Broviac Catheter Infection with *Kluyvera cryocrescens*: a Case Report

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*Kluyvera cryocrescens* was isolated from a blood culture drawn from a patient with a Broviac catheter-related infection. *K. cryocrescens* has been considered an opportunistic pathogen but has not previously been associated with central venous catheter infections.

The utilization of central venous catheters (CVCs) in many patients with hematologic, oncologic, or gastrointestinal disorders has become routine since the introduction of these devices by Broviac et al. (3) and Hickman et al. (8) in the 1970s. Concomitant with the increased use of CVCs have been reports of both short-term and long-term complications including malposition of the catheter (5), venous thrombosis and superior vena cava syndrome (10), accidental removal by patients (12), and CVC infections and sepsis (9, 13, 15). This report describes a CVC infection by *K. cryocrescens*, an uncommonly reported pathogen.

A 17-month-old male with known congenital heart disease was admitted to Children's Hospital of Los Angeles on 11 January 1986 with severe congestive heart failure requiring emergency intubation. As a newborn, he had had a right Blalock-Taussig shunt performed for a severe form of tetralogy of Fallot. His hospital course included tetralogy of Fallot repair, patent ductus arteriosus ligation, and ligation of the right Blalock-Taussig shunt in April 1986. Subsequently, he became ventilator dependent, and a tracheostomy was performed in June 1986. At the time of the tracheostomy, a Broviac catheter was also placed for intravenous access. He was treated for two episodes of pneumonia during his hospitalization and received trimethoprim-sulfamethoxazole prophylaxis because of a history of urinary tract infections.

On 11 July 1986, the patient became febrile with a temperature of 39.2°C, and blood cultures were obtained through the central line. During the next 2 days, his temperature increased to 40.3°C, and he was assessed as clinically ill, agitated, and irritable. On 13 July, a blood culture was again drawn through the Broviac catheter, and intravenous ampicillin and gentamicin were begun. A chest X-ray also was obtained but did not demonstrate any infiltrates. Subsequently, *K. cryocrescens* in pure culture was isolated from both blood cultures. Blood culture specimens were collected with a pediatric isolator tube (Dupont Biosystems, Wilmington, Del.) and inoculated onto a chocolate agar plate and into prereduced anaerobically sterilized brain heart infusion broth with Bacto Supplement B (Difco Laboratories, Detroit, Mich.). Genus identification was established by routine biochemical profiles done by using the AutoMicrobic system (Vitek Systems, Inc., Hazelwood, Mo.). The genus and species identification was confirmed by the California State Microbiology Laboratory by glucose fermentation testing. The blood cultures were quantitated by the method of Raucher et al. (14). The specimens from 11 and 13 July were found to have 1 and 100 CFU/ml, respectively. Bagged urine specimens were obtained on 13 and 14 July and yielded less than 10⁶ organisms per ml. Similarly, an echocardiogram failed to demonstrate a focus of infection.

A follow-up blood culture obtained through the Broviac catheter on 16 July yielded no growth of *K. cryocrescens* but did yield *Candida albicans*. A corresponding peripheral blood culture did not yield growth of bacteria or yeast. Intravenous amphotericin B was started but discontinued after 3 doses (6 mg total) because of severe shaking chills, cyanosis, and hypotension requiring cardiovascular pressor agents. Oral flucytosine was initiated and sterile blood cultures were obtained through the Broviac catheter on 21 July. The patient ultimately received a 10-day course of ampicillin and gentamicin and a 7-day course of flucytosine.

The Broviac catheter was removed on 23 July, and the catheter tip culture was negative for bacteria and yeasts.

On 3 August 1986, the patient suffered a cardiopulmonary arrest and could not be resuscitated. Postmortem cultures of lung tissue and blood yielded few diphtheroid bacilli and *Clostridium butyricum*, respectively. There was no gross or microscopic evidence of bacterial or yeast infection.

Infections of CVCs remain a significant concern because of associated morbidity and mortality. The number of infections per 100 catheter days ranges from 0 to 0.80, as reviewed by Press et al. (13) and Hiemenz et al. (9). The incidence of infections correlates with duration of usage, immunologic status of the patient (e.g., neutropenia), use of the CVC (e.g., hyperalimentation versus chemotherapy), type of catheter utilized, and maintenance techniques employed (1, 4, 9). The complication of infection has been difficult to assess because of different definitions of CVC infection, use of retrospective studies, and problems differentiating contaminant from pathogen (e.g., *Staphylococcus epidermidis*).

Isolated pathogens associated with CVC infections include gram-positive and gram-negative bacteria as well as fungi (4, 12, 13, 15, 16). No reports of the isolation of *Kluyvera* species from CVCs have come to our attention. This lack is not surprising in view of the infrequent isolation of this organism from clinical specimens.

The *Kluyvera* genus was recently proposed by Farmer et al. (7) to include a group of organisms previously identified as Enteric Group 8. These gram-negative motile organisms are α-glucose fermenters which produce acid and gas and are oxidase negative and nitrate positive. They differ from other members of the family *Enterobacteriaceae*, however, by their ability to utilize malonate and citrate and their positive reaction in Moeller ornithine decarboxylase. Farmer et al. (7) have shown that of a glucose fermentation test (in...
peptone water) at 5°C with observation for growth and a pH of <6.0 within 21 days is useful for differentiating *K. cryocrescens* from *Klebsiella ascorbata*. Similarly, an ascorbate test in which the organism is inoculated into Difco fermentation base 836-01 (to which L-ascorbic acid–sodium salt, bromothymol blue, water, and sodium hydroxide have been added with observation for the production of acid and gas) has been utilized by the Centers for Disease Control to identify *K. ascorbata*. These tests, however, are not routinely available in many microbiology laboratories.

Despite sharing many of the biochemical properties of organisms in the family *Enterobacteriaceae*, *Klebsiella* spp. have rarely been considered pathogens (2, 6, 7). Farmer et al. (7) reported the isolation of *Klebsiella* spp. from human sources, including sputum, urine, stool, throat, and blood. Environmental sources noted were sewage, soil, kitchen food, water, milk, and a hospital sink. These findings suggest that *Klebsiella* spp. may be more widely distributed than previously recognized. Braunstein et al. (2) reported the isolation of Enteric Group 8 organisms from the sputum of a 6-year-old boy with tuberculosis and from gall bladder fluid drainage of a 63-year-old woman with acute pancreatitis. Similarly, Farmer’s isolation of five strains of *Klebsiella* spp. from blood cultures suggested that *Klebsiella* spp. be considered an “infrequent opportunistic pathogen” (7). Notably, only one of the blood culture isolates was *K. cryocrescens*.

In the work reported here, the isolation of *K. cryocrescens* from blood drawn through a Broviac catheter and the clinical response to antibiotic therapy suggested a CVC-associated infection. Furthermore, no other foci of infection were found. Possible environmental sources of *K. cryocrescens* were not investigated, and *K. cryocrescens* was not isolated from the tracheostomy tube despite the reported association of tracheostomy and catheter tip infections (11).

The subsequent isolation of *C. albicans* from the same CVC is not an unusual occurrence. Michel et al. (11) isolated multiple organisms from 8 of 47 culture-positive catheter tips; all samples contained *C. albicans*.

The sterilization of the catheter tip in this case suggests that *Klebsiella* CVC infections may be successfully managed with antibiotics administered through the infected catheter. Further epidemiologic studies and observations of *Klebsiella* spp. are needed to delineate and clarify their pathogenic role in CVC and opportunistic infections.

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**LITERATURE CITED**


