In Vitro Susceptibility of *Pseudomonas* Species to Carbenicillin and Trimethoprim-Sulfamethoxazole

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We compared susceptibility tests of 47 *Pseudomonas aeruginosa* isolates and 40 *Pseudomonas* species to carbenicillin and trimethoprim-sulfamethoxazole by the MS-2 and Sceptor systems and agar dilution. The major and very major errors encountered in these tests in the MS-2 and Sceptor systems raise doubts about the accuracy of these methods for testing *P. aeruginosa* and confirm that they should not be used for testing the susceptibility of *Pseudomonas* species to the two drugs tested.

Carbenicillin (2) and trimethoprim-sulfamethoxazole (TMP-SMX) (1, 4) are useful in the treatment of infections caused by *Pseudomonas aeruginosa* and *Pseudomonas* species, respectively. Differences have been noted in our laboratory in the antimicrobial susceptibility results obtained with the MS-2 system (Abbott Laboratories, Irving, Tex.) compared with agar plate disk diffusion when testing carbenicillin and TMP-SMX against *Pseudomonas* species. We describe in this report the susceptibility test results of 47 *P. aeruginosa* isolates and 40 isolates of other *Pseudomonas* spp. to carbenicillin and TMP-SMX in the MS-2 and the Sceptor microdilution system (BBL Microbiology Systems, Cockeysville, Md.) in comparison with agar dilution as the reference method (3).

Isolates of *P. aeruginosa* and other *Pseudomonas* spp. from specimens sent to the microbiology laboratory of Vancouver General Hospital were preserved in glycerol citrate at −70°C. All oxidase-positive organisms producing pyocyanin were identified as *P. aeruginosa*. Other *Pseudomonas* spp. were identified by oxidase reaction, the presence or absence of growth on MacConkey medium, the ability to oxidize glucose, and biochemical profiles obtained with the API 20E system (Analytab Products, Plainview, N.Y.). Organisms tested included 47 *P. aeruginosa* isolates, 9 *P. cepacia* isolates, 23 *P. maltophilia* isolates, 2 *P. putida* isolates, and 6 other *Pseudomonas* isolates. For quality control of media and susceptibility tests, reference strains of *P. aeruginosa*, ATCC 27853, and *Streptococcus faecalis*, ATCC 29212, were used.

A single batch of Mueller-Hinton agar was used to prepare plates containing 100, 200, and 300 μg of carbenicillin per ml, convenient multiples of the 100 μg/ml concentration used in the MS-2 system. In addition, a series of plates containing twofold dilutions of TMP-SMX at concentrations of 0.25 to 8.0 μg/ml plus 4.75 to 152.0 μg/ml, respectively, were prepared. The batch of Mueller-Hinton agar gave good results when tested against *Streptococcus faecalis* (ATCC 29212), thus indicating that the medium was free of sulfonamide and TMP inhibitors. The isolates were tested with the MS-2 and Sceptor systems in accordance with the protocol for susceptibility testing supplied by each manufacturer.

The results (Table 1) comparing the agar dilution method of susceptibility tests of 44 *P. aeruginosa* isolates to carbenicillin and TMP-SMX with the MS-2 system showed three major and three very major errors, a total of 13.6%. These same antimicrobial agents in tests of 39 isolates of *Pseudo-

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**TABLE 1.** Susceptibility tests of *Pseudomonas aeruginosa* and *Pseudomonas* species to carbenicillin and TMP-SMX by MS-2 and Sceptor in comparison with agar dilution

<table>
<thead>
<tr>
<th>Method</th>
<th>Carbenicillin</th>
<th>P. aeruginosa</th>
<th>TMP-SMX</th>
<th>Pseudomonas species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VM</td>
<td>Mi</td>
<td>% Correlation</td>
<td>VM</td>
</tr>
<tr>
<td>MS-2</td>
<td>2</td>
<td>5</td>
<td>79.5</td>
<td>1</td>
</tr>
<tr>
<td>Sceptor</td>
<td>0</td>
<td>8</td>
<td>76.6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>10</td>
<td>48.5</td>
<td>0</td>
</tr>
</tbody>
</table>

* Abbreviations: VM, Very major disagreement (reported susceptible, truly resistant); Ma, major disagreement (reported resistant, truly susceptible); and Mi, minor disagreement (incorrect susceptibility report featuring an intermediate result either in the test method or the agar dilution reference method). For the MS-2 method, 44 *P. aeruginosa* and 39 other *Pseudomonas* isolates were used. For the Sceptor method, 47 *P. aeruginosa* and 40 other *Pseudomonas* isolates were used.

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monas species gave 30 major (77%) and 8 very major (21%) errors in the MS-2.

In testing 47 isolates of *P. aeruginosa* in the Sceptor system, there were three major and three very major errors, a total of 12.8%. When the two antimicrobial agents were tested in the Sceptor system against 40 isolates of *Pseudomonas* species, there were 19 major (48%) and no very major errors.

These results cast doubt on the reliability of testing the susceptibility of *P. aeruginosa* to these two antimicrobial agents in the MS-2 and Sceptor systems. Moreover, these two systems appear to be unacceptable for testing the susceptibility of *Pseudomonas* species to carbenicillin and TMP-SMX.

LITERATURE CITED