URINARY TRACT INFECTIONS

INTRODUCTION

- UTIs are common, especially among women
- Incidence of UTI increases in old age.
- UTIs infection usually occur by ascending route (urethra to bladder), less common by hematogenous spread
- UTIs occur in two general settings: community-acquired and hospital (nosocomially) acquired

- Uncomplicated urinary tract infection: Infection in a structurally and neurologically normal urinary tract

- Complicated urinary tract infection: Infection in a urinary tract with functional or structural abnormalities

Common Risk Factors for UTI: **Women**

- Urinary tract obstruction (including calculi)
- Catheterization
- Pregnancy
- Urologic instrumentation or surgery
- Diabetes mellitus
- Aged/Postmenopausal

Common Risk Factors for UTI: **Men**

- Urinary tract obstruction (including calculi)
- Catheterization
- Prostatic enlargement
- Urologic instrumentation or surgery
- Diabetes mellitus
- Lack of circumcision (children and young adults)

- For complicated UTIs, the order of prevalence for causative agents:
  - UPEC
  - *Enterococcus* spp.
  - *K. pneumoniae*
  - *Candida* spp.
  - *S. aureus*
  - *P. mirabilis*
  - *P. aeruginosa*
  - GBS

- For the agents involved in uncomplicated UTIs
  - UPEC
  - *Klebsiella pneumoniae*
  - *Staphylococcus saprophyticus*
  - *Enterococcus faecalis*
  - GBS
  - *Proteus mirabilis*
  - *Pseudomonas aeruginosas*
  - *Staphylococcus aureus*
  - *Candida* spp

- Uncomplicated urinary tract infections (UTIs) begin when

1. uropathogens that reside in the gut contaminate the periurethral area colonize the urethra
2. Migration to the bladder and expression of pili and adhesins results in colonization and invasion
3. Host inflammatory responses:neutrophil infiltration and evasion of evade the immune system
4. Bacteria undergo multiplication and biofilm formation
5. These bacteria produce toxins and proteases that induce host cell damage
6. Release of essential nutrients that promote bacterial survival and ascension to the kidneys
7. Kidney colonization results in bacterial toxin production and host tissue damage
8. If left untreated, UTIs can ultimately progress to bacteraemia if the pathogen crosses the tubular epithelial barrier in the kidneys

- Uropathogens that cause complicated UTIs follow the same initial steps as those described for uncomplicated infections (steps 1 and 2)
- However the bladder must be compromised- catheterization
  - fibrinogen accumulates on the catheter-attachment
  - Infection induces neutrophil infiltration
  - bacteria multiply
  - form biofilms
  - promote epithelial damage and can seed infection of the kidneys
  - toxin production induces tissue damage
  - If left untreated- bacteraemia

Asymptomatic bacteriuria:

- Significant bacteriuria without clinical symptoms or other abnormal findings.
- Up to 40% of elderly men and women have asymptomatic bacteriuria
- Screening for asymptomatic bacteriuria can be done in some individuals/patients

- Screening for asymptomatic bacteriuria in adults has little value except for two situations:
  - pregnancy (because of the high risk of acute pyelonephritis with its accompanying risk of fetal complications)
  - prior to urologic surgery (because of the risk of postoperative sepsis).

LABORATORY DIAGNOSIS OF UTIS

Sample collection

- sterile, dry, wide-necked, leakproof container, well labelled
- 10–20 ml specimen
- "mid stream" urine sample

Macroscopic examination

Describe the appearance of the specimen

- Colour of specimen
- Whether it is clear or cloudy (turbid)

Direct microscopy

wet prep is examined to detect:

- Wet film to detect :
  - . Pus cells, red cells, yeasts, casts
  - . Bacteria, *T.vaginalis, S. haematobium*
- Significant pyuria, i.e. WBCs in excess of 10cells/µl (10^6/L) of urine

Urine biochemistry

Biochemical tests which are helpful in investigating UTI include:

- Protein-indicative of bacterial UTI
- Nitrite-*E. coli*, *Proteus* species, and *Klebsiella* species,(able to reduce nitrates)-Greiss test or a nitrite reagent strip test
- Leukocyte esterase-indirect test for pus cells

Urine culture

Not necessary when microscopically and biochemically normal, except when screening for asymptomatic bacteriuria in pregnancy.

