Gastroenteritis, Sepsis, and Osteomyelitis Caused by *Plesiomonas shigelloides* in an Immunocompetent Host: Case Report and Review of the Literature

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We report the 11th human case of bloodstream infection with *Plesiomonas shigelloides*. This was the first case without any apparent underlying immunocompromising disease, and the patient was the first adult to survive the infection. We review all the extraintestinal cases associated with this organism, giving special attention to the clinical characteristics of the bloodstream infections reported previously.

*Plesiomonas shigelloides* is a member of the family *Vibrionaceae*, is closely related to *Aeromonas* spp., and has been identified in the past as *Aeromonas shigelloides*, *Pseudomonas shigelloides*, *Fergusonia shigelloides*, *Pseudomonas michiganii*, and C27 (10). The organism is a facultative, anaerobic, polarly flagellated, gram-negative bacterium. *P. shigelloides* can be differentiated from members of the family *Enterobacteriaceae* by a positive reaction with oxidase testing and from *Aeromonas* spp. and *Vibrio* spp. (which like *P. shigelloides* have positive fermentation tests with glucose and positive oxidase tests) by positive ornithine decarboxylase reactions (which are negative with *Aeromonas* spp.) and fermentation of inositol (which is negative with both *Aeromonas* spp. and *Vibrio* spp.) (27). *P. shigelloides* can be isolated from fresh and salt water and is not part of the normal human gastrointestinal flora (13, 16). Sporadic and epidemic gastrointestinal disease caused by *P. shigelloides* has been documented previously (14, 17, 18, 23, 24). Rarely, bloodstream isolates have been documented in immunocompromised persons (1, 6, 7, 9, 12, 15, 20, 21). This report describes the first human case of septicaemia and septic arthritis and osteomyelitis after a gastrointestinal illness in an apparently immunocompetent host.

**Case report.** A 39-year-old man was admitted to Falmouth Hospital, Falmouth, Mass., with a one-day history of diarrhea, tenesmus, nausea, vomiting, fever, and chills after the ingestion of a seafood meal which included oysters, fish, scallops, and shrimp.

His past medical history was remarkable for osteoarthritis treated with fenoprofen, supraventricular tachycardia treated with propranolol, and a right total hip replacement done several years before this admission.

A physical examination of the patient at the time of admission revealed a blood pressure of 115/75 mm Hg and a pulse rate of 88 beats per min in a supine position, changing to 95/60 mm Hg and 100 beats per min in a sitting position. His oral temperature was 40°C. His skin was normal, and his heart sounds were normal without murmurs, rubs, or gallops. He had mild tenderness on palpation of the left lower abdominal quadrant and normal bowel sounds. The rectal exam revealed tenderness, and the stool guaiac test was negative.

The complete blood count showed a leukocyte count of 4,300/mm³ with 47% segmented polymorphonuclear cells and 39% band forms, a hematocrit of 45.4%, and a platelet count of 166,000/mm³. A Wright stain of the stool did not reveal leukocytes.

Overnight intravenous hydration was begun after cultures of blood and stool were obtained. On hospital day 2, the left ankle of the patient was tender and swollen. Arthrocentesis yielded fluid containing 131,000 erythrocytes per mm³ and 266,000 leukocytes per mm³ (100% polymorphonuclear cells) and a glucose level of 5 mg/dl. A Gram stain of the joint fluid revealed gram-negative bacteria within leukocytes and urate crystals. Intravenous ampicillin (1 g every 6 h) and tobramycin (80 mg every 4 h) were begun on hospital day 2. Intravenous chloramphenicol (1 g every 6 h) was added because of a persistent fever of up to 40°C.

*P. shigelloides* was isolated from blood, stool, and joint fluid cultures. After antibiotic susceptibilities became known, intravenous cefazolin (1 g every 6 h) was started, and ampicillin and tobramycin were discontinued. Chloramphenicol was discontinued on hospital day 8, and the cefazolin was increased to a dosage of 3 g every 6 h. In addition to antibiotic therapy, the left ankle of the patient required daily arthrocentesis for 2 days, followed by open drainage on hospital day 4. Subsequently, plain radiographs revealed cortical erosion in the ankle joint, consistent with osteomyelitis. Cefazolin was discontinued on hospital day 18, and intravenous ceftriaxone (2 g every 24 h) was begun and continued for 28 days. Ceftriaxone was then discontinued, and oral cephalixin (500 mg every 6 h) was administered for 14 days. The patient improved steadily during therapy and was still asymptomatic 7 months after completing therapy.

