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Oerskovia xanthineolytica Implicated in Peritonitis Associated with Peritoneal Dialysis: Case Report and Review of *Oerskovia* Infections in Humans

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***Oerskovia* species are nocardialike bacteria that have been implicated as pathogens only rarely. These organisms are branched, gram-positive bacilli that are oxidase negative, catalase positive, and non-acid fast. Unlike *Nocardia* species, these organisms are motile, do not produce aerial mycelia, and possess a cell wall with large amounts of galactose. Colonies are bright yellow and produce branched vegetative hyphae on nutrient agar. A 70-year-old patient undergoing chronic ambulatory peritoneal dialysis for end-stage renal dysfunction developed recurrent peritonitis. Five peritoneal fluid cultures and one catheter specimen obtained over a period of two weeks yielded a gram-positive bacillus; *Oerskovia xanthineolytica* was isolated from all six cultures. Prolonged systemic therapy with gentamicin and vancomycin was unsuccessful in curing the peritonitis, but the infection resolved following removal of the peritoneal catheter. This is the first reported case of peritonitis associated with this microorganism. A review of previously described *Oerskovia* infections, most of which were associated with foreign bodies, showed that removal of infected foci was usually necessary for cure.**

The genus *Oerskovia* in the class of *Actinomycetales* comprises two species, *Oerskovia turbata* and *Oerskovia xanthineolytica*. *Oerskovia* spp. have only rarely been implicated as pathogens in humans (2, 4–6, 8, 11). In this paper we describe a patient with recurrent *O. xanthineolytica* peritonitis that was due to an infected indwelling peritoneal catheter. We also reviewed the literature for other cases of *Oerskovia* infection; below we describe the common clinical features of these infections and discuss implications for therapy.

CASE REPORT

A 70-year-old male with renal failure secondary to chronic hypertension presented to the outpatient clinic twice over 4 days with a history of constipation and dull abdominal pain. He had been undergoing continuous ambulatory peritoneal dialysis for 11 years and was on a regimen of 2-liter exchanges four times a day. He denied having any fever or chills. Vital signs, physical examination of the abdomen, and a plain X-ray film of the abdomen were unrevealing. The peritoneal effluent appeared dark yellow and was slightly turbid; the leukocyte count was 50 cells per ml with 50% neutrophils. A culture of the effluent yielded a gram-positive, diphtheroidlike bacillus. Vancomycin was administered intraperitoneally, and gentamicin was administered intramuscularly. One week later, he returned with a 3-day history of abdominal discomfort, anorexia, and constipation but denied having nausea, vomiting, fever, and chills. The dialysate remained persistently cloudy with a leukocyte count of 1,300 cells per ml and 100% neutrophils. Again, vancomycin was administered intraperitoneally, and gentamicin was administered intramuscularly; gentamicin was also added to each dialysate exchange bag. Malaise and diffuse abdominal tenderness persisted. At 11 days after the first visit, both vancomycin and gentamicin were given intravenously. Peak concentrations of vancomycin in serum ranged from 4.5 to 24.9 mg/ml, and peak concentrations of gentamicin in serum ranged from 2.9 to 6.2 μg/ml. Cultures of the peritoneal effluent of the patient again yielded a gram-positive bacillus; the peritoneal leukocyte count was 2,511 cells per ml with 100% neutrophils. Four days later, the peritoneal catheter was removed, and hemodialysis was initiated; the same organism was again isolated from the catheter tip. The abdominal symptoms gradually resolved, and antibiotic treatment was discontinued 5 days after removal of the catheter. The patient has remained well for 1 year.

MATERIALS AND METHODS

During the course of the infection, 2-liter bags of peritoneal effluent were sampled. A 15-ml sample was aspirated from the administration port. Following centrifugation (3,000 rpm, 10 min), the sediment was used to prepare a smear for Gram staining and to inoculate 5% sheep blood agar, heart infusion agar, chocolate agar, buffered charcoal-yeast extract agar, reduced anaerobic blood agar, Sabouraud dextrose agar (pH 5.6), and Lowenstein-Jensen medium. The anaerobic blood agar was incubated under anaerobic conditions at 37°C; the Sabouraud dextrose agar and heart infusion agar were incubated at 30°C, and the remaining media were incubated in the presence of 5% CO_2 at 35°C. Biochemical tests routinely used in actinomycete laboratories were performed (1). Tests for acid production from carbohydrates were performed in fermentative basal medium (3). Antimicrobial agent susceptibility tests were performed at 35°C by using the microdilution method and Mueller-Hinton broth (M. M. McNeil, J. Brown, L. Ajello, and W. Jarvis, Rev. Infect. Dis., in press).

