Update on the 2012-2013 CLSI Standards for Antimicrobial Susceptibility Testing:

What’s New with the Gram Positive Cocci?

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Summary of Major Changes

- Changes to CLSI documents are summarized in the front of each document.
- Information listed in boldface type is new or modified since the previous edition of M100 document.
- Recent breakpoint addition/revision dates are listed in the front of M100-S22.

Today’s Review: 2012-2013 changes

- Staphylococcus species
- Streptococcus pneumoniae
- β-Streptococcus species
- Enterococcus species

Staphylococcus species

- Penicillin testing

Staphylococcus spp. – Penicillin

The story….

- > 90% of staphylococci are penicillin “R”
- Penicillin rarely considered for treatment of staphylococcal infections
  - …BUT - Penicillin might be considered for infections requiring lengthy therapy (e.g., endocarditis, osteomyelitis)
  - IF penicillin were known to be “S”

Some Staphylococcus spp. that test “S” to penicillin by MIC or disk diffusion may actually possess a β-lactamase (BL) that may cause the patient to fail penicillin therapy
Staphylococcus spp. – Penicillin

CLSI Previous recommendation:
- Perform induced nitrocefin BL test before reporting penicillin as “S” if:
  - zone diameter ≥29 mm
  - MIC ≤0.12 µg/ml
- PCR for the blaZ β-lactamase gene may be considered

<table>
<thead>
<tr>
<th>MIC (µg/ml)</th>
<th>Zone (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>I</td>
</tr>
<tr>
<td>≤0.12</td>
<td>≤0.25</td>
</tr>
</tbody>
</table>

Reference: M100-S21 Table 2C, Page 70

Induced β-lactamase (BL) Test
- Sub isolate to blood agar
- Induction: Drop disk to induce BL production (e.g., oxacillin or cefoxitin)
- Incubate overnight
- Test cells from periphery of zone
- If BL positive, report penicillin R

Staphylococcus aureus β-lactamase (BL)

- Induced nitrocefin BL test usually, but not always, detects staphylococcal BL
- Other BL tests are more sensitive for BL:
  - Cloverleaf test
  - Penicillin disk zone edge test
- blaZ gene PCR not optimal for BL:
  - Several types of blaZ genes

Staphylococcus aureus β-lactamase (BL) Study
- 348 MSSA (low penicillin MICs) characterized for blaZ by PCR:
  - 303 PCR negative
  - 45 PCR positive
- Methods:
  - Penicillin MICs
  - Phenotypic BL tests
    - Nitrocefin - Cefinase
    - Nitrocefin - Dryslide
    - Cloverleaf assay
    - Penicillin disk zone edge

Cloverleaf Assay for β-lactamase + S. aureus
- 5% sheep blood agar
- S. aureus ATCC 25923 as the indicator BL+ organism
- 1 unit penicillin disk
- Negative (penicillin-S) strain
- Some difficulties reading

Isolates A-D are all BL positive


Reference: M100-S21 Table 2C, Page 70
**Staphylococcus aureus**

Disk Zone Edge Test (10 U penicillin disk and standard disk diffusion method)

- Fuzzy / “beach” = \( \beta \)-lactamase negative, Penicillin - S
- Sharp / “cliff” = \( \beta \)-lactamase positive, Penicillin - R

S. aureus QC:
- Neg - ATCC 25923
- Pos - ATCC 29213 (supplemental QC)

Reference: M100-S22, Table 2C Supplemental Table 1. Page 83

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**Staphylococcus aureus**

3 Lab BL Study Results (N=348)

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefinase</td>
<td>77%</td>
<td>100%</td>
</tr>
<tr>
<td>Dryslide</td>
<td>88%</td>
<td>100%</td>
</tr>
<tr>
<td>Cloverleaf</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Penicillin zone edge</td>
<td>96%</td>
<td>100%</td>
</tr>
</tbody>
</table>


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**Staphylococcus spp. – Penicillin**

- NEW RECOMMENDATION:
  - Added ‘penicillin disk zone edge test’ for BL production in \( S \). \textit{aureus}

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**Staphylococcus spp. – Penicillin Optional Strategy**

- Report penicillin if “R”
- Suppress penicillin if “S” and add note “Contact laboratory if penicillin results needed”
- If penicillin “S” and penicillin results needed, perform:
  - \( S \). \textit{aureus}
    - Nitrocefin BL test, and if negative
  - Penicillin zone edge test

