Case Report

Consecutive episodes of peritonitis in a patient undergoing peritoneal dialysis caused by unusual organisms: *Brevibacterium* and *Pantoea agglomerans*

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**Abstract**

A 52-year-old man undergoing continuous ambulatory peritoneal dialysis presented with two consecutive episodes of peritonitis caused by unusual organisms, namely, *Brevibacterium* and *Pantoea agglomerans*. The patient was successfully treated with a 2-week course of cefazolin and ceftazidime for the *Brevibacterium*-associated peritonitis, and a 3-week course of gentamicin for the *P. agglomerans*-associated peritonitis. Although these environmental organisms are rarely responsible for human infection, the number of reported cases of human infection by these unusual organisms has increased. This report emphasizes the potential for infection by environmental organisms in patients undergoing peritoneal dialysis.

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**Introduction**

Peritonitis and exit site infection are common and serious complications in patients undergoing peritoneal dialysis that can cause significant morbidity. The organisms that are commonly isolated in such patients are Gram-positive and aerobic Gram-negative bacteria. However, culture of the peritoneal fluid sometimes reveals unusual microorganisms. We report the case of a patient who experienced two consecutive episodes of peritonitis while undergoing peritoneal dialysis, caused by *Brevibacterium* and *Pantoea agglomerans*. To date, a limited number of clinical cases associated with these organisms have been described.

**Case report**

A 52-year-old man undergoing continuous ambulatory peritoneal dialysis (CAPD) with no prior peritonitis presented with abdominal discomfort and cloudy peritoneal fluid that had persisted for 7 days. He had a history of hypertension and liver cirrhosis, and had been maintained on CAPD since June 2009. Physical examination revealed mild generalized abdominal tenderness. The presence of turbid peritoneal fluid with a white blood cell (WBC) count of 11000 cells/mm³ (86% neutrophils) indicated CAPD peritonitis. A 50-mL sample of peritoneal fluid was centrifuged at 3000 g for 15 minutes, followed by resuspension of the sediment in 3–5 mL of sterile saline and inoculation on solid culture medium. Immediately after sampling, the patient was treated empirically with intraperitoneal cefazolin (1 g/day) and ceftazidime (1 g/day) on an outpatient basis, as per his request. After 72 hours of aerobic incubation on blood agar, pigmented colonies with a white-gray appearance were detected. The organism was identified as *Brevibacterium*, which was resistant to clindamycin, erythromycin, penicillin and...
vancomycin, and sensitive to chloramphenicol, ciprofloxacin, gentamicin, tetracycline, and trimethoprim–sulfamethoxazole. After the patient returned home, the peritonitis quickly responded to treatment within 2 days; the patient’s clinical state improved and the dialysate became clear. He continued antibiotic treatment for 2 weeks and recovered completely from peritonitis, which was confirmed in the outpatient clinic by dialysate analysis. Five weeks later, the patient visited the emergency department, presenting with colicky abdominal pain and vomiting that had persisted for 3 days. He had also suffered from diarrhea over the previous 5 days. Physical examination revealed a distended and tender abdomen with increased bowel sounds. The catheter exit site was clean, without evidence of erythema or discharge. Laboratory data showed peripheral leukopenia, with a WBC count of 3200 cells/mm$^3$ (87.3% neutrophils). Serum C-reactive protein (CRP) was 5.3 mg/dL. The dialysate fluid was cloudy and analysis of peritoneal fluid demonstrated a high WBC count (CRP) was 5.3 mg/dL. The dialysate fluid was cloudy and analysis of peritoneal fluid demonstrated a high WBC count (5940 cells/mm$^3$), consisting mainly of neutrophils (91%). Samples of dialysate effluent were obtained using an aseptic technique and processed using the same method as that for the first peritonitis episode. The patient was immediately started on intraperitoneal antibiotic treatment with cefazolin (1 g/day) and gentamicin (40 mg/day) on admission. His serum CRP level increased to 9.3 mg/dL after admission. By 48 hours after inoculation of peritoneal samples on blood agar, Gram-negative bacteria belonging to the Enterobacteriaceae family were isolated. Further analysis identified the bacteria as *P. agglomerans*. The bacteria were sensitive to all antibiotics tested, including ampicillin, ceftazidime, cefoxitin, ciprofloxacin, gentamicin, tetracycline, imipenem, and piperacillin. On the basis of these results, cefazolin was discontinued after 3 days, whereas gentamicin treatment was continued. The patient’s abdominal pain improved and the peritoneal fluid became clear by the third day of treatment. His CRP level dropped to 1.35 mg/dL on hospital Day 7, and analysis of peritoneal fluid revealed steady improvements in peritonitis, as evidenced by a reduction in peritoneal fluid WBC count (190 and 30 cells/mm$^3$ on hospital Days 7 and 14, respectively). Antibiotic treatment with gentamicin was continued for 3 weeks and the patient was discharged.

