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Recovery of a Catalase-Negative *Staphylococcus epidermidis* Strain in Blood and Urine Cultures from a Patient with Pyelonephritis▽

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This report describes a 60-year-old patient with bilateral nephrolithiasis. A catalase-negative *Staphylococcus epidermidis* strain was recovered from both urine and blood cultures. Although rare, isolates of catalase-negative *Staphylococcus* spp., including *Staphylococcus aureus*, have been reported. Here, we describe the first report of a catalase-negative *S. epidermidis* strain.

CASE REPORT

A 60-year-old male presented to the emergency room in December 2010 with severe back pain and trouble urinating. Ten years previously, the patient had similar symptoms and was diagnosed with bilateral staghorn nephrolithiasis requiring percutaneous nephrolithotomy. Computed tomography (CT) imaging performed during the current admission confirmed recurrent bilateral nephrolithiasis with moderate obstruction. His temperature was slightly elevated at 38°C. Abnormal laboratory values included leukocytosis of 18,000 cells/μl, mild hyperkalemia at 5.5 meq/liter, and an elevated serum creatinine level at 2.67 mg/dl. Urinalysis was notable for more than 100 white blood cells (WBCs), 20 to 30 red blood cells (RBCs), and few bacteria per high-powered field of view. Urine leukocyte esterase and nitrite were positive. Given that clinical signs and laboratory testing were consistent with pyelonephritis, urine and blood cultures were obtained prior to initiating levofloxacin and cefazolin antibiotic therapy. The patient was taken to surgery for emergent bilateral ureteral stent placement. Postoperatively, antibiotic therapy was changed to levofloxacin and ceftriaxone.

Blood cultures were collected and incubated using the BacTALERT3D automated microbial detection system (bioMérieux USA, Durham, NC). Both bottles from the set of blood cultures collected prior to initiation of antibiotic therapy became positive at 31 h with Gram-positive cocci in clusters (GPCC), presumptively identified as coagulase-negative staphylococci (CNS) by PNA FISH GPCC-*S. aureus*/CNS (AdvanDx, Woburn, MA). Upon subculture, the organism was found to be catalase negative. VITEK2 (bioMérieux USA, Durham, NC) testing using the GP card identified the isolate as *S. epidermidis*. Catalase testing was repeated several times, and the VITEK2 results were also repeated. Repeated coagulation testing (tube and latex agglutination) was negative. The organism tested as resistant to penicillin, oxacillin, and the fluoroquinolones and sensitive to gentamicin, erythromycin, clindamycin, quinupristin-dalfopristin, linezolid, tetracycline, and tigecycline using the VITEK2 AST-GP67 card. The patient's urine cultures were also positive (10,000 to 100,000 CFU/ml) for the same catalase-negative presumptive *S. epidermidis* strain seen in the blood culture (identical antibiotic susceptibility profile, biochemical reactions, and colony morphology). The 5′ approximately 500-bp region of the 16S rRNA gene was amplified and sequenced at Associated Regional and University Pathologists (ARUP Laboratories, Salt Lake City, UT) using primers 5F-t and 534R-t (GTAAAACGACGGCCAGTTGGAGAGTTTGATCCTGGCTC and CAGGAAACAGCTATGACTACCGCGGCTGCTGGCAC, respectively). M13 primers (underlined above) were used to bidirectionally sequence the amplicon. SmartGene IDNS and NCBI databases were used to confirm the identification, with 100% homology to *S. epidermidis* type strain ATCC 14990 (GenBank accession number NR_036904.1) over the full length of the sequence (496 bp). In addition to 16S sequencing, matrix-assisted laser desorption ionization–time of flight mass spectrometry (MALDI-TOF MS) analysis of extracted proteins yielded a pattern indistinguishable from that of 12 confirmed *S. epidermidis* isolates, and MALDI Biotyper software (Bruker Daltonics, Billerica, MA) identified the isolate as *S. epidermidis* (data not shown). Multiple samples were evaluated (6 separate spots from 2 cultures), with Biotyper scores ranging from 2.15 to 2.30. The isolate was also sent to the Hawaii state laboratories for additional biochemical testing, which confirmed the initial identification of a catalase-negative *S. epidermidis* strain. The Hawaii state laboratory forwarded the isolate to the CDC to perform confirmatory testing that the isolate was *S. epidermidis* and catalase negative. The CDC confirmed the identification of *S. epidermidis*, with the only contraindicating testing being sensitivity to polymyxin B and a negative catalase reaction. Definitive stone treatment took place in two stages. Initially, the patient underwent right-sided percutaneous nephrolithotomy and, subsequently, bilateral ureterorenoscopic surgery 2 weeks later. His ureteral stents were removed transurethrally 7 days later.

Staphylococcus epidermidis is a commensal organism found most commonly as part of the normal skin flora or mucosal

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flora of humans and other animals. *S. epidermidis* is a member of the coagulase-negative staphylococci and is generally believed to be of low pathogenicity. *S. epidermidis* is one of the most commonly recovered contaminants in the clinical microbiology laboratory. A positive catalase reaction is a defining characteristic for the vast majority of *Staphylococcus* species. There have been rare case reports of catalase-negative *S. aureus* subsp. *aureus* isolates, and *S. aureus* subsp. *anaerobius* is intrinsically catalase negative (1, 2, 3, 6). Both catalase-negative *S. aureus* subsp. *aureus* and *S. aureus* subsp. *anaerobius* possess homologs of the *katA* and *katB* catalase genes, but mutations in these genes prevent the synthesis of functioning catalase enzymes (4, 5). To our knowledge, this is the first reported case of a catalase-negative *S. epidermidis* strain.

S. epidermidis can cause infection in immunocompromised patients and is particularly adept at forming biofilms on surgical implants and indwelling catheters. Our patient did not have any indwelling foreign devices at the time of presentation but did have bilateral kidney stones that may have provided a surface for the bacteria to form a biofilm, ultimately leading to pyelonephritis and bacteremia.

The views expressed here are those of the authors and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. government.

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