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jhindler CLSI M100-S22 Update
S. aureus
- Isolates where penicillin zones are ≥29 mm or penicillin MICs are ≤0.12 µg/ml, perform a penicillin ‘disk zone edge test’ before reporting as penicillin susceptible.
- NOTE:
  - *S. lugdunensis* isolates where penicillin zones are ≥29 mm or penicillin MICs are ≤0.12 µg/ml, perform an induced nitrocefin assay or other CLSI reference method on isolates before reporting as penicillin susceptible.
  - The penicillin disk zone edge test was shown to be inferior as compared to the induced nitrocefin assay and should not be used with *S. lugdunensis*.

> Action Items

**Staphylococcus**
- Oxacillin – Intermediate
  - Table 2C / Note (13)
    - If oxacillin-I results (disk diffusion testing) are obtained for *S. aureus*, perform testing for mecA or PBP 2a, the cefoxitin MIC or cefoxitin disk test, an oxacillin MIC test, or the oxacillin-salt agar screening test. Report the result of the alternative test rather than the oxacillin-I result.

**Staphylococcus**
- Oxacillin – Resistance
  - Table 2C / Note (12)
    - If oxacillin-R staphylococci report penicillin as resistant or do not report.

**Staphylococcus**
- Disks per plate – clarification
  - 12 disks only on a 150mm plate
  - 5 disks only on a 100mm plate
  - Do not measure zone of inhibition of hemolysis

**Enterococcus – Vancomycin (4/32)**
- For isolates with MICs of 8-16 µg/ml
- Perform tests are listed in 2D-Supplemental Table 1

**Enterococcus – Vancomycin**
- Alternative inoculum method provided for vancomycin resistance screen test
  - 2D-Supplemental Table 1
    - OLD: 1-10µL of a 0.5 McFarland suspension spotted onto agar surface (agar = 6µg/ml vanco in BHI agar)
    - NEW (added): Alternatively, using a swab dipped in the suspension and the excess liquid expressed, spot an area 10-15mm in diameter or streak a portion of the plate.
Streptococcus pneumoniae

- Predicting susceptibility to Fluoroquinolones
  - Isolates susceptible to levofloxacin are predictably susceptible to gemifloxacin and moxifloxacin.
  - Isolates susceptible to gemifloxacin or moxifloxacin can not be assumed to be susceptible to levofloxacin.

β-Streptococcus

- Table 2H-1 Supplemental Table 1 (inducible clindamycin resistance)
  - Included new comment regarding CDC recommendations:
    - "The 2010 CDC guidelines on prevention of group B streptococcal disease in neonates recommend that colonization isolates from pregnant women with severe penicillin allergy (high risk for anaphylaxis) should be tested for inducible clindamycin resistance."

Streptococcus pneumoniae & β-Streptococcus

- Disks per plate – clarification
  - 9 disks only on a 150mm plate
  - 4 disks only on a 100mm plate
  - Do not measure zone of inhibition of hemolysis (for Viridans streptococci as well)

β-Streptococcus

- Table 2H-1
  - Daptomycin
    - Disk diffusion testing is not reliable (previously indicated for the staphylococci)

Staphylococcus - 2013

- All cephalosporins/many penicillins currently in the 2012 Table 2C will be removed.
  - Deleted all β-lactam breakpoints except penicillin, oxacillin (cefoxitin), and ceftaroline.
  - Statements will be made to indicate that results for cephalosporins and other β-lactam antibiotics (that are appropriate for staphylococci treatment) can be predicted from the results of oxacillin MIC, cefoxitin MIC, or cefoxitin disk diffusion testing.
**Staphylococcus - 2013**

- Rationale for deleting breakpoints for β-lactams (except penicillin, oxacillin [cefoxitin], & ceftaroline) from the CLSI M100 tables for staphylococci:
  - Current breakpoints are most likely inaccurate
    - They were ‘Grandfathered’ into the staphylococcal tables with other major table over-hauls in the early 2000’s.
    - Can deduce anti-staphylococcal β-lactam results from penicillin and oxacillin [cefoxitin] results.

