**β-Lactam Susceptibility of *Neisseria gonorrhoeae* Isolates from Pelvic Inflammatory Disease**

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Gonococci isolated in France from urethral and endocervical cultures in 12 women with pelvic inflammatory disease were similar, in their susceptibility to six β-lactam antibiotics as determined by an agar dilution procedure, to isolates from patients with uncomplicated anogenital infections (83 patients). These data contrast with an earlier study done in the United States.

*Neisseria gonorrhoeae* isolates from pelvic inflammatory disease have been reported to be more resistant to β-lactam antibiotics than strains from uncomplicated anogenital infections (6).

Pelvic inflammatory disease occurs in an estimated 30% of women with gonorrhea attending Bretonneau Hospital's gynecological out-patient clinic. In the past 18 months, 12 strains of *N. gonorrhoeae* were the only pathogens isolated from cases of pelvic inflammatory disease. Cultures for *Chlamydia* and *Mycoplasma* were not performed. The diagnosis of pelvic inflammatory disease was based on laparoscopic criteria (3). The laparoscopic examination was systematically done the day after the patient was admitted in cases of clinically suspected acute salpingitis. During the same 18-month period, 83 strains of gonococcus were isolated from men and women who presented uncomplicated anogenital infections.

Urethral and endocervical specimens were inoculated on Thayer-Martin selective agar (BioMérieux) and incubated for 48 h at 37°C under 5% carbon dioxide. Isolates were identified as *N. gonorrhoeae* by oxidae reaction, Gram stain, and sugar acidification and preserved by lyophilization or freezing at −80°C in brain heart broth (Difco) containing 15% (vol/vol) glycerol.

Minimum inhibitory concentrations (MICs) were determined by an agar dilution procedure (4). Before each set of tests, the organisms were inoculated on GC agar (GC medium base, containing 1% hemoglobin and 1% supplement B [all from Difco]) and incubated for 24 h at 37°C under 5% carbon dioxide. Colonies were thoroughly suspended in Mueller-Hinton broth (Institut Pasteur Production). The suspensions were standardized to contain 10⁶ bacteria per ml as judged by a barium sulfate standard (1) and then diluted 1:10 in Mueller-Hinton broth. The following antibiotics were studied: penicillin G (Roger Belon), ampicillin, amoxicillin, carbenicillin (Beecham), cefazolin (Eli Lilly), and cefoxitin (Merck Sharp & Dohme, Chibret). Twofold serial dilutions of the antibiotics were prepared in sterile distilled water and incorporated in GC agar. Plates were inoculated with a Steers replicator (5 μl per spot) and incubated for 24 h at 37°C under 5% carbon dioxide. *Staphylococcus aureus* NCTC 6571 was included in each set of plates to control technical variables. MIC was accepted as being the lowest concentration of antibiotic completely inhibiting growth.

Table 1 summarizes the results of MIC determinations for isolates from pelvic inflammatory disease and from uncomplicated anogenital infections. No differences were found in MICs of these antibiotics between the two groups of isolates as judged by the Wilcoxon rank sum test (8).

Sackel et al. (6) in Boston, Mass., found isolates from pelvic inflammatory disease to be more resistant to penicillin G, penicillin X, ampicillin, and amoxicillin than strains from uncomplicated anogenital infections. The average differences in the MICs were about twofold for each of these antibiotics. This is in contrast to the data presented here.

The two studies differ only on minor points. Sackel et al. used an inoculum of 2 × 10⁸ bacteria per ml and based their diagnosis on clinical criteria. Change in inoculum does not seem to be of real importance; laparoscopic criteria are more reliable than clinical ones to affirm a diagnosis of pelvic inflammatory disease (3), but this cannot explain the apparent discrepancy between our results and those of Sackel et al. (6).

A much more interesting explanation is that regional variations in antibiotic susceptibilities for *N. gonorrhoeae* exist. This may account for
the differences found between Boston and Tours (5, 9). Nevertheless, a better characterization of strains by auxanographic determinations would certainly facilitate the comparison of different clinical isolates of *N. gonorrhoeae* and would be useful to define the exact status of isolates from pelvic inflammatory disease (2, 7).

**LITERATURE CITED**


**TABLE 1.** Comparisons of MICs for six β-lactam antibiotics against clinical isolates of *N. gonorrhoeae*

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Pelvic inflammatory disease (12)(^b)</th>
<th>Uncomplicated anogenital infection (83)(^b)</th>
<th>(P^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range (\mu g/ml)</td>
<td>MIC(_{50})</td>
<td>MIC(_{90})</td>
</tr>
<tr>
<td>Penicillin G</td>
<td>0.007-0.5</td>
<td>0.015</td>
<td>0.25</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>0.007-1</td>
<td>0.06</td>
<td>0.25</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>0.03-4</td>
<td>0.25</td>
<td>0.5</td>
</tr>
<tr>
<td>Carbenicillin</td>
<td>0.007-1</td>
<td>0.03</td>
<td>0.5</td>
</tr>
<tr>
<td>Cefazolin</td>
<td>0.03-2</td>
<td>0.25</td>
<td>1</td>
</tr>
<tr>
<td>Cefoxitin</td>
<td>0.06-0.5</td>
<td>0.25</td>
<td>0.5</td>
</tr>
</tbody>
</table>

\(a\) \(P\) value is derived from the Wilcoxon rank sum test.

\(b\) Parentheses indicate number of isolates.

\(c\) MIC\(_{50}\), Concentration required for inhibition of 50% of strains.

\(d\) MIC\(_{90}\), Concentration required for inhibition of 90% of strains.

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