**Bacteriology.** Two blood cultures were obtained before antibiotic treatment and were incubated at 37°C on 5% sheep blood agar. In addition, stool samples submitted for culture were streaked onto eosin methylene blue, Hektoen enteric agar, and xylose-lysine-deoxycholate plates, and samples of joint fluid submitted for culture were streaked on Thayer-Martin and 5% sheep blood agar plates. All were incubated at 37°C. After 24 h, all of the cultures yielded pure growth of a gram-negative fermentative bacterium. Biochemical testing was performed with the API 20E system (Analytab...
TABLE 1. Clinical characteristics of cases of *P. shigelloides* bloodstream infections

<table>
<thead>
<tr>
<th>Reference</th>
<th>Culture sites(s) positive for <em>P. shigelloides</em></th>
<th>Clinical diagnosis</th>
<th>Antibiotic therapy</th>
<th>Outcome</th>
<th>Underlying disease or condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>This report</td>
<td>Blood, joint fluid, stool</td>
<td>Gastroenteritis, sepsis, arthritis, and osteomyelitis</td>
<td>Ampicillin-tobramycin, chloramphenicol, cefazolin, ceftriaxone</td>
<td>Survival</td>
<td>None</td>
</tr>
<tr>
<td>Curti et al. (6)</td>
<td>Blood, urine</td>
<td>Gastroenteritis, sepsis</td>
<td>Cefoxitin-penicillin-amikacin, ampicillin-nafcillin</td>
<td>Death</td>
<td>Stage 1A mixed cellularity Hodgkin's disease</td>
</tr>
<tr>
<td>Ellner and McCarthy (10)</td>
<td>Blood</td>
<td>Cellulitis, sepsis</td>
<td>Erythromycin-cefalothin-gentamicin</td>
<td>Death</td>
<td>Sickle cell disease, renal insufficiency, Rheumatoid arthritis, Felty's syndrome, alcoholic cirrhosis, Alcoholic liver disease, Sickle cell disease</td>
</tr>
<tr>
<td>Gordon et al. (12)</td>
<td>Blood, joint fluid, postmortem stool</td>
<td>Arthritis in both knees, congestive heart failure</td>
<td>Trimethoprim-sulfamethoxazole</td>
<td>Death</td>
<td></td>
</tr>
<tr>
<td>Humphreys et al. (15)</td>
<td>Blood, pleural fluid</td>
<td>Septicemia, Gastroenteritis, sepsis</td>
<td>Cefotaxime</td>
<td>Survival</td>
<td></td>
</tr>
<tr>
<td>McNeely et al. (20)</td>
<td>Blood</td>
<td></td>
<td>Ampicillin-chloramphenicol-gentamicin, cefazolin, moxalactam</td>
<td>Death</td>
<td>Infancy (4 days old)</td>
</tr>
<tr>
<td>Appelbaum et al. (1)</td>
<td>Spinal fluid, blood</td>
<td>Septicemia, meningitis</td>
<td>Ampicillin-rifampin</td>
<td>Death</td>
<td>Infancy (2 days old)</td>
</tr>
<tr>
<td>Dahm and Weinberg (7)</td>
<td>Spinal fluid, blood</td>
<td>Septicemia, meningitis</td>
<td>Ampicillin-gentamicin</td>
<td>Death</td>
<td>Infancy (4 days old)</td>
</tr>
<tr>
<td>Dudley et al. (9)</td>
<td>Spinal fluid, blood</td>
<td>Septicemia, meningitis</td>
<td>Ampicillin-gentamicin</td>
<td>Death</td>
<td>Infancy (4 days old)</td>
</tr>
<tr>
<td>Pathak et al. (21)</td>
<td>Spinal fluid, blood</td>
<td>Septicemia, meningitis</td>
<td>Ampicillin-kanamycin</td>
<td>Death</td>
<td>Infancy (2 days old)</td>
</tr>
</tbody>
</table>

* Ewing et al. (11) reported a positive bloodstream isolate without any clinical information.

