Salmonella* typing serum. Most strains of *E. tarda* are sensitive to ampicillin, chloramphenicol, tetracycline, and aminoglycosides but not to colistin (2, 6, 15, 18, 20, 29); our isolates showed this pattern by Kirby-Bauer and microtiter methods (Table 1). To our knowledge only four colistin-sensitive strains have been reported (4, 16, 17, 27), and two of these reports (16, 27) occurred before routine use of standardized sensitivity testing. The high level of colistin resistance has been suggested as an aid in isolating and identifying the organism (22).

TABLE 1. *Antibiotic sensitivity profile of Edwardsiella tarda by the disk diffusion method (KB) and by minimal inhibitory concentrations (MIC)*

| Drug | KB (all isolates) | MIC (mcg/ml) | | |
|---|---|---|---|---|
| | | Case 1 | Case 2 | Case 3 |
| Ampicillin | S[a] | 0.25 | 0.5 | 0.5 |
| Carbenicillin | S | 8 | 8 | 8 |
| Cephalothin | S | 1 | 4 | 4 |
| Chloramphenicol | S | 0.5 | 1 | 0.5 |
| Colistin | R | 4 | 4 | 4 |
| Gentamicin | S | 0.5 | 0.5 | 0.5 |
| Kanamycin | S | 1 | 2 | 4 |
| Streptomycin | S | | | |
| Tetracycline | S | 0.25 | 0.5 | 0.25 |
| Tobramycin | | 0.25 | 0.5 | 2 |
| Amikacin | S | 1 | 2 | 2 |
| Co-trimoxazole (trimethoprim-sulfamethoxazole) | | 0.5/9.5 | 0.5/9.5 | 0.5/9.5 |
| Penicillin | R | | | |

[a] S, Susceptible; R, resistant.

## DISCUSSION

*E. tarda*, a recently described member of the family *Enterobacteriaceae* (9, 16, 26), exists widely in nature, being isolated from fish (1, 30), lizards (28), snakes (14, 17, 26), sea mammals (7), cattle (5), swine (24), and the environment (30). The rate of isolation of this organism from human fecal specimens has ranged from nil for an urban population in Panama (17) and asymptomatic subjects elsewhere (2, 20) up to about 1% in rural Panamanians (17), Indian children with diarrhea (2), or Zairese with gastroenteritis (20). Of those people from whose feces this organism has been isolated, the percent with diarrhea has varied from 25% (17) to over 75% (4, 9, 20). The rest were asymptomatic, possibly showing analogy to the carrier state for salmonellosis. In two populations a significant association between *E. tarda* and *Entamoeba histolytica* was noted (10, 20).

Although the most common manifestations of infection due to *E. tarda* are symptoms of gastrointestinal disease, a number of serious, extraintestinal infections have been reported; these are summarized in Table 2. In six cases trauma was followed by direct inoculation of bacteria causing abscess formation or cellulitis (cases 3 to 8); three of these cases resulted from water-associated accidents. In cases 2, 9, and 10 infection probably was subsequent to escape of bacteria from the bowel and spread into adjacent tissues. Four patients developed liver abscess or cholangitis with *E. tarda* as the sole or predominant pathogen (cases 11 to 14). Nine patients had sepsis without an identifiable anatomic lesion in the bowel; three of these had an underlying condition such as immunological immaturity or connective tissue disorders with steroid therapy or malignancy which might have predisposed them to sepsis, and the patient with endocarditis had preexisting mitral valve disease. A typhoid-like illness, sometimes with hematogenous seeding of other areas, seemed to be present in at least seven cases; in two of these patients meningitis was also documented. Our patient (case 1) had the most characteristically typhoid-like illness of any described to date.

*E. tarda* is susceptible in vitro to nearly all antibiotics that are used to treat serious gram-negative infections. Our patients received a variety of antibiotics; patients 1 and 3 recovered with ampicillin therapy, and death in case 2 was related to consequences of sepsis. Three septic

TABLE 2. *Review of 20 cases of extraintestinal E. tarda infections*

| Case no. | Reference | Age/sex | Clinical diagnosis | Source of isolation | Other organisms | Underlying disease |
|---|---|---|---|---|---|---|
| 1 | —[a] | 46/M | Typhoid-like illness, septic shock | Blood, feces | None (blood); no enteric pathogens (feces) | None |
| 2 | —[a] | 42/M | Septic shock, peritonitis, death | Peritoneal fluid | None | Alcoholic liver disease, pancreatitis |
| 3 | —[a] | 52/M | Cellulitis (stepped on catfish) | Tissue aspirate | None | Diabetes mellitus |
| 4 | 15 | 20/M | Scalp wound (diving accident) | Wound exudate | *Pseudomonas, Aerobacter, Micrococcus* | NR[b] |
| 5 | 6 | 15/M | Leg wound (swimming accident) | Wound exudate | *Clostridium perfringens* | None |
| 6 | 15 | 18/M | Leg abscess (auto accident) | Wound exudate | *S. epidermidis* | NR |
| 7 | 11 | 89/M | Cellulitis of foot | Wound exudate | NR | NR |
| 8 | 12 | 6/M | Subgaleal abscess (auto accident) | Wound exudate | NR | NR |
| 9 | 15 | 38/M | Perirectal abscess | Pus | No enteric pathogens | NR |
| 10 | 15 | 49/M | Intraabdominal abscess (small bowel perforation) | Pus | NR | NR |
| 11 | 15 | 14/F | Hepatic abscess, sepsis | Pus, blood | NR | NR |
| 12 | 17 | 71/F | Hepatic abscess, intestinal obstruction, death | Pus, blood | NR | NR |
| 13 | 4 | NR/F | Cholangitis | Bile | NR | NR |
| 14 | 17 | 35/M | Cholangitis, hepatic abscess, sepsis, death | Blood | NR | NR |
| 15 | 4 | <18/M | Sepsis | Blood | NR | Acute lymphatic leukemia |
| 16 | 18 | 61/M | Sepsis | Blood | NR | Alcoholic liver disease |
| 17 | 18 | 39/M | Sepsis, subacute bacterial endocarditis | Blood, feces | NR | Mitral valve insufficiency |
| 18 | 25 | 83/M | Sepsis, death | Blood | *S. aureus, P. aeruginosa, E. coli* | Organic heart disease |
| 19 | 27 | 31/F | Meningitis, sepsis, death | CSF[c], blood | NR | Systemic lupus, erythematosus, glucocorticosteroids |
| 20 | 23 | 1 mo/F | Meningitis, sepsis, death | CSF, blood | NR | NR |

[a] Present report.
[b] NR, Not recorded.
[c] CSF, Cerebrospinal fluid.

patients who recovered (cases 11, 16, and 17) received both an aminoglycoside and a beta-lactam antibiotic, whereas only one of the six who died (case 14) received this therapy.

Although extraintestinal human infection with *E. tarda* has been reported only infrequently, the recent identification of three such cases at one medical center within 8 months, each representing a major syndrome caused by this organism, suggests that better isolation techniques or methods of identification may be leading to increasing recognition of this organism. The possibility that its real incidence has increased cannot be excluded.

ACKNOWLEDGMENTS

We thank the Veterans Administration Laboratory Service (Microbiology Section) personnel for their cooperation and Mona Thomas for preparation of the manuscript.

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