

Infections Due to *Yersinia enterocolitica* Serotypes O:2,3 and O:5 Acquired in South Florida

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Four recent cases of *Yersinia enterocolitica* infections from Florida are discussed. Two of the cases presented as acute mesenteric lymphadenitis, and the other two presented as septicemia. Three of the isolates were an uncommon serotype, O:2,3, and the fourth was serotype O:5. The increasing occurrence of *Y. enterocolitica* in semitropical areas of the United States is emphasized.

Infections caused by *Yersinia enterocolitica* manifest themselves in a variety of forms such as enterocolitis, polyarthritits, erythema nodosum, acute mesenteric lymphadenitis (often mimicking appendicitis) (2), and a typhoid-like septicemia (6). The latter two conditions can pose a life-threatening situation to the patient. A mortality rate approaching 50% has been reported for septicemia (3, 5). Although most *Y. enterocolitica* infections have occurred in temperate climates (2), this report describes four recent infections due to *Y. enterocolitica*, each acquired in South Florida, one of the very few semitropical areas of the United States. Two of these cases presented as acute mesenteric lymphadenitis, and two presented as septicemia. These four cases were significant in two respects: (i) three of the four *Y. enterocolitica* isolates belonged to serotype O:2,3 rather than to one of the more common American serotypes, i.e., O:5, O:8, or O:4,32 [T. Wetzler and D. McClellan, Abstr. Annu. Meet. Am. Soc. Microbiol. 1979, C(H)69, p. 357]; and (ii) previously, only two *Y. enterocolitica* infections have been reported from Florida (8).

CASE REPORTS

Case 1. Patient 1, a 13-year-old white male, was admitted to Hollywood Medical Center, Broward County, Hollywood, Florida, with right lower-quadrant abdominal pain and an elevated temperature for 2 days. The patient had moved to Florida from his home in Pennsylvania 1 week before this episode. The pain was intermittent for 48 h and then became more steady, with localization in the right lower quadrant. There was no nausea, vomiting, or diarrhea.

Physical examination revealed a well-developed, well-nourished young adult with a soft abdomen, but with localization and guarding in the right lower quadrant. There was no rebound tenderness. Vital signs

revealed the following: temperature, 102°F (ca. 38.9°C); pulse, 120; respirations, 20; and blood pressure, 130/70. The remaining physical examination was unremarkable, with the exception of the rectal exam, which showed a right abdominal tenderness. The chest X ray was normal. Laboratory data revealed the following: hemoglobin, 13.1 g/dl; hematocrit, 38.0%; leukocyte count, 11,300/mm³ with a normal differential. The urinalysis was unremarkable.

An appendectomy was performed. The appendix showed mild hyperemia of the serosal surface. The entire appendix was serially sectioned. Microscopic examination did not show acute appendicitis. Forty-eight hours after surgery, the patient retained a low-grade temperature, with drainage from the abdominal wound. *Y. enterocolitica* serotype O:2,3 was isolated from the drainage. The patient's serum, drawn 32 days after the onset of symptoms, showed agglutination titers of 1:512 against the homologous antigen. Against *Y. enterocolitica* antigens O:2 and O:3, the serum showed titers, respectively, of 1:256 and 1:1,024. Cross-adsorption of the antiserum with either of these antigens caused a complete loss of reactivity. The isolate conformed to a Wauters biotype 4 (G. Wauters, Ph.D. Thesis, Vander, Louvain, Belgium, 1970), with positive reactions for nitrate, ornithine, and *o*-nitrophenyl- β -D-galactopyranoside. Negative results were obtained for lecithinase, indole, and xylose (oxidative). Bauer-Kirby disk diffusion testing (1) indicated resistance to penicillin, ampicillin, carbenicillin, and cephalothin. The patient, who had been receiving cephalexin (1 g every 6 h) for 2 days, was started on cefoxitin (1 g every 6 h) and made an uneventful recovery.

