Rapid Identification and Susceptibility Testing of Gram-Negative Rods from Positive Blood Cultures Using the Accelerate Pheno™ System: A Comparison Study in a Clinical Laboratory

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INTRODUCTION

Turnaround times for bloodstream infection diagnosis average between 24-48 h, resulting in delays to targeted therapy. Fast and reliable diagnostic tools are needed to allow for de-escalation of broad-spectrum antimicrobial treatment. The Accelerate Pheno™ system (AXDX) performs fully automated identification (ID) and antimicrobial susceptibility testing (AST) directly from positive blood cultures (PBC) in approximately 7 h. The system uses a single 48-channel disposable test cassette that is capable of identifying Gram-positive and Gram-negative organisms using fluorescence in situ hybridization, as well as performing phenotypic AST using morphokinetic cellular analysis (MCA).

METHODS

PBC bottles were tested on AXDX within 8 hours of positivity from October-December 2018. All isolates were subcultured and analyzed for ID within 24 h on the MALDI Biotyper® system and for AST within 48 h on the VITEK® 2 system. CLSI 2016 breakpoints were used to compare AST results. The parameters analyzed were turnaround time, ID/AST performance, and AST discrepancy rates. Discrepancies were analyzed in a reference laboratory. .

OBJECTIVES

To assess the performance of the AXDX in the clinical laboratory by comparing its results to results obtained through the conventional identification and antimicrobial susceptibility methods.

To evaluate the operation of the technology and assess its incorporation into the laboratory workflow.

RESULTS

32 PBC were tested (11 patient samples and 22 challenge isolates). One sample was excluded because it was not run within 8 hours of positivity. A total of 31 samples were included, with one polymicrobial sample containing 2 organisms, for a total of 32 organisms analyzed. 1 organism was not detected by AXDX and 1 isolate was incorrectly identified at both the genus and species levels. For the polymicrobial sample, AXDX provided ID for the 2 organisms present and AST for the predominant organism. The overall ID and AST essential agreement was 93.2% and categorical agreement was 91.3%. The system provided complete ID and AST results 96.8% of the time. The average time to ID was improved by 23.9 h and the average time to AST was improved by 29.9 h. There were no major errors, and only 24 minor errors (8.7%).

Table 1. Accuracy of Identification

Organism identified by SOC	Total analyzed	Accelerate Pheno identification result
A.baumanii	3	3
Citrobacter spp.	2	1 (one failed ID)
Enterobacter spp.	8	9 (one wrong ID)
Escherichia coli	7	7
Klebsiella spp.	6	6
Proteus spp.	1	1
P. aeruginosa	6	5 (one non-detected)

Table 2. Susceptibility Testing Performance

Antibiotic	**Count**	**Essential Agreement**	**Count**	**Categorical Agreement**
Amikacin	25/25	100%	25/25	100%
Ampicillin-Sulbactam	12/12	100%	11/12	91.7%
Aztreonam	16/17	94.1%	16/17	94.1%
Cefepime	22/26	84.6%	23/26	88.5%
Ceftazidime	22/25	88%	21/25	84%
Ceftriaxone	21/21	100%	21/21	100%
Ciprofloxacin	24/25	96%	23/25	92%
Ertapenem	19/19	100%	18/19	94.7%
Gentamicin	25/25	100%	25/25	100%
Meropenem	12/14	85.7%	12/14	85.7%
Piperacillin-Tazobactam	24/29	82.8%	22/29	75.9%
Tobramycin	23/25	92%	23/25	92%

CONCLUSIONS

The Accelerate Pheno™ system performs adequately for ID and AST of Gram-negative organisms present in positive blood cultures in a significantly shorter time than our laboratory SOC; this allows for the reporting of definitive blood culture results in record time and the possibility of timely therapy de-escalation.

Acknowledgments/ References:
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