In Vitro Ceftriaxone Susceptibility in Methicillin-Susceptible Staphylococcus aureus

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*Staphylococcus aureus* is a leading cause of invasive infections in both hospital and community settings. Beta-lactams, specifically oxacillin, nafcillin, and cefazolin, are the drugs of choice against methicillin-susceptible *Staphylococcus aureus* (MSSA). At our institution, ceftriaxone is commonly used for infections due to MSSA and susceptible Gram-negative organisms, in view of the convenient once-daily dosing schedule (1, 2). However, routine susceptibility testing for *S. aureus* is performed only for oxacillin, and the results are extrapolated to other beta-lactams, including ceftriaxone.

We were alerted to the potential lack of concordance between susceptibilities to oxacillin and ceftriaxone in *S. aureus*; 60% of MSSA bloodstream isolates were reported to be resistant to ceftriaxone (3). The publication was subsequently retracted because the testing method used (Etest) was not FDA cleared for testing against *S. aureus*. In addition, the authors’ findings were not consistent with an independent study using a standard broth microdilution method (4).

We report the results of our investigations completed in the interim period. Ceftriaxone (USP) powder was purchased from Sigma-Aldrich (St. Louis, MO). A stock solution was prepared, aliquoted, and stored at −70°C. For each susceptibility test, an aliquot of the drug was thawed and diluted to desired concentrations. Seventeen clinical MSSA bloodstream isolates (oxacillin MIC = 0.5 µg/ml) and 1 methicillin-resistant *S. aureus* bloodstream isolate (MRSA) (oxacillin MIC = 64 µg/ml) from our institution were evaluated in this study. The isolates were subcultured twice on 5% blood agar plates (Hardy Diagnostics, Santa Maria, CA) prior to each experiment. MICs were determined in cation-adjusted Mueller-Hinton II broth (BBL, Sparks, MD) using a broth dilution method. A standard wild-type isolate, ATCC 29213 (American Type Culture Collection, Manassas, VA), was used as the reference control. The studies were conducted in triplicate and repeated at least once on a separate day.

All 17 MSSA isolates were found to be susceptible to ceftriaxone according to 2012 CLSI interpretive criteria (5), with a MIC range of 1 to 8 µg/ml. In comparison, the ceftriaxone MIC for the MRSA isolate was 32 µg/ml. We found a complete categorical concordance between oxacillin and ceftriaxone susceptibilities in *S. aureus*. In our experience, ceftriaxone susceptibility may be reasonably inferred based on the testing using oxacillin, as recommended by the 2014 CLSI guidelines (6).

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REFERENCES


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