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Staphylococcus lugdunensis Carrying the *mecA* Gene Causes Catheter-Associated Bloodstream Infection in Premature Neonate

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A premature neonate had a catheter-associated bloodstream infection due to *Staphylococcus lugdunensis*. The MIC of oxacillin for the strain was >256 μg/ml, and the *mecA* gene of *S. lugdunensis* was detected by PCR. The infection was resolved after removal of the line and treatment with vancomycin for 2 weeks.

CASE REPORT

A baby boy was delivered by caesarean section at 29 weeks of gestation with a birth weight of 980 g. Initial problems included grade III hyaline membrane disease, patent ductus arteriosus, and pulmonary hemorrhage. On day 8 of life, a long line was inserted into the left cubital fossa. On day 23, the baby developed sepsis. He had recurrent apnea and bradycardia requiring him to receive assisted ventilation. The level of C-reactive protein was elevated, at 125.5 mg/liter. The total white cell count was 14×10^9/liter, and the immature neutrophil-to-total neutrophil ratio was 0.04. Thrombocytopenia (platelet count, 67×10^9/liter) was also present. Based on empirical evidence, the baby was started on cloxacillin and gentamicin. Two species of staphylococci were isolated from blood cultures taken before antibiotic administration. Both strains were resistant to cloxacillin. Treatment was changed to vancomycin after the baby had been on cloxacillin and gentamicin for 3 days. The long line was removed on the fifth day of infection, when one of the isolated organisms was confirmed to be *Staphylococcus lugdunensis*; the other isolate was reported to be a coagulase-negative staphylococcus. The culture of the long line tip also yielded *S. lugdunensis*. The chest X ray showed right upper lobe pneumonia. The results of a cranial ultrasound and a two-dimensional echocardiogram were normal. The baby showed good response to treatment with vancomycin. The level of C-reactive protein decreased to 7.3 mg/liter (on day 13 of vancomycin treatment), and the platelet count increased to 141×10^9/liter (on day 9 of vancomycin treatment). A repeat blood culture was still positive 48 h after vancomycin treatment was started but was negative by day 7. Vancomycin treatment was continued for a total of 2 weeks, with good clinical response.

This is the first case report in the English-language literature of an infection due to an *S. lugdunensis* isolate carrying the *mecA* gene. Kawaguchi et al. detected *mecA* in one of two strains of *S. lugdunensis* in 1996 during a survey of staphylococcal isolates, but no description of clinical infection was given (5). As far as we are aware, this is also the first documentation of *S. lugdunensis* causing bloodstream infection in a neonate.

As noted above, there were two isolates from the first blood culture. Both were characterized as staphylococci by Gram stain, colonial morphology, and a positive catalase reaction. The first isolate was a coagulase-negative staphylococcus with a typical negative reaction in both the latex agglutination test for clumping factor and protein A (BACTi Staph; Remel, Lenexa, Kans.) and the tube coagulase test with rabbit plasma. The second isolate had slightly yellow colonies and showed beta hemolysis on Columbia sheep blood agar. It gave a positive reaction for clumping factor, but the tube coagulase test was negative. It was positive for ornithine decarboxylase and pyrrolidonyl arylamidase (Oxoid, Basingstoke, England). The API Staph (APILAB version 3.3.3) profile was 6716152, identifying the organism as *S. lugdunensis* (percent identity, 64.6%). The 16S rRNA gene was amplified by using universal primers (10) and sequenced by using BigDye Terminator reagents (Applied Biosystems). Part of the resulting DNA sequence was compared to the entries in the EMBL prokaryote database by using Fasta (www.ebi.ac.uk/fasta33/) (9). The 537-bp sequence showed 95.36% identity with the *S. lugdunensis* 16S rRNA gene. This match was the closest one found by the BLAST search. The organism was resistant to methicillin, with no zone produced in response to a 5-μg methicillin disk (equivalent breakpoint, 4 μg/ml) used in the Calibrated Dichotomous Susceptibility system (1). The MIC of oxacillin as determined by the Etest (AB Biodisk, Solna, Sweden) was >256 μg/ml. The *mecA* gene was detected by DNA amplification by PCR, following a protocol described previously (6). The MRSA-Screen latex agglutination test (Denka Seiken, Tokyo, Japan) was positive only after induction of the oxacillin-resistance gene (4).

S. lugdunensis should be suspected when a staphylococcus isolate gives a positive reaction in the test for clumping factor but a negative tube coagulase test. Identification of this organism is important because clinically it behaves like *Staphylococcus aureus* (8). *S. lugdunensis* has been reported to cause a

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variety of serious infections, such as infective endocarditis, bacterial arthritis, osteomyelitis, brain abscess, peritonitis, skin and soft tissue infections, and septic shock. Most case reports describe the aggressive nature of infective endocarditis caused by this organism, with a clinical course resembling that of *S. aureus* infection (2, 8).

The MIC of oxacillin for *S. lugdunensis* strains without *mecA* has been reported to be in the range of 0.5 to 2 μg/ml (3). This concentration is higher than the recommended National Committee for Clinical Laboratory Standards breakpoint of 0.25 μg/ml (7) for coagulase-negative staphylococci. Disk testing based on the National Committee for Clinical Laboratory Standards' criteria is known to falsely indicate oxacillin resistance (3), and the latest recommendation is to determine susceptibility according to the presence of either the *mecA* gene or PBP 2a. For the detection of PBP 2a with the MRSA-Screen latex agglutination test, induction of the oxacillin-resistance gene may be necessary, as demonstrated by this isolate.

Other authors have previously noted the almost universal susceptibility of *S. lugdunensis* to penicillins and cephalosporins. This generalization may no longer hold. It is important not only to identify *S. lugdunensis* in view of its clinical course, which is more agressive than those of commonly isolated coagulase-negative staphylococci, but also to determine its susceptibility to oxacillin by detecting the *mecA* gene or its product. This case report demonstrates that accurate identification and testing would lead to early line removal and treatment with appropriate antibiotics, ensuring a successful clinical outcome.

Nucleotide sequence accession number. The sequence of the 16S rRNA gene of the *S. lugdunensis* isolate was deposited in GenBank under accession number AJ508354.

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