Yersinia enterocolitica Serotype O:8 Septicemia in an Otherwise Healthy Adult: Analysis of Chromosome DNA Pattern by Pulsed-Field Gel Electrophoresis

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We report the first case of blood culture-positive Yersinia enterocolitica serotype O:8 septicemia in Japan. Y. enterocolitica serotype O:8 infection is very rare, but chromosomal DNA analysis suggested that this bacterium may persist latently in healthy carriers throughout Japan.

Yersinia enterocolitica is enteropathogenic for humans and rodents. Serotype O:8 has been considered the most pathogenic among those of Y. enterocolitica, and outbreaks associated with serotype O:8 have been documented in North America (1, 2, 5). However, Y. enterocolitica serotype O:8 infection is rare in Japan; it has been found sporadically and solely limited to Aomori Prefecture (6, 7, 20). Here we report a case of Y. enterocolitica serotype O:8 septicemia in an area of Japan outside of Aomori Prefecture. We have analyzed the chromosome DNA by pulsed-field gel electrophoresis (PFGE).

A 47-year-old Japanese man living in Kanagawa Prefecture, located 750 mi south of Aomori Prefecture, was admitted to Kitasato University Hospital because of high fever, sore throat, unproductive cough, polyarthralgia, and skin rash on 18 June 1996. He did not have gastrointestinal complaints and previous illnesses. On physical examination, his temperature was 38.5°C. The pharynx appeared reddish. Chest findings were negative. Mild hepatosplenomegaly was noted. Active synovitis was evident in the bilateral knee and ankle joints. Small, tender skin lesions were present on his trunk and the extremities. Laboratory findings showed a blood gas analysis as follows: pH 7.498; PaO2, 67.5 torr; PCO2, 34.7 torr; HCO3- 26.9 mmol/liter. Urinalysis results were as follows: protein 1+, 20 to 30 erythrocytes per high-power field, 5 to 8 leukocytes per high-power field, granular and hyaline casts positive; leukocyte count, 20,700/mm3; erythrocyte sedimentation rate, 110 mm/h; total bilirubin, 1.2 mg/dl; glutamic-oxaloacetic transaminase, 78 IU/liter; glutamic pyruvic transaminase, 98 IU/liter; lactate dehydrogenase, 458 IU/liter; alkaline phosphatase, 702 IU/liter; C-reactive protein, 13.848 µg/dl. Chest X-ray and computerized tomography scan showed tiny nodular lesions in the bilateral lung fields. Pathological findings for the skin biopsy specimens were erythema nodosum. On the third day after his admission, treatment with 1 g of panipenem-betamipron was started because the blood culture grew gram-negative rods. The blood specimens were drawn into a Bectec culture bottle (Becton Dickinson, Sparks, Md.), and skin biopsy specimens were cultured directly on Mueller-Hinton agar, MacConkey agar, and bromthymol blue-lactose agar plates at 35°C. A stool culture was not performed because the patient had no gastrointestinal symptoms. An isolate (strain KU14) obtained from two specimens was identified as Y. enterocolitica by the direct bacterial agglutination test (Denka Seiken Co., Tokyo, Japan). Antimicrobial sensitivities of the isolate from two different sources were the same: sensitivity to piperacillin, expanded-spectrum cephalosporins, imipenem, aminoglycosides, minocycline, and ofloxacin but not to narrow-spectrum cephalosporins. The patient improved immediately after the treatment, and the lung lesions also disappeared completely.

The genotypic characteristics of strain KU14 were analyzed by PFGE as previously described (14) and compared with those of five strains of Y. enterocolitica serotype O:8 isolated from patients with gastroenteritis in Aomori Prefecture (kindly provided by Y. Ohtomo, Aomori Prefectural Institute of Public Health and Environment, Aomori, Japan) and two strains of Y. enterocolitica serotype O:3. Chromosome DNA was extracted by lysozyme and proteinase K treatment, and XbaI-digested genomic DNA was separated by contour-clamped homogeneous electric field electrophoresis (CHEF Mapper; Bio-Rad Laboratories, Hercules, Calif.). The PFGE pattern of strain KU14 was very similar to those of five strains of Y. enterocolitica serotype O:8 but quite different from those of two strains of Y. enterocolitica serotype O:3 (Fig. 1). Based on the revised biogrouping scheme of Wauters et al. (22), strain KU14 was identified as biotype 1B, as were the other five strains of serotype O:8. Next, we performed plasmid analysis and a mouse inoculation study to examine the pathogenicity of strain KU14. Plasmid DNA was purified by the alkaline lysis method (9) and separated by electrophoresis. Strain KU14 lacked a plasmid.

In 1991, Ichinohe et al. reported the first case of Y. enterocolitica serotype O:8 infection in northern Japan (Hirosaki city in Aomori Prefecture) (7), and only sporadic cases, limited to this area, have been reported subsequently (6, 20). Therefore, serotype O:8 infection is still uncommon in Japan. Y. enterocolitica septicemia has been reported for individuals having underlying conditions such as liver cirrhosis, thalassemia major, malnutrition, renal failure, diabetes mellitus, and immunosuppression (4, 11, 18, 19), as well as for young children (12), although it is rarely found in healthy adults (3, 11, 18).

Considering the above background, the present case of Y. enterocolitica serotype O:8 septicemia in an otherwise healthy person presenting pulmonary embolization without gastro-

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standards are indicated on the left and on the right of the figure, respectively.

lanes M, the sizes of yeast chromosomal DNA standards and 1 DNA ladder standards are indicated on the left and on the right of the figure, respectively.

Food-borne transmission of Y. enterocolitica has been suggested; however, a specific food has not been determined for our patient. Furthermore, the patient had not been exposed to small rodents, which are considered to be carriers of this pathogen in Japan (6, 8, 21), and had not traveled to Aomori Prefecture.

Strains of the same evolutionary lineage should show similar or identical patterns by PFGE (14, 15). The result of our PFGE analysis may indicate that the same strain is distributed in both Aomori and Kanagawa prefectures. The 70-kb plasmid is shown to be related to the virulence of Y. enterocolitica (10, 16), such as in proliferation in the host tissue and establishment of infection (13). We speculated that strain KU14 lost the 70-kb virulence plasmid under culture conditions (9, 17).

From our experience, Y. enterocolitica is not a common causative pathogen for septicemia, but its presence should be considered in healthy subjects with signs of septic features, even if they do not have symptoms of gastroenteritis. Y. enterocolitica serotype O:8 infection is still uncommon in our community, but it should be emphasized that the bacterium may persist latently in healthy carriers throughout Japan and possess a potential virulence even in immunocompetent hosts.

REFERENCES