RESULTS

Five cultures of the peritoneal effluent of the patient and the culture obtained from the peritoneal catheter site revealed the presence of a branched, gram-positive bacillus.

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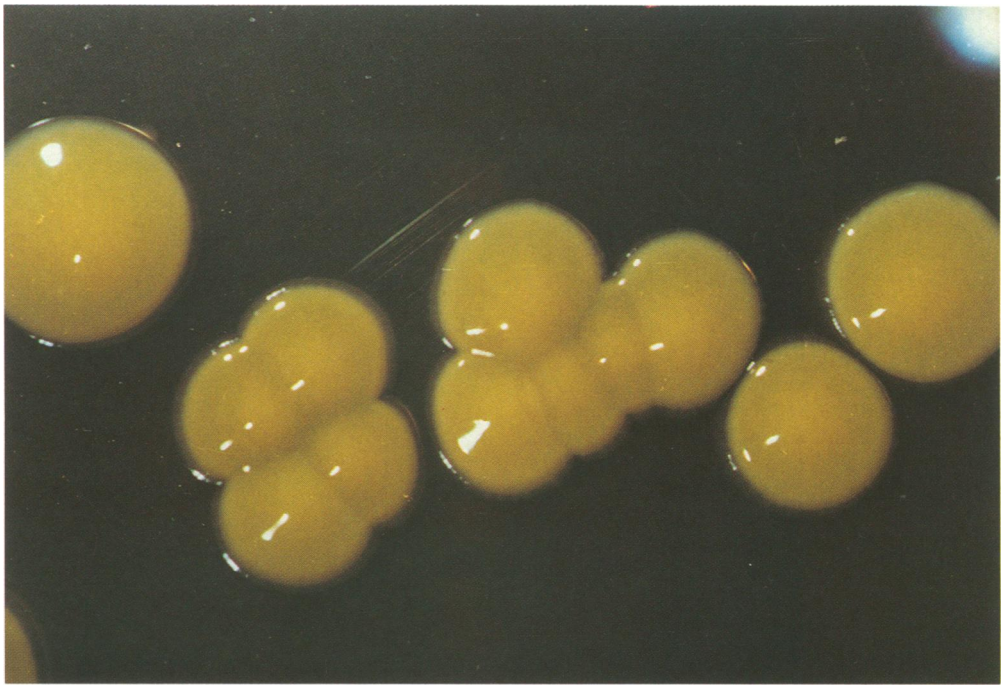

FIG. 1. *O. xanthineolytica* colonies on Trypticase soy agar plate at 72 h. Note the bright yellow pigment. Magnification, ×60.

Colonies were visible on blood agar, buffered charcoal-yeast extract agar, and chocolate agar after overnight incubation; after 48 h, the colonies were bright yellow (Fig. 1). Branched substrate hyphae were observed after 24 h on the heart infusion agar plate (Fig. 2). The organism was oxidase negative (1% tetramethyl-*p*-phenylenediamine dihydrochloride), catalase positive, and motile. The organism grew anaerobically but failed to grow on Sabouraud dextrose agar. Acid was produced from glucose, lactose, sucrose, maltose, and xylose. No acid was produced from mannitol. Nitrate was reduced to nitrite. Citrate was not utilized. β-Galactosidase was produced, but urease was not produced. Gelatin, esculin, casein, xanthine, and hypoxanthine were hydrolyzed, but tyrosine was not hydrolyzed. *O. xanthineolytica* was differentiated from *O. turbata* by its ability to hydrolyze xanthine and hypoxanthine.