- Oxacillin disk diffusion testing will be removed from the staphylococci charts.
**Staphylococcus - 2013**

Detection of oxacillin resistance:
- In most staphylococcal isolates, oxacillin resistance is mediated by mecA encoding the penicillin-binding protein 2a (PBP 2a, also called PBP2').
- Other mechanisms of oxacillin resistance are rare and include a novel mecA homologue (eg, mecC) which may not be detected by tests for mecA or PBP 2a.
- Isolates that test positive for mecA or PBP 2a should be reported as oxacillin resistant.
- Isolates for which either the oxacillin MIC, cefoxitin MIC, or cefoxitin disk diffusion test is in the resistant range should also be reported as oxacillin resistant.

**Streptococcus pneumoniae - 2013**

- New (revised) tetracycline disk diffusion and MIC interpretive criteria.
- New doxycycline disk diffusion and MIC interpretive criteria.
- Clarified that isolates of *S. pneumoniae* from CSF can also be tested against vancomycin using the MIC or disk method.

**Inducible clindamycin resistance - Streptococcus: - 2013**

- Clarified note for erythromycin for testing and reporting on isolates from pregnant women with severe penicillin allergies.
  - When a Group B *Streptococcus* is isolated from a pregnant woman with severe penicillin allergy (high risk for anaphylaxis), erythromycin and clindamycin, (including inducible clindamycin resistance) should be tested, and only clindamycin should be reported.
  - Clarified that susceptibility testing of β-hemolytic streptococci need not be performed routinely.
New antibiotics

- Doripenem
- Ceftaroline

Doripenem (Doribax)

- A broad spectrum injectable antibiotic
- A β-lactam drug
- Belongs to the carbapenem group (imipenem, ertapenem, meropenem)

Doripenem

Complicated Intra-Abdominal Infections

- Indicated as a single agent for the treatment of complicated intra-abdominal infections caused by Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Bacteroides fragilis, Bacteroides thetaiotaomicron, Bacteroides uniformis, Bacteroides vulgatus, Streptococcus intermedius, Streptococcus constellatus and Peptostreptococcus micros.

Complicated Urinary Tract Infections, Including Pyelonephritis

- Indicated as a single agent for the treatment of complicated urinary tract infections, including pyelonephritis caused by Escherichia coli including cases with concurrent bacteremia, Klebsiella pneumoniae, Proteus mirabilis, Pseudomonas aeruginosa, and Acinetobacter baumannii.

Doripenem

- Exerts its bactericidal activity by inhibiting bacterial cell wall biosynthesis.
- Inactivates multiple essential penicillin-binding proteins (PBPs) resulting in inhibition of cell wall synthesis with subsequent cell death.

Doripenem (Gram positive's)

- Staphylococcus aureus (MSSA only)
- Streptococcus agalactiae
- Streptococcus pyogenes
- Streptococcus Viridans group

Bacterial resistance mechanisms that affect doripenem include:

- Inactivation by carbapenem-hydrolyzing enzymes
  - KPC, NDM-1, etc.
- Mutant or acquired PBPs
- Decreased outer membrane permeability
- Active efflux

Doripenem is stable to hydrolysis by most β-lactamases, including penicillinases and cephalosporinases produced by GP &GN bacteria.
Doripenem (Gram positive’s)

No disk diffusion criteria

<table>
<thead>
<tr>
<th></th>
<th>S (µg/ml)</th>
<th>I (µg/ml)</th>
<th>R (µg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streptococcus Viridans group (O)</td>
<td>≤ 1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>β-Streptococcus (O)</td>
<td>≤ 0.12</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>S.pneumoniae (C) (O)</td>
<td>≤ 1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>S.aureus*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Remember: Only penicillin, oxacillin (cefotixin), ceftaroline for staph with the β-lactams in 2013

Ceftaroline

Ceftaroline is a cephalosporin with in vitro activity against GP and GN bacteria.

- Bactericidal action is mediated through binding to essential penicillin-binding proteins (PBP).
- Bactericidal against S. aureus due to its affinity for PBP2a and against Streptococcus pneumoniae due to its affinity for PBP2x.
- Ceftaroline is not active against Gram negative bacteria which produce ESBLs or carbapenemases.

