Introduction

Bloodstream infections (BSI) are an important cause of morbidity and mortality. Particularly when a BSI develops into septic shock, the mortality of patients increases 7.6% for every hour that treatment is delayed. As many as 80% of sepsis deaths could be prevented with rapid diagnosis.

Traditional methods for identification (ID) and antimicrobial susceptibility testing (AST) of organisms from clinical samples typically require overnight subculturing to isolate individual species prior to identification (for example, biochemical testing), followed by growing isolated organisms in the presence of various antimicrobials to determine susceptibilities. Molecular and mass spectrometry identification methods can provide organism identification in a few hours directly from clinical samples, as well as resistance marker detection, but these methods do not provide the phenotypic antimicrobial susceptibility information required by clinicians to inform treatment decisions.

The aim of this study is to evaluate the performance of the Accelerate Pheno™ system (AXDX) for the early identification and antimicrobial susceptibility testing of a panel of Gram-negative bacilli (GNB) with different resistance profiles (e.g. penicillinases, ESBLs, cephalosporinase overproduction, carbapenemases, impermeability) directly from positive blood cultures in <7h.

Methods

A total of 46 blood cultures (15 Gram-positive, 30 Gram-negative and one off-panel organism) from clinical samples, were incubated to positivity using the Bact/ALERT® system (bioMérieux, Inc., France). Positive blood cultures were subjected to parallel testing using AXDX and standard of care (SOC) methods (MALDI-TOF MS of isolated colonies for ID and VITEK® 2 system (bioMérieux, Inc. France) for AST (Figure 1). When discordant AST results were obtained between techniques, E-test was applied (Table 3). All tests were performed following CLSI recommendations.

Results

The overall identification agreement between the Accelerate Pheno™ system and conventional method was 95.3% (41/43) sensitivity, 99.8% specificity (Table 1). The average time of positive blood culture until the Accelerate Pheno™ system provided ID results was 5.7 h. The average time of positive blood culture until the SOC method provided ID results was 24.6 h (Figure 2). The overall categorical agreement between AXDX and SOC AST was 91.4%, with a minor error rate of 6.6% (16/244), major error rate of 2% (3/151), and very major error rate of 2.4% (2/83) (Table 2). The average time from positive blood culture until the Accelerate Pheno™ system provided AST results was 11.3 h. The average time from positive blood culture until the SOC method provided AST results was 36.6 h (Figure 3). The Accelerate Pheno™ system has a less than 90 min time-to-report for identification and less than 7 h time-to-report for AST, on average. The Accelerate Pheno™ system produced AST results faster than the conventional SOC method by 25.3 h.

Conclusion

The Accelerate Pheno™ system is an accurate, sensitive and easy-to-use test for the rapid identification and AST of multi-drug resistant Gram-negative bacilli and Gram-positive cocci in bloodstream infections. Given the burden of multi-drug resistance, its implementation in the microbiology laboratory could be useful for prompt and early management of sepsis.