Products, Plainview, N.Y.). Positive reactions were observed for cephalase, oxidase, L-lysine and L-ornithine decarboxylase, and arginine dihydrodase. Acid was produced from glucose and inositol in oxidation-fermentation medium. Negative reactions were noted for citrate, urease, and tryptophan deaminase. Acid was not produced from mannitol, sorbitol, rhamnose, or sucrose. Hydrogen sulfide was not produced from thiosulfate. The isolates were all identical and were identified as *P. shigelloides*. The antimicrobial susceptibility of each organism was determined by standard disk diffusion techniques (2), and the results were identical for all isolates. The organism was uniformly susceptible to cefazolin, cefoxitin, cefuroxime, cefazadime, ceftriaxone, chloramphenicol, imipenem, gentamicin, and tobramycin but was resistant to ampicillin and ticarcillin.

**Discussion.** *P. shigelloides* is found worldwide in surface water but is rarely associated with appearance in the feces of healthy human hosts (16). Both enteric and extraintestinal infections with *P. shigelloides* have been described previously. Cases of enteric infection may occur sporadically or in clusters; however, raw shellfish ingestion or foreign travel or both provide an epidemiologic link with both types of infection (14, 17, 23). Extraintestinal infections have occurred in immunocompromised patients and include endophthalmitis (5), cellulitis and wound infections (19, 28), cholecystitis (4), pyometra (28), and bloodstream infections (1, 6, 7, 9–12, 15, 20, 21). The patient in this report was similar to the previously reported patients who had *P. shigelloides* enteritis but, uniquely, represents bloodstream infection in the absence of a demonstrable host immune defect.

Enteric infection caused by *P. shigelloides* has been reviewed previously (14). Commonly, gastrointestinal symptoms and fever occur within 48 h of ingestion of a seafood meal and last an average of 11 days. Several patients have been treated solely with rehydration; however, antibiotic therapy has been associated with a shortened duration of symptoms. In vitro studies to determine the mechanism by which *P. shigelloides* produces human disease include a negative Sereny test (for enteroinvasive capability) and equivocal findings for the production of enterotoxin (14, 16, 25, 26).

Reports of extraintestinal infection caused by *P. shigelloides* have been sporadic. Of five patients whose illness was not associated with bloodstream infection, four patients demonstrated polymicrobial infection and two patients were exposed to contaminated water; no deaths were reported. One patient was thought to be immunocompromised because of preexisting hepatobiliary disease.

Bloodstream infection caused by *P. shigelloides* is uncommon (Table 1). No case clustering has been reported, and all of the prior cases were reported in patients demonstrating immune defects. A probable source of infection was found in three cases. A symptomatic diarrhea positive for *P. shigelloides* was observed in our patient, a positive postmortem stool for *P. shigelloides* was found in a patient with rheumatoid arthritis, and a positive maternal cervical culture was found for a paracolon species observed in a neonate with meningitis. A fatal outcome was reported in all cases of bloodstream infection, with the exception of our patient and a child with sickle cell anemia who was in crisis. Overall, most of the extraintestinal infections with *P. shigelloides*, like the extraintestinal infections with the closely related *Aeromonas* spp., involved patients with solid malignancies, leukemias or lymphomas, collagen-vascular tissue diseases, or hepatobiliary disease (8).

Prior experience in treating extraintestinal infections caused by *P. shigelloides* has been limited to isolated case reports. *P. shigelloides* has been shown to produce a betalactamase which mediates resistance to most penicillins (22). In vitro testing of isolates associated with human disease indicates susceptibility to the cephalosporin antibiotics, amoxicylides, trimethoprim, sulfamethoxazole, tetracycline, chloramphenicol, and the quinolone carboxylic acids, including ciprofloxacin, enoxacin, and norfloxacin, and indicates resistance to erythromycin (3, 22). Including our patient, 9 of 10 patients with bloodstream infections were treated with antibiotics to which the organism was susceptible. However, the favorable outcome in our patient was more likely related to his previous good health, whereas the
fatal outcome in other patients may be attributed to the severity of their underlying diseases despite administration of the appropriate antibiotics.

The patient described in this report became ill after ingesting a seafood meal. His blood, stool, and joint fluid cultures were all positive for *P. shigelloides*. Treatment with several cephalosporin antibiotics to which the organism was susceptible eventually resulted in a cure for his bloodstream infection and osteomyelitis. *P. shigelloides* should be considered in the differential diagnosis of human diarrheal illness after seafood ingestion. This report adds further evidence that an enteroinvasive form of disease caused by this organism may exist and that the organism may be a rare cause of septicemia associated with a gastrointestinal illness in an immunocompetent host.

**LITERATURE CITED**