Viridans group streptococci

Calibration of zone diameter breakpoints to MIC values

Version 3.0
January 2020
Viridans group streptococci
MIC and zone diameter correlates

• The following histograms present inhibition zone diameter distributions from EUCAST antimicrobial susceptibility testing. In most, the different colours of the bars indicate different MIC values. In some, the colours of the bars indicate a resistance gene or a resistance mechanism.

• The distributions include data for wild-type isolates and for isolates with acquired resistance mechanisms. A large number of isolates with MIC values close to the edge of the wild-type distribution and/or close to EUCAST clinical breakpoints were intentionally included. These distributions cannot be used to infer resistance rates or the performance of the tests with routine isolates.

• For some agents, isolates were tested on more than one occasion, including parallel tests with disks and media from several manufacturers. When this is the case, data are presented as both the “number of isolates tested” and the “total number of MIC-zone diameter correlates”, including replicate tests and parallel tests with disks and media from different sources.
Viridans group streptococci
Materials and methods

- Antimicrobial susceptibility testing was performed on a collection of viridans group streptococci, comprising mostly *S. mitis*, *S. oralis*, *S. anginosus*, *S. salivarius*, *S. gallolyticus*, *S. sanguinis*, *S. constellatus*, *S. bovis*, *S. gordonii*, *S. mutans*, *S. intermedius* and *S. vestibularis*.

- Disk diffusion was performed according to EUCAST methodology and MIC determination was performed with gradient tests or broth microdilution using the EUCAST MH-F broth.

- The distributions of MIC vs. zone diameter in this presentation are the result of a collaboration between EUCAST and several other laboratories (K-res, Tromsø, Norway; JMI Laboratories, Iowa, USA; Vestfold Hospital, Tønsberg, Norway; Akershus University Hospital, Lørenskog, Norway; Stavanger University Hospital, Norway; Kalmar Hospital, Sweden; Linköping University Hospital, Sweden; Southmead Hospital, Bristol, UK; Analyse BioLab GmbH, Linz, Austria and Laboratory Specialists Inc., USA).

- This presentation is based on EUCAST Clinical Breakpoint Tables v. 10.0.
Changes from previous version (2.4)

<table>
<thead>
<tr>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• New distributions for teicoplanin, eravacycline and tedizolid.</td>
</tr>
</tbody>
</table>
Explanation of graphs:

- These graphs show zone diameter distributions with MIC values or resistance mechanisms as coloured bars. Colours are related to current EUCAST MIC breakpoints.

**Agent X**

- MIC (mg/L)
  - ≥8
  - 4
  - 2
  - 1
  - 0.5
  - ≤0.25

**Agent Y**

- MIC (mg/L)
  - ≥64
  - 32
  - 16
  - 8
  - 4
  - 2
  - 1
  - 0.5
  - ≤0.25
Benzylpenicillin 1 unit vs. MIC
Viridans group streptococci, 245 isolates

(9 data sources)

**Breakpoints**

- **MIC**
  - S $\leq 0.25$, R $> 2$ mg/L
- **Zone diameter**
  - S $\geq 18$, R $< 12$ mm

**Inhibition zone diameter (mm)**

<table>
<thead>
<tr>
<th>MIC (mg/L)</th>
<th>Breakpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\geq 16$</td>
<td>S $\leq 0.25$, R $&gt; 2$ mg/L</td>
</tr>
<tr>
<td>8</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>4</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>2</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>1</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>0.5</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>0.25</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>0.125</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>0.06</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>0.03</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
<tr>
<td>$\leq 0.016$</td>
<td>S $\geq 18$, R $&lt; 12$ mm</td>
</tr>
</tbody>
</table>
Ampicillin 2 µg vs. MIC
Viridans group streptococci, 245 isolates

(9 data sources)

**Breakpoints**
MIC  
S≤0.5, R>2 mg/L

Zone diameter  
S≥21, R<15 mm
Cefotaxime 5 µg vs. MIC
Viridans group streptococci, 245 isolates

(9 data sources)

Breakpoints

<table>
<thead>
<tr>
<th>MIC (mg/L)</th>
<th>S≤0.5, R&gt;0.5 mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>0.125</td>
<td></td>
</tr>
<tr>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>0.016</td>
<td></td>
</tr>
<tr>
<td>≤0.008</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zone diameter</th>
<th>S≥23, R&lt;23 mm</th>
</tr>
</thead>
</table>
Cefuroxime 30 µg vs. MIC
Viridans group streptococci, 85 isolates

