

Serratia plymuthica Sepsis Associated with Infection of Central Venous Catheter

HAROLD W. HOROWITZ,^{1*} ROBERT B. NADELMAN,¹ KEN G. VAN HORN,² SHARON E. WEEKES,²
LILA GOYBURU,² AND GARY P. WORMSER¹

Division of Infectious Diseases, Department of Medicine,¹ and Department of Pathology,² New York Medical College, Valhalla, New York 10595

Received 20 January 1987/Accepted 20 April 1987

***Serratia plymuthica* was isolated from the blood and from a central venous catheter tip in a 54-year-old man with alcoholic cirrhosis and clinical signs of sepsis. This was the seventh reported isolate of *S. plymuthica* from a clinical specimen and the first in which the organism was clearly a significant pathogen.**

The genus *Serratia* now includes at least six recognized species (4). For years, *Serratia* spp. were considered non-pathogenic in humans (5). Over the past 25 years, *Serratia marcescens* has emerged as an important predominantly nosocomial pathogen, capable of causing endocarditis, osteomyelitis, intravenous catheter-associated infections, pneumonia, and urinary tract infections. Other *Serratia* species have caused infections less frequently. *S. liquefaciens* (4) has been implicated in pneumonia and bacteremia. *S. rubidaea* (5) and *S. ficaria* (1) have been isolated from human sputum but were not clearly associated with human infection, although in one case (7), *S. ficaria* was suspected of contributing to a wound infection.

In a recent review of clinical isolates of members of the family *Enterobacteriaceae* which were evaluated at the Centers for Disease Control reference laboratories (4), five *S. plymuthica* specimens were noted, all from respiratory fluid. In view of the lack of available information, the clinical importance of these isolates is unclear. The only other isolate of *S. plymuthica* from a patient was from a burn site in a child, but no infection was clearly present (3). Between 1965, and 1978, no *S. plymuthica* was isolated among 1,107 clinical isolates of *Serratia* spp. from Pellegrin Hospital in France (6). In this paper, we describe a patient with alcoholic cirrhosis who had *S. plymuthica* sepsis associated with infection of a central venous catheter.

A 54-year-old alcoholic man with biopsy-proven cirrhosis was admitted to Westchester County Medical Center on 5 October 1986 for treatment of progressive ascites. On admission, his physical exam was remarkable for spider angiomas, a fluid wave, and the presence of caput medusae on abdominal examination. A complete blood count and liver function studies were normal. A peritoneal fluid specimen showed 422 cells per mm³ (of which 98% were mononuclear), a glucose of 111 mg/dl, and a total protein of 2.5 g/dl. Cultures of peritoneal fluid for aerobic and anaerobic bacteria were negative. An abdominal ultrasound showed massive ascites and a nodular liver with nonhomogeneous uptake consistent with alcoholic cirrhosis. A peritoneovenous (LeVeen) shunt was placed on hospital day 7. Peritoneal cultures taken at the time of shunt placement were negative.

On hospital day 14, the patient appeared ill, complained of chills, and noted pain over a central venous catheter site. His temperature was 37.5°C. The catheter site showed no signs of infection, and the LeVeen shunt was working well. The

next morning, the patient had a fever of 38.6°C, was noted to be tachypneic and lethargic, and had a drop in systolic blood pressure to less than 90 mm Hg. The peripheral leukocyte count rose to 11,000/mm³. A paracentesis showed 100 leukocytes, of which 40% were polymorphonuclear. Chemistry studies of peritoneal fluid were unchanged from previous results. The bladder and central venous catheters were removed from the patient, and cultures from blood, urine, and the central venous catheter tip were obtained. Intravenous ampicillin, gentamicin, and clindamycin were begun. The patient defervesced within 24 h and became hemodynamically stable, and his leukocyte count returned to normal. A nuclear medicine scan showed the LeVeen shunt to be patent. One of two sets of peripheral blood cultures, a blood culture drawn through the central venous catheter tip, and a culture of the catheter tip itself grew *S. plymuthica* which was susceptible to gentamicin (Table 1). A urine culture was negative. Peritoneal fluid was not cultured at the time of sepsis. Blood cultures taken 24 h after antibiotics were discontinued were negative. The patient, significantly improved, was discharged from the hospital after 10 days of gentamicin therapy and 7 days of ampicillin and clindamycin therapy.

Two of three blood culture sets (BACTEC 6B and 7D; Johnston Laboratories Inc., Towson, Md.) and a culture obtained on 20 October 1986 of a central venous catheter tip yielded pure growth of a gram-negative bacterium. All cultures were incubated at 35°C. The organism grew on 5%

TABLE 1. In vitro antimicrobial susceptibility of *S. plymuthica* isolated from blood and catheter tip

Antimicrobial agent	MIC (μ g/ml)	MBC (μ g/ml)	Interpretation ^a
Amikacin	≤ 2	≤ 2	S
Ampicillin	> 16		R
Cefamandole	> 16		R
Cefoperazone	≤ 4	≤ 4	S
Cefotaxime	≤ 2	≤ 2	S
Cefoxitin	≤ 2	≤ 2	S
Cephalothin	≥ 16		R
Chloramphenicol	≤ 1	4	S
Gentamicin	≤ 1	≤ 1	S
Piperacillin	≤ 8	≤ 8	S
Tetracycline	≤ 1	≤ 2	S
Tobramycin	≤ 1	≤ 1	S
Trimethoprim-sulfamethoxazole	≤ 2	≤ 2	S

^a S, Susceptible; R, resistant.