Staphylococcus aureus (MSSA & MRSA)

- Streptococcus pyogenes
- Streptococcus agalactiae
- Streptococcus pneumoniae

NEW AST QC Guidance

Table 3C. Disk Diffusion: Reference Guide to QC Frequency

Conversion from Daily to Weekly QC

- Routine QC is performed each day the test is performed unless an alternative quality control plan has been established.
- CLSI document M02-A11 Section 15.7 describes a QC plan using a 20-30 day protocol that if successfully completed allows a user to convert from daily to weekly quality control.
NEW AST QC: 3x5 (15) Plan

- A new QC plan using a two-phase, 15 replicate (3 X 5 day) plan is described as follows:
  - 15 replicate (3 X 5 day) plan
  - Test three replicates using individual inoculum preparations of the appropriate QC strains for 5 consecutive test days to perform the 15 replicate (3 x 5 day) plan.
  - Each QC strain tested is evaluated separately according to the acceptance criteria and recommended action described below (e.g., pass, test another 3 replicates for 5 days, fail).
  - Upon successful completion of the QC plan, the laboratory can convert from daily to weekly QC testing.

- If unsuccessful investigate, take corrective action as appropriate and continue daily QC testing.

### Table 3C*

<table>
<thead>
<tr>
<th>Number out of range with initial testing (based on 15 replicates)</th>
<th>Conclusion from initial testing</th>
<th>Number out of range after repeat testing (based on all 30 replicates)</th>
<th>Conclusion after repeat testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>QC plan successful. Convert to weekly QC testing.</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2-3</td>
<td>Test another 3 replicates for 5 days.</td>
<td>2-3</td>
<td>QC plan successful. Convert to weekly testing.</td>
</tr>
<tr>
<td>4 or greater</td>
<td>QC plan fails. Investigate and take corrective action as appropriate. Continue QC each test day.</td>
<td>4 or greater</td>
<td>QC plan fails. Investigate and take corrective action as appropriate. Continue QC each test day.</td>
</tr>
</tbody>
</table>

*A assess each QC strain individually

NEW AST QC 3x5 (15) Plan

- Statistician’s comments:
  - 3x5 Plan
    - Similar to manufactured product releases
      - 'Go' or 'No-Go' based on mathematical considerations
  - Two-Stage sampling plan:
    - May be completed in first stage or proceed to a second stage
    - Two new plans were considered:
      - 0-1 error allowed in first stage of Plan 1
      - 0 errors allowed in first stage of Plan 2

NEW AST QC: 3x5 (15) Plan

- Statistician’s comments
  - Out-of-control results could be due to either systemic or random errors
    - Systemic errors = likely to get >2 outliers out of 15 results
    - Random (allowable) errors = very high probability of getting 1 outlier of 15 results due to random error
  - Plan 1: 0-1 errors allowed:
    - Deemed likely to pick up systematic errors (>2/15)
  - Plan 2: 0 errors allowed:
    - Deemed likely to be problematic and unlikely to improve quality of results (no allowance for random errors @ ≤1/15)

NEW AST QC 3x5 (15)

3x5 Replicate or 20/30 day QC testing.

In addition, this testing is required for the following modifications of existing antimicrobial susceptibility test system:

- Addition of new antimicrobial agent to existing system
- Convert inoculum preparation/standardization to a method that depends on user technique
- Change method of measuring zones
QC Testing Frequency:
Screening Tests

<table>
<thead>
<tr>
<th>QC Strain</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive (resistant)</td>
<td>Daily; convert to weekly after 20-30 days</td>
</tr>
<tr>
<td>Negative (susceptible)</td>
<td>Daily; convert to weekly after 20-30 days</td>
</tr>
</tbody>
</table>

QC Recommendations:
- 'Routine'
  - Test negative (susceptible) QC strain:
    - Daily; convert to weekly after 20-30 days
  - Test positive (resistant) QC strain:
    - Daily; convert to weekly after 20-30 days

NEW QC Testing Frequency:
Screening Tests*

<table>
<thead>
<tr>
<th>QC Strain</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive (resistant)</td>
<td>Daily; convert to weekly after 20-30 days</td>
</tr>
<tr>
<td>Negative (susceptible)</td>
<td>Daily; convert to weekly after 20-30 days</td>
</tr>
</tbody>
</table>

QC Recommendations:
- 'Routine'
  - Test negative (susceptible) QC strain:
    - Each new batch/lot/shipment of testing materials
- 'Lot/shipment'
  - Test positive (resistant) QC strain at minimum of at least once with each new lot/shipment of testing materials