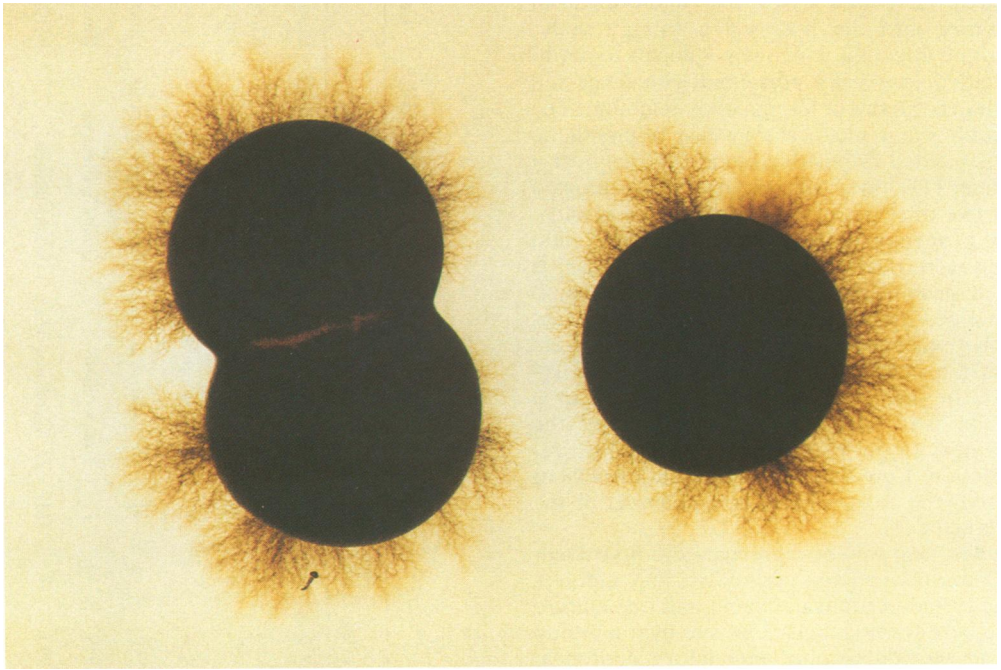

FIG. 2. *O. xanthineolytica* colonies producing vegetative hyphae on Trypticase soy agar plate at 72 h. Magnification, ×150.

The results of in vitro antimicrobial agent susceptibility tests for the isolate from the patient, in which we used the National Committee for Clinical Laboratory Standards MIC interpretive standards (9), were as follows: susceptible to sulfamethoxazole (≤1 μg/ml), sulfamethoxazole-trimethoprim (≤1.19/0.06 μg/ml), vancomycin (≤0.25 μg/ml), and amikacin (16 μg/ml); moderately susceptible to ampicillin (16 μg/ml), amoxicillin-clavulanate (16/8 μg/ml) and imipenem (8 μg/ml); and resistant to cefotaxime (64 μg/ml), ceftriaxone (64 μg/ml), ciprofloxacin (>8 μg/ml), doxycycline (16 μg/ml), erythromycin (16 μg/ml), and gentamicin (16 μg/ml).

DISCUSSION

Oerskovia spp. are typically yellow-pigmented, gram-positive, non-acid-fast organisms with extensively branched filaments which fragment into small motile rodlike elements. They lack aerial mycelia, and their cell walls (type VI) characteristically contain large amounts of galactose. These organisms were first described by Orskov in 1938 as motile *Nocardia* species (10). This organism was first isolated from soil (10), although it has also been isolated from dry grass cuttings (7).

Reports of *Oerskovia* spp. causing human infection are rare. A total of 35 *Oerskovia* spp. isolates, including 5 heart valve or cardiac isolates, 9 blood isolates, 1 cerebrospinal fluid isolate, and isolates from other sites, were submitted to the Centers for Disease Control over a 20-year period prior to 1977 for identification, but clinical details were not available (12). Six cases in which *Oerskovia* spp. caused human infections have been reported; five of these six cases (83.3%) were in compromised hosts (Table 1). Two cases showed an association with soil, the presumed natural reservoir. A 47-year-old farmer developed endophthalmitis because of a penetrating injury into the vitreous cavity caused by a metallic foreign object while he was repairing a farm machine (5), and a 3-year-old male developed bacteremia from an infected Broviac catheter immediately following a camping trip (8).