Case 2. Patient 2, a 7-year-old white female, was admitted to Jackson Medical Center, Dade County, Miami, Florida, with severe abdominal pain and vomiting for 2 days. The patient was admitted for observation to rule out appendicitis. Physical examination revealed a well-developed, well-nourished female in moderate abdominal distress. The abdominal examination showed generalized tenderness with no localization or rigidity. Radiological examination of the abdomen was compatible with an ileus. Vital signs

included the following: temperature, 102°F; pulse, 104; respirations, 30; blood pressure, 120/106. The chest X ray was clear. The remainder of the physical examination was unremarkable. Laboratory data included the following: hemoglobin, 11.7 g/dl; hematocrit, 34.8%; leukocyte count, 12,400/mm³ with a slight shift to the left. Electrolytes, urinalysis, and liver function tests were within normal limits. Blood and urine cultures were negative. Stool cultures, using conventional methodology, were negative for enteric pathogens. The patient improved dramatically on cefoxitin (1 g every 6 h) and was discharged 4 days after admission. Stool cultures, obtained on the day of admission and treated with the cold enrichment technique (7), grew *Y. enterocolitica* serotype O:2,3 on day 15. Based on positive reactions for xylose (oxidative) and nitrate and negative reactions for lecithinase and indole, the isolate most closely conformed to a biotype 3 in the Wauters scheme. However, we obtained negative ornithine and *o*-nitrophenyl- β -D-galactopyranoside tests, which are not characteristic for biotype 3. Bauer-Kirby disk diffusion testing (1) indicated resistance to penicillin, ampicillin, carbenicillin, and cephalothin.

Case 3. Patient 3, a 5-week-old black male weighing 8 lb. 14 oz. (ca. 4.025 kg), was brought to the emergency room at Jackson Medical Center, Dade County, Miami, Florida. The patient had been experiencing 6 to 10 watery stools daily during the previous 3 days with fever of 103°F (ca. 39.5°C) for 2 days before admission. The stools were described by his mother as soft, seedy, and yellow, with green mucous strands, but no blood. There was no vomiting associated with the diarrhea. The patient had a 17-month-old sister at home who had an upper respiratory infection 2 weeks earlier but no diarrheal symptoms.

At admission, a physical examination revealed a well-developed and nourished male infant in no acute distress. Vital signs included the following: temperature, 100°F (ca. 37.8°C); pulse, 140. Only minimal signs of dehydration were noted. The chest X ray was normal. Laboratory data included the following: hemoglobin, 10 g/dl; hematocrit, 32.3%; leukocyte count, 15,600/mm³ with a normal differential. A lumbar puncture produced values within normal limits. The patient was treated initially with pedialyte to replace fluid loss. For several days after, the patient continued to have 7 to 10 stools daily. These stools were watery, yellow, and seedy, with occasional blood streaks and green mucous. Temperature spikes to 103°F continued. Blood and spinal fluid cultures were negative. Stool cultures (conventional methodology) were negative for enteric pathogens but produced a heavy growth of yeast. Microscopic examination of the stool showed pseudohyphae. The patient was then started on nystatin, which failed to alter the clinical symptoms. On day 7 of incubation, *Y. enterocolitica* serotype O:2,3 was isolated from both blood cultures (Trypticase soy broth, CO₂ under vacuum, 0.03% sodium polyanetholesulfonate [BBL Microbiology Systems, Cockeysville, Md.]). Positive reactions for xylose (oxidative), nitrate, *o*-nitrophenyl- β -D-galactopyranoside, and ornithine tests and negative reactions for lecithinase and indole placed the isolate in Wauters biotype 3. The patient was started on chlorampheni-

col, which was continued for 14 days. Attempts to recover *Y. enterocolitica* from stools were unsuccessful with conventional and cold enrichment methodologies. The patient's diarrhea slowly improved, and he was discharged 30 days after admission.