* Corresponding author.

sheep blood agar and produced lactose-fermenting colonies on MacConkey agar. The organism was catalase positive, oxidase negative, and nonmotile; hydrolyzed gelatin at 35 and 22°C, and produced DNase. On a triple sugar iron slant, the organism produced an acid slant, acid butt, no gas, and no H₂S. Biochemical testing was done with the Microscan Gram-Negative Combo 1 panel (American Microscan, West Sacramento, Calif.). Identical biotype code numbers were obtained for each isolate. Acid was produced from glucose, sucrose, raffinose, arabinose, and melibiose. Positive reactions were observed for *o*-nitrophenyl-β-D-pyranogalactoside, esculin hydrolysis, nitrate reduction, Voges-Proskauer, and citrate utilization. Acid was not produced from sortitol, rhamnose, inositol, or adonitol. Negative reactions were observed for urea hydrolysis, H₂S, indole, tryptophan deaminase, malonate utilization, L-lysine, L-ornithine decarboxylase, and L-arginine dihydrolase. Conventional biochemical tests were used to confirm the identification of the organism as *S. plymuthica* (3). Antibiotic susceptibility testing was performed by a microbroth technique with the Microscan Gram-Negative Combo 1 panel (Table 1). The MBC, identified as the lowest antibiotic concentration to cause 99.9% killing, was determined with a microbroth technique using the Microscan Gram-Negative panel. Results were identical for each isolate.

This is the first isolate of *S. plymuthica* from our hospital. However, the epidemiology of this organism will need to be further defined since it has only recently been added to the database of American Microscan and other identification systems. It may have been classified with other *Serratia* species in the past. It is unclear how this species of *Serratia* was acquired by the patient. *S. plymuthica* has been previously isolated from water, crickets, and wild voles (5). It is uncertain how these factors would have played a role in the illness of the patient. Whether the organism was seeded from the catheter insertion site remains open to question since this site was not cultured. It is tempting to implicate the catheter as the source of infection since the patient had pain over the insertion site prior to the onset of sepsis and the culture of the catheter tip grew the same organism as that cultured from the blood. Sepsis secondary to peritonitis could not be excluded since a sample of the peritoneal fluid was not

cultured at the time of onset of sepsis. However, the normal cell count and chemistries and the absence of peritoneal signs and symptoms were not suggestive of peritonitis. *S. plymuthica* must now be considered an organism capable of causing serious infection in humans. Whether people with alcoholic or other liver disease are at particular risk for infection with this organism, as has been reported with nontyphoidal salmonellae (2) and *Vibrio vulnificus* (8), for example, requires further observation and study.

We thank E. J. Bottone, Mount Sinai Hospital and Medical Center, New York, N.Y., and P. Gialanella, Montefiore Hospital, Bronx, New York, N.Y., for confirming the identification of *S. plymuthica*.

LITERATURE CITED

1. Brouillard, J. A., W. Hansen, and A. Compere. 1984. Isolation of *Serratia ficaria* from human clinical specimens. *J. Clin. Microbiol.* **19**:902-904.
2. Cherubin C. E., T. Fodor, L. I. Denmark, C. S. Master, H. T. Fuerst, and J. Winter. 1969. Symptoms, septicemia and death in salmonellosis. *Am. J. Epidemiol.* **90**:285-291.
3. Clark, R. B., and J. M. Janda. 1985. Isolation of *Serratia plymuthica* from a human burn site. *J. Clin. Microbiol.* **21**:656-657.
4. Farmer, J. J., III, B. R. Davis, F. W. Hickman-Brenner, A. McWhorter, G. P. Huntley-Carter, M. A. Asbury, C. Riddle, H. G. Wathen-Grady, C. Elias, G. R. Fanning, A. G. Steigerwalt, C. M. O'Hara, G. K. Morris, P. B. Smith, and D. J. Brenner. 1985. Biochemical identification of new species and biogroups of *Enterobacteriaceae* isolated from clinical specimens. *J. Clin. Microbiol.* **21**:46-76.
5. Grimont, P. A. D., and F. Grimont. 1981. The genus *Serratia*. *Annu. Rev. Microbiol.* **32**:221-248.
6. Grimont, P. A. D., and F. Grimont. 1981. The genus *Serratia*, p. 1187-1203. *In* M. P. Starr, H. Stolp, H. G. Truper, A. Balows, and H. G. Schlegel (ed.), *The procaryotes*. Springer-Verlag KG, Berlin.
7. Pien, F. D., and J. J. Farmer III. 1983. *Serratia ficaria* isolated from a leg ulcer. *South. Med. J.* **76**:1591-1592.
8. Wongpaitoon V., B. Sathapatayavongs, R. Prackaktam, S. Bunyaratvej, and S. Kurathong. 1985. Spontaneous *Vibrio vulnificus* peritonitis and primary sepsis in two patients with alcoholic cirrhosis. *Am. J. Gastroenterol.* **80**:706-708.