Carbapenem Resistant Respiratory Tract Isolates of *Pseudomonas aeruginosa* in Europe: Comparative Antibacterial Activity (TEST 2013-2016)

**Revised Abstract**

*Pseudomonas aeruginosa* is a major pathogen in ventilator-associated pneumonia. Unfortunately, there has been a global increase in strains with multi-drug resistance mechanisms including AmpC beta-lactamase, extended-spectrum beta-lactamase, outer membrane porin alterations, metallo-beta-lactamase and efflux pumps. Carbapenem-resistant isolates of *Pseudomonas aeruginosa* dramatically reduce the activity of all currently used antibiotics. This report documents the in vivo activity of a number of first-line antibiotics against in vitro resistant *Pseudomonas aeruginosa* isolates collected in Europe during the Tigecycline European Surveillance Trial (TEST) program.

**Materials & Methods**

- **Between 2013 and 2016, 817 cumulative hospital sites in 21 European countries (Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the United Kingdom) participated in the TEST program. For this report 2578 isolates of *Pseudomonas aeruginosa* were identified to the species level and MICs determined at each participating laboratory using supplied broth microdilution panels. All isolates were derived from respiratory tract infections. Only one isolate per patient was accepted into the study.**
- **Organism collection, transport, confirmation of organism identification, susceptibility testing, and development and management of a centralized database were coordinated by International Health Management Associates, Inc. located in Schaumburg, IL, USA.**
- **Minimum inhibitory concentrations (MICs) were determined by the Clinical and Laboratory Standards Institute (CLSI) recommended broth microdilution testing method using MicroScan (Beckman Coulter, West Sacramento, CA). All antimicrobials were supplied by the panel manufacturers.**
- **MIC interpretive criteria followed published EUCAST guidelines [3].**
- **Quality controls (QC) were performed on each day of testing by using appropriate ATCC control strains, following CLSI and manufacturer guidelines. Results were included in the analysis only when corresponding QC results were within the acceptable ranges [3].**

**Results**

**Table 1. In vitro activity of beta-lactams and comparator agents tested against 2,578 *Pseudomonas aeruginosa* isolates collected in Europe**

<table>
<thead>
<tr>
<th>Drug</th>
<th>%S</th>
<th>%I</th>
<th>%R</th>
<th>MIC &lt;4</th>
<th>MIC 4-8</th>
<th>MIC 8-16</th>
<th>MIC &gt;16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin</td>
<td>95.5</td>
<td>0.0</td>
<td>4.5</td>
<td>87%</td>
<td>90%</td>
<td>91%</td>
<td>70%</td>
</tr>
<tr>
<td>Cefepime</td>
<td>76.0</td>
<td>0.0</td>
<td>24.0</td>
<td>76%</td>
<td>24%</td>
<td>28%</td>
<td>32%</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>78.5</td>
<td>0.0</td>
<td>21.5</td>
<td>78%</td>
<td>21%</td>
<td>16%</td>
<td>1%</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>59.8</td>
<td>0.0</td>
<td>40.2</td>
<td>59%</td>
<td>40%</td>
<td>8%</td>
<td>&gt;8%</td>
</tr>
<tr>
<td>Meropenem</td>
<td>67.7</td>
<td>15.1</td>
<td>17.2</td>
<td>67%</td>
<td>15%</td>
<td>16%</td>
<td>0%</td>
</tr>
<tr>
<td>Pip-Tazo</td>
<td>76.3</td>
<td>0.0</td>
<td>23.7</td>
<td>76%</td>
<td>24%</td>
<td>0%</td>
<td>&gt;8%</td>
</tr>
</tbody>
</table>

**Figure 1. P. aeruginosa and Carbapenem Resistant P. aeruginosa Distribution by Country**

**Figure 2. MIC Distribution of beta-lactams against *Pseudomonas aeruginosa* isolates in Europe**

**Figure 3. MIC Distribution of beta-lactams against Carbapenem Resistant *Pseudomonas aeruginosa***

**Conclusions**

- **Amikacin was the only studied antibiotic to exhibit >95% susceptibility to all PA isolates from Europe.**
- **Carbapenem resistant isolates of PA demonstrated significantly reduced susceptibility to all tested agents with only Amikacin again showing percent susceptible of 67%.**
- **The presence of carbapenem resistant in PA dramatically reduced the activity of all studied agents.**
- **Continued monitoring of the resistance profiles of PA in Europe is warranted.**

**References**


**Acknowledgments**

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