5-Hour Antibiotic Susceptibility Testing of Enterococcus faecium and E. faecalis and Acinetobacter baumannii Directly from Positive Cultures Using Automated Microscopy

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OBJECTIVES: Healthcare-associated Acinetobacter baumannii and enterococcal bloodstream infections are of increasing concern due to their resistance to multiple classes of antibiotics. Delays to appropriate therapy for septic patients infected with these organisms have been shown to have a higher risk of receiving inappropriate initial therapy due to their resistance to multiple classes of antibiotics. Delays to appropriate therapy for septic patients infected with these organisms have been shown to increase the risk of severe morbidity and mortality. An innovative technology using automated microscopy was evaluated for its performance for rapid antibiotic susceptibility testing (AST) of A. baumannii, E. faecium, and E. faecalis directly from positive blood culture.

METHODS: A total of 285 clinical isolates selected for having MICs near the CLSI breakpoints were tested: 88 A. baumannii isolates (45 with imipenem (IPM) and 43 with minocycline (MIN)), and 142 E. faecium isolates (45 with ampicillin (AMP) and 97 with vancomycin (VAN)). To test one hundred colony forming units of bacterial suspensions were spiked into simulated bloodstream infections at 1:1000 dilution (BMD). Automated microscopy was evaluated in five separate experiments for performing overnight pure culture using BMD. Automated microscopy offers a promising alternative for performing rapid AST results directly from positive blood culture within 5 h. AST results were concordant with the standard reference methodology, and were obtained within 5 h versus overnight pure colonies tested for BMD. A. baumannii with IPM had essential agreement of 98% and categorical agreement of 91%. There were 4 minor errors observed. Finally, Enterococcus spp. with VAN had essential agreement of 93% and categorical agreement of 91% with 3 minor errors observed. Two major errors and four minor errors were observed. Overall, Enterococcus spp. with MIN had essential agreement of 95% and categorical agreement of 93% with 3 minor errors observed. Two major errors and four minor errors were observed. Finally, Enterococcus spp. with LZD had essential and categorical agreement of 94% with 3 minor errors observed. Two major errors and four minor errors were observed. Three-time images of susceptible and resistant E. faecium isolates grown in the presence of AMP are shown in Figure 3. (Color figure available online.)

RESULTS

A. baumannii with VAN had essential agreement of 99% and categorical agreement of 98% with 3 minor errors observed. Enterococcus spp. with AMP had essential and categorical agreement of 98% (Table 2a). Two major errors and four minor errors were observed. Finally, Enterococcus spp. with VAN had essential agreement of 98% and categorical agreement of 91% with 3 minor errors observed. Two major errors and four minor errors were observed. Finally, Enterococcus spp. with LZD had essential and categorical agreement of 94% with 3 minor errors observed. Three-time images of susceptible and resistant E. faecium isolates grown in the presence of AMP are shown in Figure 3. (Color figure available online.)

CONCLUSION

The results of this study demonstrate the feasibility of the automated microscopy technology to obtain AST results directly from positive blood cultures, exactly matching MIC results from the standard reference methodology, and were obtained within 5 h versus overnight pure colonies tested for BMD. This pioneering approach is expected to improve diagnostic accuracy by reducing the time to AST results directly from positive blood cultures to guide treatment for patients with A. baumannii and enterococcal bloodstream infections.

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