Intrinsic Resistance Table

Intrinsic Resistance (Appendix B):
Split out to four appendices as follows:
- B.1 Enterobacteriaceae
  - Deleted 'R' for Citrobacter koseri with amoxicillin-clavulanate and ampicillin-sulbactam
  - P. mirabilis – clarified that there is no intrinsic resistance to penicillin and cephalosporins
  - Added imipenem with note that Proteus species, Providencia species and Morganella species may have elevated MICs by mechanisms other than by production of carbapenemases
  - Added information that Enterobacteriaceae are also intrinsically resistant to clindamycin, daptoycin, fusidic acid, glycopeptides (vancomycin, teicoplanin), linezolid, macrolides (erythromycin, clarithromycin, azithromycin), quinupristin-dalfopristin, and rifampin.
- New Appendix B.2 Other Non-Enterobacteriaceae
- New Appendix B.3 Staphylococci
- New Appendix B.4 Enterococcus spp.

Intrinsic Resistance Tables –
Staphylococcus (Appendix B)

<table>
<thead>
<tr>
<th>Organism/drug</th>
<th>Drug</th>
<th>Novobiocin</th>
<th>Fosfomycin</th>
<th>Fusidic Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. aureus/S. lugdunensis</td>
<td>There is no intrinsic resistance in these species.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. epidermidis</td>
<td>There is no intrinsic resistance in this species.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. haemolyticus</td>
<td>There is no intrinsic resistance in this species.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. saprophyticus</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>S. capitis</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. cohnii</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. xylosus</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Gram-positive bacteria are also intrinsically resistant to aztreonam, polymyxin B/proline and naladixic acid.

Intrinsic Resistance Tables –
Enterococcus (Appendix B)

<table>
<thead>
<tr>
<th>Organism/drug</th>
<th>Cephalosporins</th>
<th>Vancomycin</th>
<th>Teicoplanin</th>
<th>Aminoglycosides</th>
<th>Clindamycin</th>
<th>Q/D</th>
<th>Trimethoprim</th>
<th>AM</th>
<th>Fusidic Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. faecalis</td>
<td>R*</td>
<td>R*</td>
<td>R*</td>
<td>R*</td>
<td>R</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. faecium</td>
<td>R*</td>
<td>R*</td>
<td>R*</td>
<td>R*</td>
<td>R</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. gallinarum/ casseliflavus</td>
<td>R*</td>
<td>R</td>
<td>R*</td>
<td>R*</td>
<td>R*</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Warning: For Enterococcus spp., cephalosporins, aminoglycosides (except for high-level resistance screening), clindamycin, and SXT may appear active in vitro, but are not effective clinically and should not be reported as susceptible.

NOTE 1: Gram-positive bacteria are also intrinsically resistant to aztreonam, polymyxin B/proline and naladixic acid.
Summary

- CLSI updates AST tables (M100) each January.
- CLSI updates documents that describe how to perform reference disk diffusion (M02) and reference MIC (M07) tests every 3 years.
- Changes to CLSI documents are summarized in the front of each document.
- Information listed in boldface type is new or modified since the previous edition of M100.
- Recent breakpoint addition/revision dates are listed in the front of M100-S22.
- Minutes of CLSI AST Subcommittee meetings and other materials are available at www.clsi.org.

Case A

- 32 year old pregnant woman had a vaginal-rectal specimen sent for GBS culture.
- The culture was positive and results were sent to the doctor.
- Two days later the doctor's office calls and requests susceptibility testing because the patient is very allergic to penicillin and the doctor needs the results for a non β-lactam antibiotic for this patient.
- You subculture the isolate for susceptibility testing.

Case B

- You want to implement a new Staphylococcus panel with ceftriaxone (not previously tested in any panel) on your AST system. What will you do?
  1. Test QC strains on new panel concurrently with patient isolates for 20-30 days and then go to weekly testing
  2. Test QC strains on new panel before testing patient isolates in the 3x5 replicate plan and then go to weekly testing
  3. Test 10 clinical isolates on new panel and compare ceftriaxone results to a reference methods before testing patients isolates
  4. Something else?

