Interpretation of Urine Culture

• After 24 hours of incubation, the culture plates are evaluated for growth

• Remember! 60-80% of urine cultures received in the laboratory will be “No growth” or “growth of contaminants only”

Interpretation of Urine Culture

• Challenge! You must determine what growth (if any) is significant (potential pathogen) and what is contamination
  – Points to keep in mind:
  – Type of urine collection method used
  – Patient clinical history (if available)
  – Normal periurethral flora (contaminants)
  – Colony count guidelines

After 24 Hours of Incubation

• No growth on either plate
  – Reincubate plates for an additional 24 hours in case there is an organism that grows more slowly

• Visible growth on plate(s)
  – Evaluate the growth

Colony Count Interpretation

• If the calibrated loop used was 0.01 ml then each colony equals 100 cfu
  – Example:
    13 colonies seen x 
    100 = 1,300 cfu/ml

True or False: The majority of urine cultures will have clinically significant growth after 24 hours of incubation.
False! 60-80% of urine cultures received in the laboratory will be “No growth” or “growth of contaminants only”
Colony Count Interpretation

• If the calibrated loop used was 0.001 ml then each colony equals 1000 cfu
  – Example: 13 colonies seen x 1000 = 13,000 cfu/ml

Colony Count Interpretation

• If the number of colonies of one colony type is more than 100,000, then report out colony count as >100,000 cfu/ml
• Confluent growth of bacteria, covering most of the inoculated surface area of the plates can be read as >100,000 cfu/ml.

Colony Count Discrepancies

• When different plates have different colony counts:
  – MAC is used to estimate gram-negative growth only
  – If there is a large difference in colony counts between 2 plates, the larger count should be reported

What is the colony count if there are 65 colonies of one colony type on a BAP and the 0.001 calibrated loop was used?

65 colonies x 1000 = 65,000 cfu/ml

Colony Count Interpretation

• If there is no growth on the plate then report out:
  – Using 0.01 loop: <100 cfu/ml, No growth
  – Using 0.001 loop: <1000 cfu/ml, No growth

Colony Count Interpretation

• Colony count guidelines are used to aid in the interpretation of a urine culture
• An example of these guidelines are provided on the next slide
• Please check your clinical site procedure manual for variations
### Colony Count Guidelines

<table>
<thead>
<tr>
<th>Result</th>
<th>Specimen type / Clinical condition, if known</th>
<th>Workup</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;100 cfu/ml of a single potential pathogen, or for each of 2 potential pathogens</td>
<td>Clean catch midstream urine / cystoscopy, asymptomatic bacteriuria. OR catheterized urine</td>
<td>Complete – identification of the organism and appropriate susceptibility testing</td>
</tr>
<tr>
<td>&gt;107 cfu/ml of a single potential pathogen</td>
<td>Clean catch midstream urine / symptomatic males OR catheterized urine OR acute pyelonephritis syndrome</td>
<td>Complete – identification of the organism and appropriate susceptibility testing</td>
</tr>
<tr>
<td>&gt;3 organism types with no predominating organism</td>
<td>Clean catch midstream urine OR catheterized urine</td>
<td>None. Because of possible contamination, ask for another specimen</td>
</tr>
<tr>
<td>Either 2 or 3 organism types with predominating growth of one organism type and &gt;105 cfu/ml of the other organism types(s)</td>
<td>Clean catch midstream urine</td>
<td>Complete workup for the predominating organism(s); description of the other organism(s)</td>
</tr>
<tr>
<td>&gt;103 cfu/ml of any number of organism types (set up with a 0.001 and 0.01 ml calibrated loop)</td>
<td>Suprapubic aspirates, any other surgically obtained urines (including ileal conduits, cystoscopy specimens)</td>
<td>Complete – identification of organism and appropriate susceptibility testing</td>
</tr>
</tbody>
</table>

### General Considerations

- >100,000 cfu/ml is indicative of a UTI, except when the isolate is a contaminant
- 10,000 – 100,000 cfu/ml may indicate infection, especially if only one colony type is growing

### General Considerations

- <10,000 cfu/ml is not worked up when contaminants are present
- Persistence of the same organism on repeat urine cultures will increase the likelihood that it is a pathogen even if the colony counts are low
  - i.e. <10,000 cfu/ml

### Questions To Ask

- What media has growth?
  - Generally, all organisms will grow on the BAP and just gram-negative bacilli will grow on the MAC
  - If a CNA plate is used, in general only gram-positive organisms will grow on it (occasionally Proteus species will grow slightly on this plate)

### Questions To Ask

- How many colony types are growing?
  - If there is just one colony type, this indicates a potential pathogen, especially if the cc is high.
  - If there is more than one colony type growing, this could indicate a variety of things:
    - Contaminants
    - Contaminants and potential pathogens, or
    - Multiple pathogens
Remember!