**Discussion**

The patient experienced two consecutive episodes of peritonitis in a relatively short period of time, both of which were caused by environmental organisms. These organisms have rarely been reported as being responsible for clinically significant infections in humans. *Brevibacterium* spp. are Gram-positive, irregular, rod-shaped, non-acid-fast bacteria that resemble corynebacteria. The main habitat of *Brevibacterium* is dairy products, in which the bacteria contribute to the aroma and color of the product; they are also found on human skin surfaces and genital hair, and have been associated with otorrhea [1–3]. A few cases of *Brevibacterium*-induced disease have been reported, but little is known about the optimal choice of antibiotics or treatment duration for such infections [4,5]. Although we did not identify the specific *Brevibacterium* strain in the present patient, our results suggest that *Brevibacterium*-associated peritonitis may be susceptible to cephalosporin antibiotics.

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**Pantoea agglomerans** (formerly *Enterobacter agglomerans*) is a Gram-negative aerobic bacillus belonging to the Enterobacteriaceae family. It is ubiquitous and is found in human and animal feces, and especially in plants, fruits, and vegetables. Recently, cases of *P. agglomerans*-associated peritonitis in peritoneal dialysis patients have been increasingly reported [6–8]. Plant-associated thorn injury was the most common etiology. However, reported cases of *P. agglomerans*-associated peritonitis in patients without plant injury suggest that gastrointestinal transformation is a possible source of infection [9,10]. In the present case, our patient was not involved in gardening and reported that he had not received of any plant-associated injuries such as from a rose thorn. We found no signs of any significant skin trauma at the time of *P. agglomerans*-associated peritonitis. Instead, it is likely that the patient was prone to infection because of his immunocompromised state. In fact, he suffered from liver cirrhosis and had recently received antibiotic therapy due to the prior *Brevibacterium*-associated peritonitis episode. Considering the preceding occurrence of diarrhea, translocation of bacteria from the gastrointestinal tract may have been responsible for this second episode of peritonitis.

The degree of severity was comparable between the two consecutive peritonitis episodes in the present patient. *Brevibacterium*-associated peritonitis showed more favorable clinical symptoms, whereas *P. agglomerans*-associated peritonitis was associated with more severe symptoms and higher CRP levels. Our findings are in line with previous findings suggesting that *Pantoea*-associated peritonitis is relatively more symptomatic, accompanied by fever, nausea, vomiting, and severe abdominal pain [9,11]. However, it has been reported that peritonitis associated with *P. agglomerans* shows good response to antibiotics such as ciprofloxacin and aminoglycoside [8–10]. The second episode of peritonitis responded well to gentamicin treatment in the present patient.

In summary, we report two consecutive episodes of unusual peritonitis caused by different environmental organisms in a patient undergoing peritoneal dialysis. The patient was successfully treated with a 2-week course of cefazolin and ceftazidime for the *Brevibacterium*-associated peritonitis, and a 3-week course of gentamicin for the *P. agglomerans*-associated peritonitis. Although these organisms are rarely responsible for human infections, it is important to view them as pathogens rather than contaminants when isolated in patients undergoing peritoneal dialysis. Plant-associated thorn injuries should be assessed in patients with *P. agglomerans*-associated peritonitis; less frequently, translocation of bacteria from the gastrointestinal tract should be considered as the source of infection.

**Conflict of interest**

None declared.

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