Viable bacterial count :

- A measured volume (calibrated loop 0.002 ml) of urine is spread on surface of a solid medium

- Incubation of the solid medium at 37°C for 18-24 hours

- Enumerate the number of colonies

Culture on CLED

Appearance of some urinary pathogens on CLED agar

- *E. coli*: Yellow (lactose-fermenting) opaque colonies often with slightly deeper coloured centre.
- *Klebsiella species*: Large mucoid yellow or yellow-white colonies.
- *Proteus species*: Transluscent blue-grey colonies.
- *P. aeruginosa*: Green colonies with rough periphery (characteristic colour).
- *E. faecalis*: Small yellow colonies.
- *S. aureus*: Deep yellow colonies of uniform colour.
- *S. saprophyticus* and other coagulase negative staphylococci Yellow to white colonies.

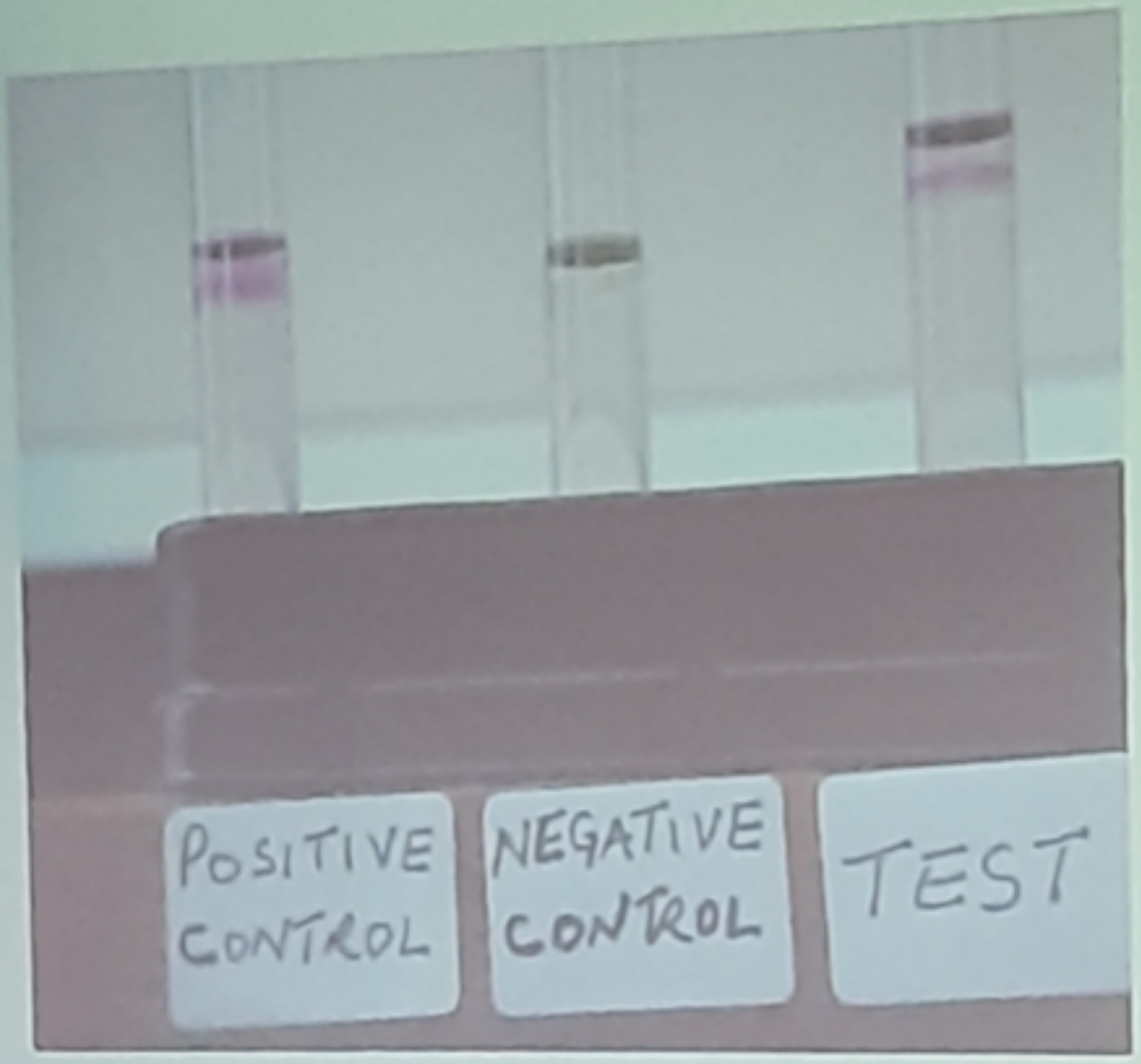
Identification tests

- Catalase test for gram + orgs
  - Positive for staphylococcus
  - Negative for streptococcus
- Tripple iron sugar for gram negative rods

  Yellow/yellow(Lactose fermenters)
  - Follow up with IMVC

Antimicrobial susceptibility testing

- Perform susceptibility testing on urines with significant bacteriuria, particularly from patients with a history of recurring UTI.
- Cultures from patients with a primary uncomplicated UTI may not require a susceptibility test.


POSITIVE CONTROL
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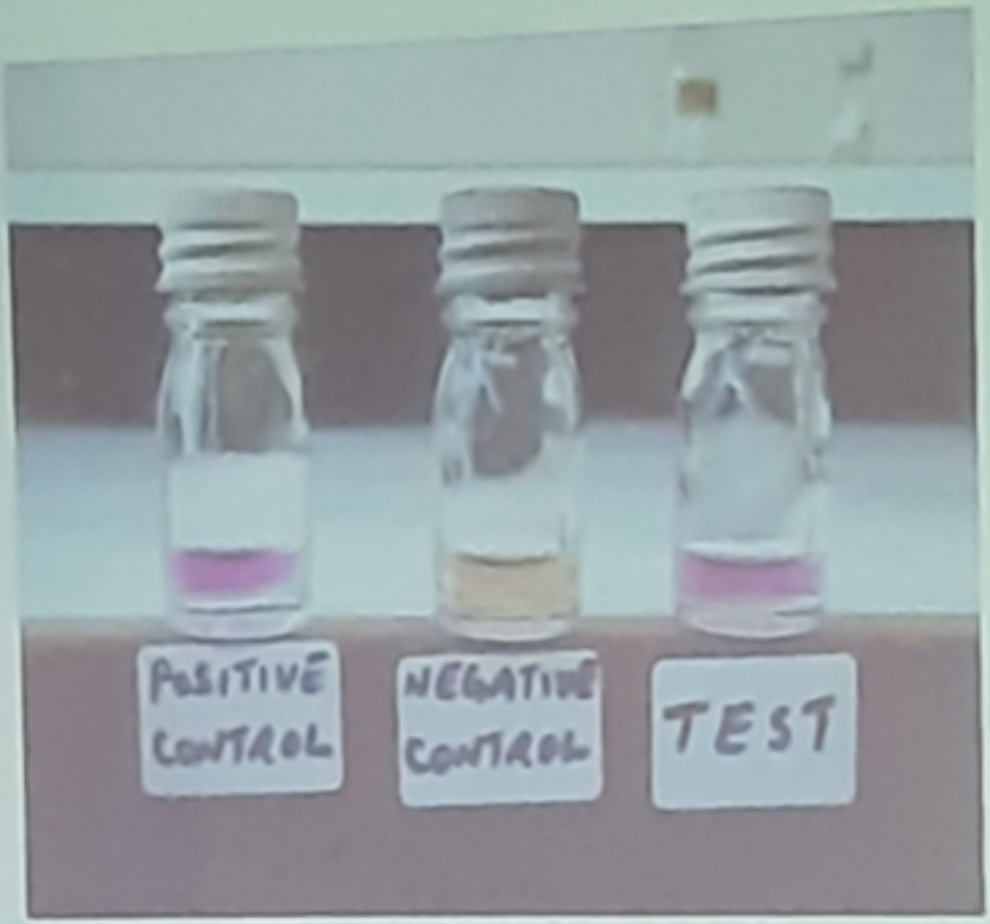
TEST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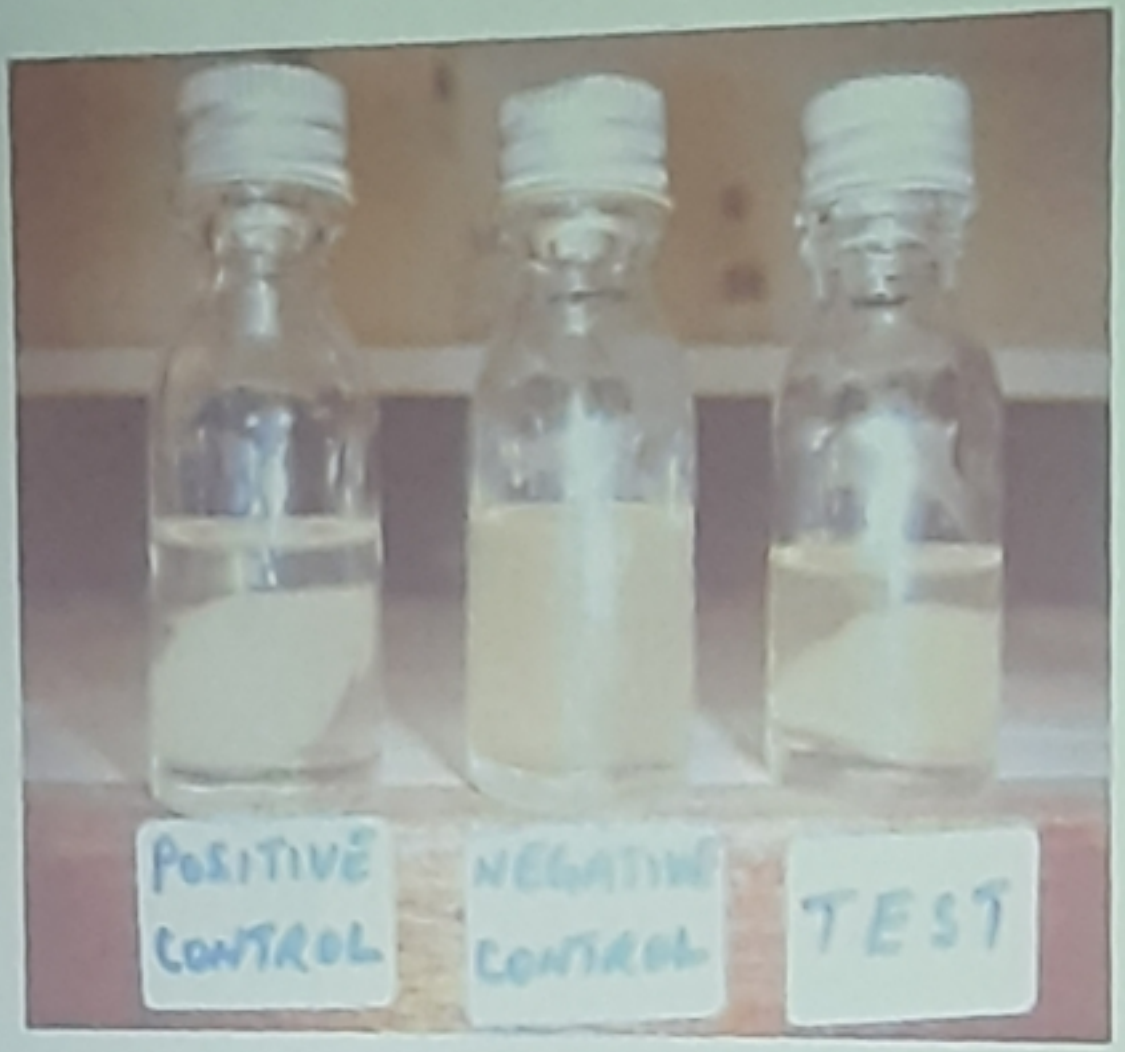
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Treatment in UTIs

BASED ON ISOLATE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OBTAINED.