Antibiograms: Review of Utilization

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The Basics - Antibiotics

- Cumulative data regarding isolate susceptibility at a specified time period
  - Often every 3, 6, or 12 months
- Provides the % susceptible to the tested antibiotic
  - Example: Out of the 125 isolates of *E. coli*, 87% were susceptible to cefepime
- Guides empiric prescribing for likely pathogens
- Core element of hospital antibiotic stewardship programs
Antibiogram Limitations

1. Not frequently separated by unit in the hospital
2. Does not trend data
3. Gives susceptibility but not MIC\textsubscript{50} or MIC\textsubscript{90}
4. Susceptibility interpretation may vary depending on if utilizing breakpoints by FDA or CLSI
5. Not all mechanisms can be detected
   - Inducible resistance
6. Does not take into consideration patient specific factors
   - Surgery, immune system, inoculum size
7. Does not give information about site of infection
8. Bacterial killing at different concentrations or doses of antibiotics
9. Depending on method used to eliminate repeat isolates, the percentage susceptible may vary
# Reading an Antibiogram

<table>
<thead>
<tr>
<th>Organism</th>
<th># of isolates</th>
<th>% Susceptible</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Includes All Adult Units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gran-negative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acinetobacter complex</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Citrobacter freundii (VHS)</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>Enterobacter cloacae</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>608</td>
<td></td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>181</td>
<td></td>
</tr>
<tr>
<td>Klebsiella oxytoca</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>Providencia stuartii (VHS)</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>153</td>
<td></td>
</tr>
<tr>
<td>Serratia marcescens (VHS)</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td><strong>Gram-positive</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterococcus faecalis</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>Enterococcus faecium</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>416</td>
<td></td>
</tr>
<tr>
<td>Coag-neg Staphylococcus sp</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

Not tested, reported, or does not cover.
Methodology can affect the reported susceptibility

- Semi-automated machines
  - Vitek®, Microscan®, Phoenix®
  - Main methodology in clinical practice
    - Accuracy varies between system and organism/antimicrobial combination

- Others:
  - Microboth dilution
    - Rarely used in clinical practice, but considered the reference method
  - Etest
    - Frequently gives ½ to 1 dilution higher MIC
  - Kirby-Bauer disk diffusion
Interpretation of Susceptibility

0 **Determined by:**
  0 Clinical, pharmacological (pharmacokinetic), microbiological, and pharmacodynamic considerations
  
0 **FDA** – determined at time of FDA approval
  0 May be changed later if new data is available
  0 Typically what is utilized with semi-automated systems
  
0 **CLSI** – Clinical Laboratory Standards Institute
  0 Non-government agency
  0 More “clinical”
    0 Utilizes pharmacokinetic and pharmacodynamic data to determine which MICs would be obtained with typical dosing
  0 Preferred
Combination Antibiograms

- Determines which antimicrobial combinations would provide the greatest efficacy against Gram-negative pathogen
  - Particularly if resistant to beta-lactam