Performance of the BD Phoenix Automated Microbiology System for Trimethoprim-Sulfamethoxazole Susceptibility Testing of *Staphylococcus aureus*

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Accurate and timely antimicrobial susceptibility testing (AST) of *Staphylococcus aureus* is crucial for patient management. In our laboratory, *S. aureus* AST is performed using the BD Phoenix automated microbiology system (BD Diagnostic Systems, Sparks, MD) and cefoxitin disk diffusion (DD).

A discrepancy between trimethoprim-sulfamethoxazole (SXT) on Phoenix and SXT DD (BD BBL Sensi-Disc) was observed on a clinical methicillin-resistant *S. aureus* (MRSA) isolate. This discrepancy prompted us to evaluate a set of clinical isolates (6 nonrelated by *spa* typing MRSA isolates and 3 methicillin-susceptible *S. aureus* [MSSA] isolates) using Phoenix, SXT DD, Etest (bioMérieux, Marcy l'Etoile, France), and MIC test strips (MTS; Liofilchem, Italy) locally and broth microdilution (BMD) (Sensititre; Thermo Fisher Scientific) at the National Microbiology Laboratory. SXT DD and the 2 gradient diffusion tests were tested using Mueller-Hinton agar (Oxoid), and all tests were quality controlled, conducted, and interpreted according to the manufacturers' recommendations and CLSI standards (1). All 9 isolates tested resistant by Phoenix but susceptible by DD, the 2 gradient diffusion strips, and BMD. To examine whether the observed discrepancies were related to instrument or reagent issues, another set of *S. aureus* isolates ($n = 15$) that was also SXT resistant by Phoenix but susceptible by DD was sent to Becton, Dickinson and Company for testing using 6 different lots from Phoenix panel PMIC 84 (BD catalog number 448420) and SXT DD. BD reported that 13/15 (86.7%) were resistant by Phoenix, but all 15 isolates were susceptible by SXT DD.

As a result of these findings, we prospectively added SXT DD to routine *S. aureus* AST. Between 25 May 2018 and 30 November 2018, 642 *S. aureus* isolates were tested using both methods (Table 1). Using DD as the reference method, categorical agreement was 91.9% with 50 (7.9%) major errors (MEs) and 2 (0.3%) minor errors (mEs). When we examined the MRSA subgroup ($n = 70$), the categorical agreement was 82.9% with 12 (17.6%) MEs and 0 mEs. There was a significantly greater number of any error type within the MRSA subgroup compared to the MSSA subgroup (odds ratio [OR], 2.7; 95% confidence interval [CI], 1.2 to 5.7; $P = 0.008$; Fisher's exact test), and this difference is represented solely by MEs.

In our experience, Phoenix achieved less than the recommended 90% categorical agreement with the reference AST method when testing MRSA against SXT (2), which is of particular concern given the limited antibiotic options for MRSA infection. The performance of the BD Phoenix automated system for SXT AST of *S. aureus* has been described previously (3–6). Carroll et al. (5) looked at 218 *S. aureus* isolates using agar dilution as the reference and found 98.6% categorical agreement and a lower rate of MEs (1.5%). Fahr et al. (6) included 114 isolates of *Staphylococcus* species using BMD as

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TABLE 1 Comparison of trimethoprim-sulfamethoxazole (SXT) antimicrobial susceptibility testing of *Staphylococcus aureus* using the BD Phoenix automated microbiology system and disk diffusion ($n = 642$)^a

Method and susceptibility	Phoenix		Total
	Susceptible	Resistant	
Disk diffusion			
Susceptible	586	50	636
Intermediate	0	2	2
Resistant	0	4	4
Total	586	56	642

^aNumber of isolates.

the reference and found 94.7% categorical agreement, lower rates of MEs (1.8%), and higher rates of very major errors (VMEs) (3.2%) and mEs (3.4%).

We hope this investigation prompts laboratories to monitor the performance of the BD Phoenix system for staphylococcal SXT susceptibility testing.

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