Case C

- SPECIMEN: Joint Fluid
- DIAGNOSIS: Septic Arthritis
- ORGANISM: Staphylococcus aureus

<table>
<thead>
<tr>
<th>MIC (μg/ml)</th>
<th>clindamycin</th>
<th>erythromycin</th>
<th>oxacillin</th>
<th>penicillin</th>
<th>vancomycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 0.5 “S”</td>
<td>≤ 0.5 “S”</td>
<td>≤ 0.5 “S”</td>
<td>“R”</td>
<td>≤ 0.5 “S”</td>
<td>≤ 0.5 “S”</td>
</tr>
</tbody>
</table>
Case C

- **SPECIMEN:** Joint Fluid
- **DIAGNOSIS:** Septic Arthritis
- **ORGANISM:** *Staphylococcus aureus*

<table>
<thead>
<tr>
<th>MIC (µg/ml)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>clindamycin</td>
<td>≤ 0.5 &quot;S&quot;</td>
</tr>
<tr>
<td>erythromycin</td>
<td>≤ 0.5 &quot;S&quot;</td>
</tr>
<tr>
<td>oxacillin</td>
<td>≤ 0.5 &quot;S&quot;</td>
</tr>
<tr>
<td>penicillin</td>
<td>“R”</td>
</tr>
<tr>
<td>vancomycin</td>
<td>≤ 0.5 &quot;S&quot;</td>
</tr>
</tbody>
</table>

Physician calls with an additional request…

Case D

- **SPECIMEN:** Blood culture
- **DIAGNOSIS:** Endocarditis
- **ORGANISM:** *Staphylococcus aureus*

<table>
<thead>
<tr>
<th>MIC (µg/ml)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>clindamycin</td>
<td>8 &quot;R&quot;</td>
</tr>
<tr>
<td>erythromycin</td>
<td>16 &quot;R&quot;</td>
</tr>
<tr>
<td>oxacillin</td>
<td>≤ 0.5 &quot;S&quot;</td>
</tr>
<tr>
<td>vancomycin</td>
<td>≤ 0.5 &quot;S&quot;</td>
</tr>
</tbody>
</table>

Physician calls with an additional request…

Case D

- The physician would like to treat this patient with penicillin as it will be a long and protracted course of therapy for this patient.
- They notice that penicillin is not resulted on the patient's report.
- What do you tell the physician about the penicillin result on this patient's isolate?
- What further steps do you take regarding this request?

Case E

25 y/o woman with acute cystitis.
- UR culture grows >100,000 *Staphylococcus* species
- The physician wants additional identification and AST done.
- What laboratory tests do you do next?
- What do you tell the physician?
**Case F**
- Young boy 3 y/o present with pneumonia.
- The suctioned sputum grows out the pathogen: *Streptococcus pneumoniae*.
- You do AST and report out...... ...
- Doc wants to use clindamycin for this patient.
- What antibiotics do you test (and how do you test) and how do you report the susceptibility results?

**Case G**
- Patient develops pain and swelling in the abdomen.
- Ascetic fluid is collected and sent for culture.
- The specimen shows many polymorphonuclear cells on initial GS along with moderate GPC in chains.
- The culture grows a pure culture of 3+ *Streptococcus anginosus* group.

**Case G**
- You report out your normal AST of the following for this organism:
  - pencillin (R), ceftriaxone (S), vancomycin (S), clindamycin (S)
- Is there anything suspect about the above susceptibility results?
- The physician calls and asks for doripenem to be tested. You do have doripenem disks and it is on your streptococci microtiter panels. What do you do?

**Case H**
- 78 year old man with signs of pneumonia is admitted through the Emergency Department.
- Sputum is collected and grows many *Streptococcus pneumoniae* with a few oral flora (GS was significant for many PMNS and GPC in short chains).
- The doctor calls and ask for a 'fluoroquinolone to be tested' other than levofoxacin (which is in your current pneumo panel).
- Here is your antibiotic panel results:
  - Penicillin (nonmeningitis) – S
  - Penicillin (oral) – S
  - Erythromycin – R
  - SXT – S
  - Levofoxacin - S
- What antibiotics do you test?
- What do you report to the physician?
Today’s Review: 2012-2013 changes

- *Staphylococcus* species
- *Streptococcus pneumoniae*
- *β-Streptococcus* species
- *Enterococcus* species

CLSI Review

- Changes to CLSI documents are summarized in the front of each document.
- Information listed in boldface type is new or modified since the previous edition of M100 document.
- Recent breakpoint addition/revision dates are listed in the front of M100-S22.
- Go to CLSI website for up-to-date information.

CLSI

Watch for the 2013 M100 document!

Thank you for attending!