• When there is growth of three or more different organisms, consider the specimen contaminated and work-ups are not done

Questions To Ask

• What is the colony count for each type of colony?
  – The number of colonies can aid in determining if the organism is just contamination (lower colony count) or a potential pathogen (higher colony count)

Questions To Ask

• Is the growth a potential pathogen or a contaminant?
  – Remember the “Points to keep in mind”:
    • Type of urine collection method used
    • Patient clinical history (if available) such as age, symptoms, antibiotic therapy
    • Normal periurethral flora (contaminants)
    • Colony count guidelines

Interpretation of Urine Culture

• Utilizing all of the information gathered enables the CLS to determine if the growth is significant.
  • A gram stain may be required to assist with determining if contaminant or potential pathogen

What questions must you ask when you evaluate a urine culture?

What media has growth?
How many colony types are growing?
What is the colony count for each colony type?
Is the growth a potential pathogen or contamination?

What are the “Points to keep in mind” when evaluating a urine culture?

• Type of urine collection method used.
• Patient clinical history (if available) such as age, symptoms, and antibiotic therapy.
• Normal periurethral flora (contaminants).
• Colony count guidelines.
Workup of Significant Growth

• Any colony type that is suspicious of being a potential pathogen needs to be identified
• Utilizing the routine procedures for identification must be followed
  – Based on your clinical site procedures
• Rapid tests such as catalase, oxidase, and spot indole can be performed

Workup of Significant Growth

• In addition, automated systems can be used to identify the organism
  – i.e. MicroScan and Vitek
• Once organism is identified, again ask:
  – “Is it still considered a pathogen or a contaminant?”

What steps must be taken when a colony type is considered a potential pathogen in a urine culture?

The organism must be identified using standard identification schemes. Then again ask if this organism is a potential pathogen. If yes, perform appropriate susceptibility testing.

Workup of Significant Growth

• If organism is considered a pathogen, then it is necessary to determine if susceptibility testing is required
  – Based on your clinical site procedures

Workup of Significant Growth

• After identification and susceptibility tests have been set up, all culture plates are reincubated and held for an additional 24 hours
  – This is to determine if there is a slower-growing organism present

Workup of Significant Growth

• Culture plates are reevaluated at 48 hours and any new and/or additional information is worked up and reported
For how long are urine culture media plates kept for evaluation?

48 hours
72 hours for ABAP

Documentation of Workup

• Date of observation
• Number of different colony types and on what media they are growing
• Colony counts
• Characteristics of each colony type (gram stain, colony morphology)

Documentation of Workup

• What rapid biochemical tests are performed
• What conventional biochemical tests and susceptibilities are setup
• Name of probable organism(s)
• Clinical significance

Reporting Results

• If culture has no growth, report:
  – The colony count as:
    • <1000 cfu/ml (if 0.001 loop used)
    • <100 cfu/ml (if 0.01 loop used)
  – And "No growth at 24 hours"
  • Or "No growth at 48 hours"

Reporting Results

• For cultures with growth, report:
  – For pathogens:
    • The colony count
    • Organism identification
    • Susceptibility test results (if performed)

Reporting Results

• For cultures with growth, report:
  – For contaminants:
    • The colony count
    • A general descriptor for identification
      – i.e.: coag-negative Staphylococcus not saprophyticus, diphtheroids, multiple contaminants
How would a urine culture be reported that has *E. coli* (>100,000 cfu/ml) and *Staph. epi.* (9,000 cfu/ml) growing?

*E. coli* would be considered a pathogen so report colony count, identification and susceptibility results. *Staph epi* is a contaminant so report colony count and identification only.

What additional information would you need to know to determine if the following is significant or contamination on a urine culture?

9,000 cfu/ml of *E. coli*

Specimen collection method, patient history (if available), and any previous urine culture results.

When a urine culture exhibits a low colony count of multiple organisms such as *E. coli*, coag-neg Staph. and diphtheroids, should this growth be considered as contamination or potential pathogens?

Contamination – multiple organisms generally indicate contamination as urine was collected

Should this growth be considered significant or contamination?

Although the colony count is >100,000, this growth is considered contamination because more than three colony types are present. In addition, the growth includes colonies that are potential contaminants. Also, there is no predominating organism present.

Review

- "No growth" versus "Growth"
- Colony count – Interpretation and guidelines
- Questions to ask
- Points to keep in mind
- Workup significant growth
- Documentation and reporting results

References: