



Urine cultures:

Work Flow



# Collection

## COLLECTION OF URINE SPECIMENS



- Urine collected in sterile specimen container must be processed within 2 hours, or refrigerated and processed within 24 hours
- Urine collected in sterile specimen container with borate preservative should be processed within 24 hours (no refrigeration required)

Boric acid



Voided urine specimens are easily contaminated with periurethral and perineal flora.



# Approach to Laboratory Workup

- **Although urinary tract infections are caused by many species of microorganisms, the majority of infections are caused by relatively few species.**
- **Many of these organisms can be found as part of the commensal urethral and fecal flora.**
- **Influencing factors on etiology of UTI:**
  - **Age**
  - **underlying conditions**
  - **structural abnormalities**
  - **instrumentation**



# Usual Urinary Pathogens

- **Gram negative bacilli are the most common organisms responsible for urinary tract infections;**
  - ***E. coli***
  - ***Proteus mirabilis***
  - ***Klebsiella pneumoniae***
  - ***Pseudomonas aeruginosa***



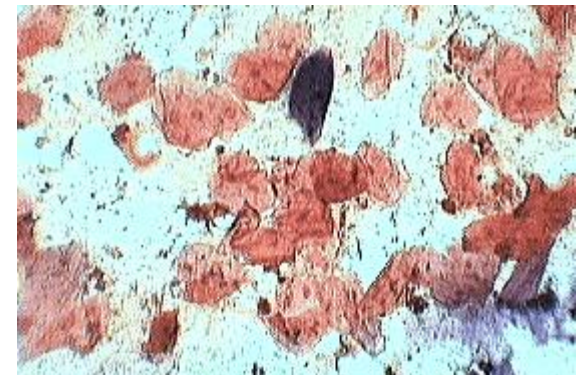
# Usual Urinary Pathogens

- **Gram positive cocci (most frequent)**
  - *Enterococcus* spp. (up to 10% of UTI)
  - *Staphylococcus saprophyticus*
    - Most common CNS species known to cause UTI.
    - In adolescents and young adult women who experience their first urinary tract infection
      - In up to 11 % of UTI in college aged women.
  - **Group B *Streptococcus***
  - *S. aureus*: Rarely a causative agent of UTI and often represents infection in association with *S. aureus* bacteremia.



# Gram staining (if performing...)

- Each bacterium seen per field corresponds to a count of  $\sim 10^5$  CFU/mL of specimen.
- The presence of many squamous epithelial cells and multiple bacterial morphotypes suggests contamination.





# UNACCEPTABLE PROCEDURES

- **Do not culture:**
  - Specimens delayed longer than 2 hours without refrigeration or preservative
  - Foley catheter tips
  - Bag urine from a catheterized patient
  - Urine from a leaky container
  
- **Consider specimens obtained with the same collection method within 24 hours to be duplicate specimens.**
  - Reculturing for proof of bacteriologic cure is not recommended.
  - If symptoms do not respond by 48 hours, or if symptoms recur, new urine for culture should be obtained.



# UNACCEPTABLE PROCEDURES

- Discourage submission of voided or bagged specimens from infants. A catheterized specimen should be collected.
- Except for suprapubic bladder aspirates, do not culture specimens for anaerobic culture.
- It is not necessary to inoculate fungal culture media; yeast will grow on standard media
  - Hold the cultures for at least two overnight incubations
  - Fungal Yeast culture: CHROMagar Candida







# Reporting Results

- Low-counts of *Enterobacteriaceae*, even in midstream urine samples, may indicate:
  - ‘urethral syndrome’ - a group of symptoms (as urinary frequency and urgency, pain and discomfort in the lower abdominal region, and dysuria) that resemble those of a urinary tract infection but for which no significant bacteriuria exists
  - early phase of infection

Always a dilemma...

- Avoid reporting results as “commensal flora”.
- Avoid reporting “no growth” or “negative”.  
Instead use ‘< 1000 cfu/mL’, ‘< 10,000 cfu/mL’



# REPORTING RESULTS

- **Regardless of the algorithm used to guide interpretation, cultures should be reported with interpretive guidelines to help the provider assess the clinical relevance of results.**
- **2 approaches;**
  - **Positive cultures should be reported with the colony count and either minimal morphologic or definitive identification of each potential pathogen isolated.**
  - OR**
  - **Send out a ‘mixed culture’ comment**
- **Perform AST if appropriate**



# What to consider?

- Quantity – What is significant ?
  - $\geq 10^5$  cfu/ml
    - Used most commonly
  - $\geq 10^4$  cfu/ml
    - Used by some
- Pure culture ?
  - Required by some laboratories in order to perform ID/AST
  - Some will perform ID/AST on up to 2 potential pathogens
- Type of urine collection ?
  - Clean cath, mid stream, Foley catheter
  - Straight/single catheter, suprapubic aspiration, bladder, etc.



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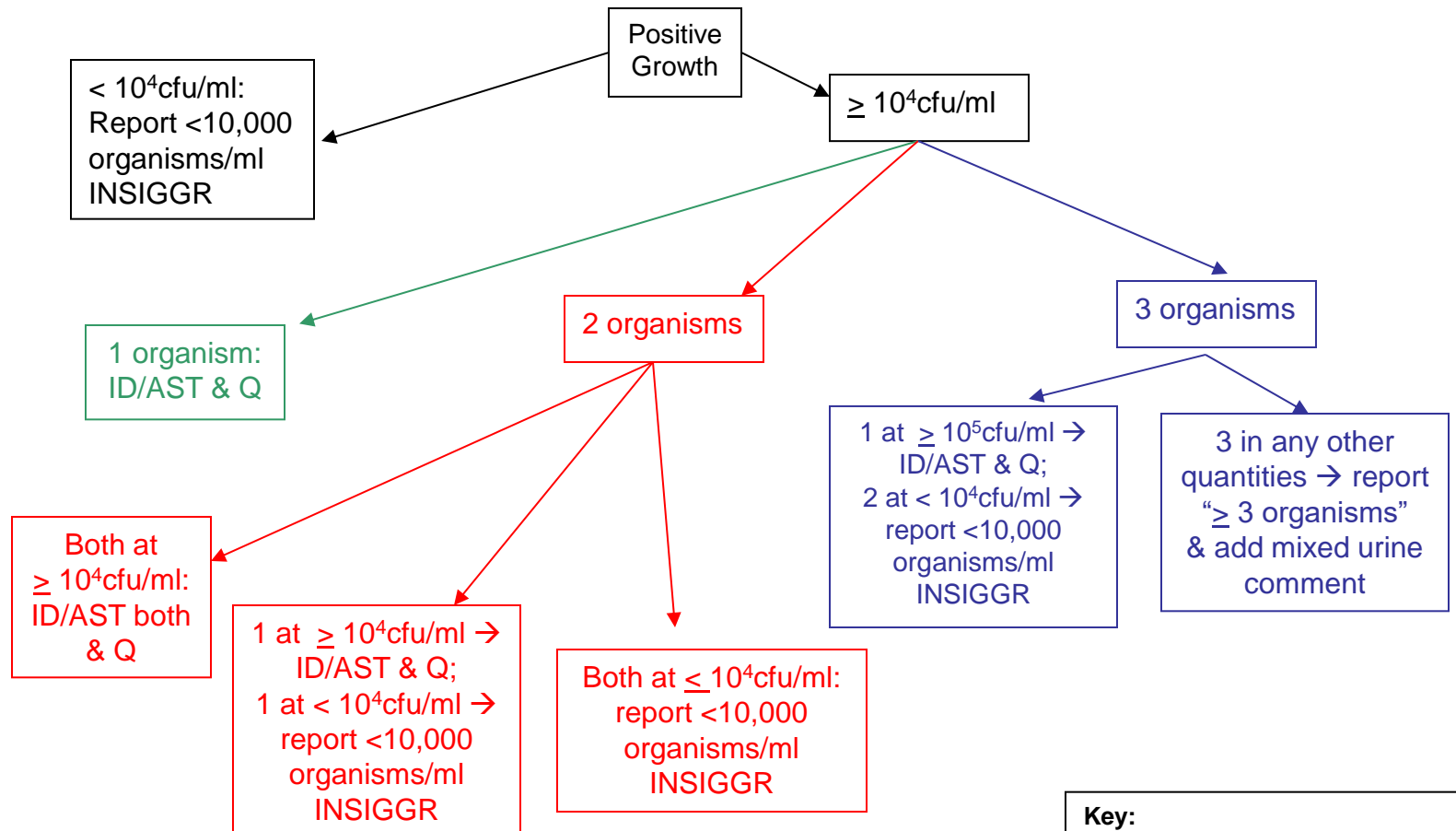
# Non-invasively collected Urine: (clean catch, Foley cath, urostomy bag)

- Incubate a minimum of 24 hours (16 hours before reading)
- If growth, then if...
  - < 10,000 = < 10,000 insignificant growth (insiggr)
  - 1 organism @  $\geq 10,000$  ID/AST\*
  - 2 organisms
    - Both @  $\geq 10,000$  (ID/AST\* both)
    - 1 @  $\geq 10,000$  (ID/AST\*) & 1 @ < 10,000 insiggr
    - Each @ < 10,000 insiggr
  - 3 organisms
    - 1 @  $\geq 100,000$  (ID/AST\*) & 2 @ < 10,000 insiggr
    - 3 in any other quantities: Mixed urine culture comment

\* AST if appropriate for organism

# Urine specimens – noninvasively collected (plate with 0.001 loop)

- Clean catch
- Midstream
- Foley catheter
- Urostomy



**Key:**  
ID = Identification  
AST = antimicrobial susceptibility testing  
Q = Quantitate  
cfu = colony forming units  
INSIGGR = insignificant growth





