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Abstract (Revised)

**Background**

Early and adequate antimicrobial therapy improves clinical outcomes in bloodstream infections. Yet the time to result for phenotypic antimicrobial susceptibility testing (AST) can take more than 48 hours, requiring long delays in tailored and appropriate therapy. The Accelerate Pheno™ system (Accelerate) provides organism identification (ID) and antibiotic use in approximately 60 minutes and MIC-based antimicrobial susceptibility results within 7 hours, directly from positive blood cultures. This study compared traditional methods to the Accelerate Pheno™ system for ID and AST of Gram-negative organisms isolated from positive blood cultures.

**Methods**

Blood cultures that flagged positive on the VersaTREK™ system (aerobic and anaerobic bottles included) with Gram-negative organisms were tested prospectively with both the Accelerate Pheno™ system (v1.2.0.69 software) and conventional methods (VITEK® MS and VITEK® 2 for organism ID; Vitek®, E-test, and disk diffusion for AST). CLSI 2016 standard interpretations were used. The following Gram-negative targets were included in the final comparison: Escherichia coli, Klebsiella spp., Enterobacter spp., Proteus spp., Citrobacter spp., Serratia marcescens, Pseudomonas aeruginosa, and Acinetobacter baumannii. Organism identification, susceptibility interpretations, and time to result were compared for this study.

**Results**

One hundred nineteen positive blood cultures were tested. Ninety-one (46 prospective and 45 seeded) of the one hundred nineteen isolates tested were included in the final analysis. Reasons for exclusion include organisms not on the panel, duplicate specimens and analysis failures. Results showed 97.1% agreement in ID between the Accelerate Pheno™ system and conventional methods. AST results showed an overall essential agreement of 93.8% and overall category agreement of 94.5%. Organism identification was available on average 29 hours earlier with the Accelerate Pheno™ system, and AST results were available on average 54 hours earlier with the Accelerate Pheno™ system.

**Conclusions**

The Accelerate Pheno™ system exhibited excellent concordance with traditional culture based identification and AST. The rapid time to AST results afforded by the Accelerate Pheno™ system provides information necessary to optimize patient therapy in a timely manner and thus potentially positively impact patient outcome.

**References**


**Acknowledgements**

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**Introduction**

- The rise of antibiotic-resistant bacteria represents a serious threat to public health and the economy, and antibiotic use is the primary driver of resistance development.
- In the presence of sepsis or septic shock, each hour delay in administration of appropriate antimicrobials is associated with a measurable increase in mortality.
- Septicemia was the sixth most common principal reason for hospitalization (2.1 percent of all hospitalizations). Nearly one out of every 23 patients in the hospital (4.2 percent) had septicemia.
- Phenotypic antimicrobial susceptibility results are necessary for optimization of antimicrobial therapy. A variety of molecular platforms are available that can identify the presence of known resistance genes. No molecular method can determine whether an isolate is in fact susceptible to a given drug.
- The Accelerate Pheno™ system provides phenotypic based AST results from positive blood cultures within 8 hours.
- Rapid AST results provide information physicians need to optimize antimicrobial therapy for septic patients in a timely manner.

**Results**

**Identification Results**

A total of 106 positive blood cultures were tested by the Accelerate Pheno™ system. Using traditional methods for organism ID as the gold standard, diagnostic sensitivity and specificity study results were:

<table>
<thead>
<tr>
<th>Organism</th>
<th>VITEK® MS</th>
<th>VITEK® 2 (CLSI 2016 standard interpretations were used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pheno™ Ident.</td>
<td>95.6%</td>
<td>97.1%</td>
</tr>
<tr>
<td>Pheno™ AST</td>
<td>94.5%</td>
<td>97.1%</td>
</tr>
</tbody>
</table>

**Susceptibility Results**

**Time to Identification and AST**

<table>
<thead>
<tr>
<th>Method</th>
<th>Time to Identification</th>
<th>Time to AST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Methods*</td>
<td>30 hours (9.1 hr to 61 hr)</td>
<td>62 hours (29.4 hr to 80 hr)</td>
</tr>
<tr>
<td>Accelerate Pheno™ System</td>
<td>1 hr 20 minutes</td>
<td>6 hr 36 minutes (8 hr total time)</td>
</tr>
</tbody>
</table>

*Traditional Methods for Identification include VITEK® MS and VITEK® 2

**Summary**

- Results showed 97.1% agreement in ID between the Accelerate Pheno™ system and conventional methods.
- AST results showed an overall essential agreement of 93.8% and overall category agreement of 94.5%.
- Organism identification was available on average 29 hours earlier with the Accelerate Pheno™ system, and AST results were available on average 54 hours earlier with the Accelerate Pheno™ system compared to traditional methods.