(1 data source)

Breakpoints (iv)

MIC
S ≤ 0.5, R > 0.5 mg/L

Zone diameter
S ≥ 26, R < 26 mm
Teicoplanin 30 µg vs. MIC
Viridans group streptococci, 35 isolates

(1 data source)

No of observations

Inhibition zone diameter (mm)

Breakpoints

MIC S≤2, R>2 mg/L
Zone diameter S≥16, R<16 mm
Vancomycin 5 µg vs. MIC
Viridans group streptococci, 154 isolates

(9 data sources)

Breakpoints
MIC: S≤2, R>2 mg/L
Zone diameter: S≥15, R<15 mm
Clindamycin 2 µg vs. MIC
Viridans group streptococci, 226 isolates

(9 data sources)

No of observations

Inhibition zone diameter (mm)

Breakpoints
MIC
S≤0.5, R>0.5 mg/L
Zone diameter
S≥19, R<19 mm

MIC (mg/L)
- ≥16
- 8
- 4
- 2
- 1
- 0.5
- 0.25
- 0.125
- 0.06
- 0.03
- ≤0.016
Eravacycline 20 µg vs. MIC
Viridans group streptococci, 103 isolates (788 correlates)

(1 data source)

**Breakpoints**

<table>
<thead>
<tr>
<th>MIC (mg/L)</th>
<th>S ≤ 0.125, R &gt; 0.125 mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>0.016</td>
<td></td>
</tr>
<tr>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>≤ 0.002</td>
<td></td>
</tr>
</tbody>
</table>

**Zone diameter**

<table>
<thead>
<tr>
<th>S ≥ 17, R &lt; 17 mm</th>
</tr>
</thead>
</table>
Tedizolid 2 µg vs. MIC
S. anginosus group, 50 isolates (364 correlates)

(2 data sources)

<table>
<thead>
<tr>
<th>MIC (mg/L)</th>
<th>No of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.06</td>
<td>3</td>
</tr>
<tr>
<td>0.125</td>
<td>27</td>
</tr>
<tr>
<td>0.25</td>
<td>30</td>
</tr>
<tr>
<td>0.5</td>
<td>4</td>
</tr>
<tr>
<td>0.25</td>
<td>19</td>
</tr>
</tbody>
</table>

Breakpoints (S. anginosus group)
- MIC: $S \leq 0.25, R > 0.25$ mg/L
- Zone diameter: $S \geq 18, R < 18$ mm
Viridans group streptococci

Benzylpenicillin 1 unit as screen for beta-lactam resistance
Viridans group streptococci

• Benzylpenicillin 1 unit can be used to screen for beta-lactam resistance.

• Isolates categorised as susceptible can be reported susceptible to beta-lactam agents for which clinical breakpoints are listed (including those with “Note”).

• Isolates categorised as non-susceptible should be tested for susceptibility to individual agents.
Benzylpenicillin 1 unit vs. Ampicillin MIC
Viridans group streptococci, 245 isolates

(9 data sources)

No of observations

Inhibition zone diameter (mm)

Breakpoints
Ampicillin MIC  S≤0.5, R>2 mg/L
Benzylpenicillin zone diameter (screen)  S≥18 mm
Benzylpenicillin 1 unit vs. Cefotaxime MIC
Viridans group streptococci, 244 isolates

(9 data sources)

**Breakpoints**
- **Cefotaxime MIC**: $S \leq 0.5$, $R > 0.5$ mg/L
- **Benzylpenicillin zone diameter (screen)**: $S \geq 18$ mm
Benzylpenicillin 1 unit vs. Cefuroxime MIC
Viridans group streptococci, 85 isolates

(1 data source)

**Breakpoints (iv)**
- Cefuroxime MIC
  - S ≤ 0.5, R > 0.5 mg/L
- Benzylpenicillin zone diameter (screen)
  - S ≥ 18 mm
Benzylpenicillin 1 unit vs. Meropenem MIC
Viridans group streptococci, 244 isolates

(9 data sources)

No of observations

MIC (mg/L)
- >8
- 4
- 2
- 1
- 0.5
- 0.25
- 0.125
- 0.06
- 0.03
- 0.016
- 0.008

Breakpoints
Meropenem MIC  S≤2, R>2 mg/L
Benzylpenicillin zone diameter (screen)  S≥18 mm