# Invasively collected Urine: (single/straight cath, perQ asp., etc.)

- Hold a minimum of 2 overnight incubations
- If growth, then...
  - < 1000 = < 1000 insiggr
  - 1 organism @  $\geq 1000$  ID/AST\*
  - 2 organisms
    - Both @  $\geq 1000$  (ID/AST\* both)
    - 1 @  $\geq 1000$  (ID/AST\*) & 1 @ < 1000 insiggr
    - Each @ < 1000 insiggr
  - 3 organisms
    - 1 @  $\geq 10,000$  (ID/AST\*) & 2 @ < 1000 insiggr
    - 3 in any other quantities: Mixed urine culture comment

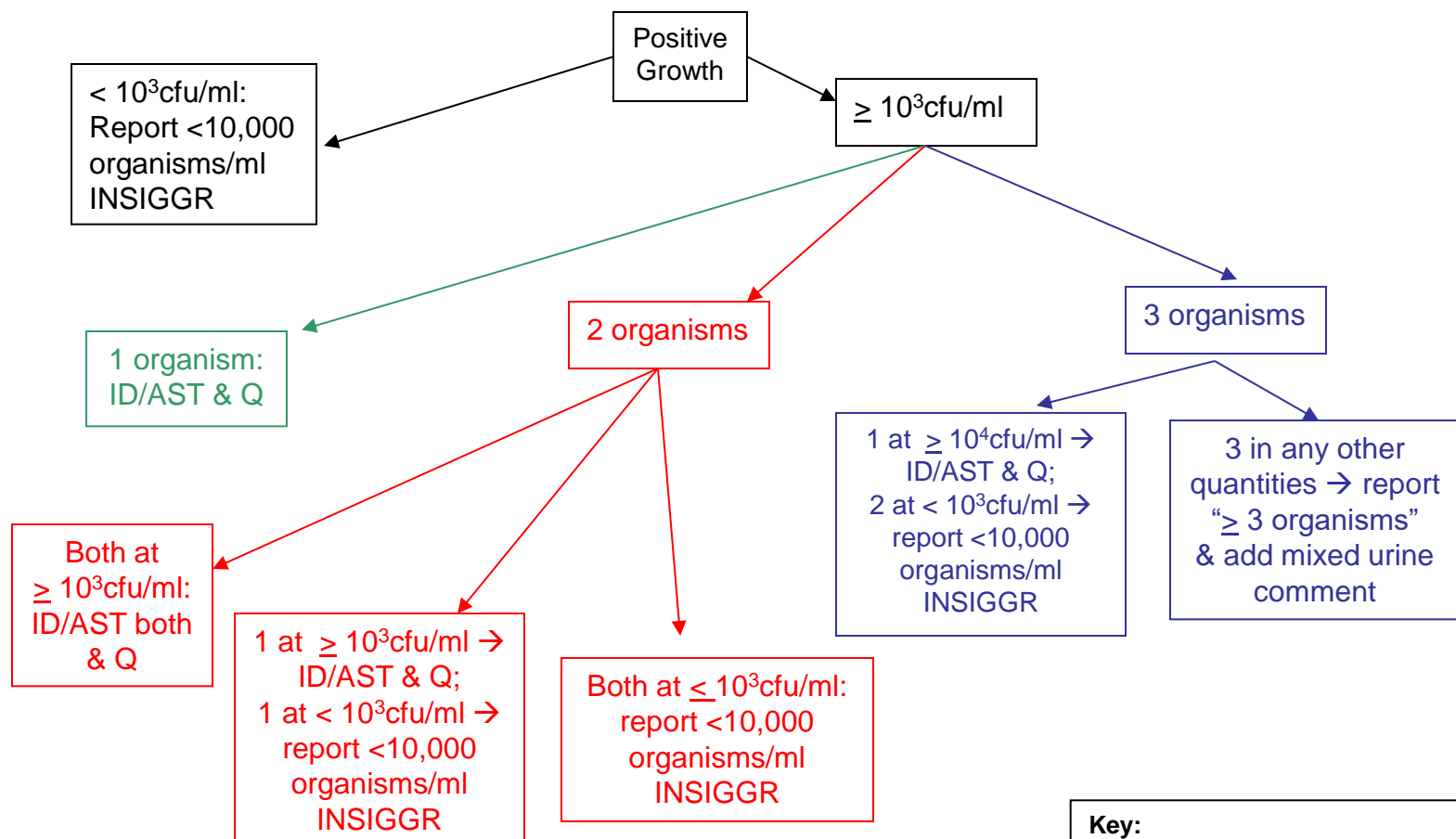
**insiggr = Insignificant growth**

**\* AST if appropriate for organism**



# Urine specimens – invasively collected (plate with 0.01 or 0.001 loop)

- Single/straight catheter
- Percutaneous (suprapubic) aspiration
- Bladder urine
- Nephrostomy tube



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# Reference

ASM's Cumitech 2C:

“Laboratory Diagnosis of  
Urinary Tract Infections”

2009