Case 4. Patient 4, a 46-year-old black male, was admitted to the Veterans Administration Hospital, Dade County, Miami, Florida, with right upper-quadrant pain and rectal-enteric fistula of the scrotum. During his 12-day hospitalization, we observed an elevation in liver function tests: alkaline phosphatase, 222; serum glutamic oxalacetic transaminase, 173; total bilirubin, 5.26; lactate dehydrogenase, 157. A liver scan showed discrete cold nodules. Ultrasound of the abdomen revealed increased portal hypertension suggestive of cirrhosis. The leukocyte and erythrocyte counts, hematocrit, hemoglobin, and erythrocyte sedimentation rate were all normal. The patient's history revealed alcoholism of many years, diabetes, and isoniazid and rifampin treatment for pulmonary tuberculosis on an intermittent basis since 1967.

After 12 days, the patient was discharged for follow-up at the hepatology clinic. Due to a continued rise in liver function test values, the possibility of isoniazid or rifampin hepatitis was considered, and these drugs were discontinued. Two months later, the patient was readmitted with ascites and marked edema of the legs and scrotum. He was febrile with a temperature of 102°F, jaundiced, and lethargic. Liver function tests were markedly elevated: alkaline phosphatase, 283; serum glutamic oxalacetic transaminase, 223; total bilirubin, 11.2; lactate dehydrogenase, 183. The leukocyte count was 13,500/mm³ with segmented neutrophils predominating. After two blood cultures were taken, the patient was started on ampicillin (2 g every 4 h) and gentamicin (70 mg every 8 h), to which he responded dramatically. Within 12 h he had become afebrile, alert, and ambulatory. After overnight incubation, both blood cultures (Trypticase soy broth) grew *Y. enterocolitica* serotype O:5. The patient's serum, drawn 6 days after admission, showed agglutination titers against the homologous antigen of 1:4,096 and against the Centers for Disease Control typing antigen (O:5) of 1:8,192. The isolates were biotyped as Wauters biotype 3, since xylose (oxidative), nitrate, *o*-nitrophenyl- β -D-galactopyranoside, and ornithine tests were positive, whereas indole and lecithinase tests were negative. The *Y. enterocolitica* isolates were resistant to penicillin, ampicillin, carbenicillin, and cephalothin as demonstrated by disk diffusion testing (1). The patient was continued on gentamicin and ampicillin for 10 days. During this period, his liver function test values returned to normal limits, the ascites and edema resolved, and the patient was discharged in good condition.

MATERIALS AND METHODS

Biochemicals. Each of the four isolates was identified with the following tests: glucose, lactose, sucrose, maltose, raffinose, rhamnose, cellobiose, melibiose, salicin, sorbitol, arabinose, mannitol, dulcitol, xylose, trehalose, and esculin; lysine, ornithine, arginine, and phenylalanine; urea; indole; acetoin; β -galactosidase; oxidase; nitrate; and lecithin. All biochemical tests, in

addition to motility tests, were performed in duplicate as previously described and incubated, with one set at 22°C and one set at 35°C (4).

DISCUSSION

Most cases of *Y. enterocolitica* have occurred in the more temperate areas of the United States, e.g., Wisconsin, Washington, and New York, and other countries, e.g., Scandinavia, Japan, and Canada (2). The four recent cases in Florida represent a significant departure from the "cold weather" geographic distribution. Since patient 3 was born in Florida and patient 2 had not been outside of Florida during the past year, both of their *Y. enterocolitica* infections were definitely acquired in Florida. The same is true of patient 4, who had not left Florida since 1967. Although patient 1 had been in Pennsylvania 1 week before the onset of symptoms, the fact that his isolate belonged to the same uncommon serotype O:2,3 as the isolates from patients 2 and 3 is convincing evidence that his infection also was acquired in Florida. In the United States, *Y. enterocolitica* serotype O:2,3 has previously been reported only from Wisconsin and Texas (T. J. Quan, Centers for Disease Control, Vector-Borne Diseases Division, Fort Collins, Colorado, personal communication).

The four cases discussed and the report of two previous *Y. enterocolitica* infections in Florida (8) suggest that infections due to this bacterium may be far more prevalent in semitropical areas of the United States than is presently appreciated. Therefore, microbiologists and physicians

in these areas should be aware of this possibility of *Y. enterocolitica* infections, even in "native" patients.

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