In the previously described cases this microorganism usually gained entry into the host via a foreign body, resulting in a chronic infection which was difficult to eradicate (Table 1). Patients typically presented with fever and symptoms referable to the site of foreign body infection. The etiology was unequivocal in most cases; a case of prosthetic valve endocarditis yielded 29 positive blood cultures over a period of 6 months (11), in a case involving an infected Broviac catheter five of seven blood cultures were positive (8), and in a case of meningitis all three cerebrospinal fluid cultures examined were positive (6). The microorganism is relatively avirulent; despite persistent symptoms and a smoldering course, no deaths occurred in the reported cases (Table 1). With the exception of one case, antibiotics were ineffective unless the contaminated foreign body was removed (Table 1). In that case, a patient receiving total parenteral nutrition was bacteremic. The source of the organism was thought to be contamination of the intravenous nutrition solution. Cure was achieved with 5 weeks of intravenous vancomycin treatment without removal of the central venous catheter (4).

To our knowledge, our patient represents the first documented case of *O. xanthineolytica* peritonitis. Five cultures obtained from the turbid peritoneal effluent and one culture obtained from the peritoneal catheter exit site over a period of 2 weeks in a patient on chronic ambulatory peritoneal dialysis yielded *O. xanthineolytica*. The presence of the

TABLE 1. Case reports of *Oerskovia* spp. infections in humans[a]

Yr reported	Age (yr)	Sex[b]	Species	Underlying disease	Culture site	Infection	Foreign body	Antibiotic(s)	Outcome	Reference
1975	68	M	*O. turbata*	Ankylosing spondylitis, steroids	Blood	Endocarditis	Homograft heart valve	TMP-SMZ, ampicillin[c]	Valve removal	11
1979	47	F	Unspecified	Kidney disease	Kidney	Pyonephrosis	None	None	Kidney removal	2
1987	47	M	*O. xanthineolytica*	Trauma, steroids	Vitreous humor	Endophthalmitis	Metallic object	Penicillin	Foreign body removal	5
1988	38	F	*O. xanthineolytica*	Hydrocephalus	Cerebrospinal fluid	Meningitis	Ventriculoperitoneal shunt	Penicillin, rifampin	Shunt removal	6
1989	3	M	*O. turbata*	Acute myelogenous leukemia	Blood	Bacteremia	Broviac catheter	Amikacin	Catheter removal	8
1989	40	F	Unspecified	Crohn's disease	Blood, TPN solution[d]	Bacteremia	Hickman catheter, TPN solution	Vancomycin	Cure with catheter in place	4
1990	70	M	*O. xanthineolytica*	Renal failure	Peritoneal dialysate	Peritonitis	Peritoneal catheter	Vancomycin, gentamicin	Catheter removal	This report

[a] All patients were cured.
[b] M, Male; F, female.
[c] TMP-SMZ, Trimethoprim-sulfamethoxazole.
[d] TPN, Total parenteral nutrition.

peritoneal catheter in our patient was consistent with the frequent association of *Oerskovia* spp. infections with a foreign body. Although the infection presumably resulted from a break in sterile technique, contamination of the dialysate solution could not be excluded. It is important to note that despite demonstrated in vitro susceptibility of the infecting microorganism to vancomycin and prolonged therapy with this antibiotic, cure was achieved only following removal of the peritoneal catheter.

Clinical specimens, including blood and cerebrospinal fluid, typically contain pleomorphic gram-positive rods with rudimentary branching. It is important to realize that *Oerskovia* spp. can easily be mistaken for *Corynebacterium* spp. (diphtheroids), which are common skin contaminants. A presumptive identification of *Oerskovia* spp. can be made if the isolate is catalase positive, oxidase negative, and motile and produces a bright yellow pigment. The pigment is an important diagnostic characteristic (Fig. 1).

With the extended survival of severely compromised patients, the popularity of long-term indwelling catheters, and the increased use of prostheses, we expect that these organisms will be encountered with greater frequency. Their pathogenicity and refractoriness to antibiotic therapy without foreign body removal may prove to be important clinical considerations.

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