# URINARY TRACT INFECTIONS
# 3rd Y Med Students

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# Urinary Tract Infections-1

- Normal urine is sterile in urinary bladder.. It contains fluids, salts, and waste products, but should be free of any microorganism.
- First portion of urine might be contaminated with few resident microorganisms during it passages through urethra .. More in women than Men.
- Urinary tract infection **(UTI)** occurs often when bacteria from the intestinal tract, contaminate the opening urethra and begin to ascend & multiply causing inflammation of any part of urinary tract System.
- **UTI** is defined as a significant **bacteriuria** associated with presence of signs & symptoms or **asymptomatic**

# Urinary Tract Infections-2

- **Dysuria** painful urination including burning, frequent urination , fever, abdominal pain ..Due to presence of **Pus cells & Bacteria** in urine , Urinary Stones, Sexually Transmitted infection.
- **Sterial Pyuria:** Presence of pus cells in urine.
- **Cystitis**: Inflammation of the lower urinary tract urethra and Bladder mucosa.. mostly by bacteria. This infection is not invasive.. It is Frequently associated with voiding frequent small volume urine, can be **mild/severe** associated with high fever, burning, abdominal pain, cloudy or bloody urine. Rarely can be associated with **septicemia**.. Young children & Immunosuppressed patients.
- **Hemorrhagic cystitis** is characterized by presence large numbers of visible RBCs in the urine.

# Urinary Tract Infections-3

- **Pyelonephritis:** Infection usually results from ascending of the bacteria to the Ureter & Kidney from the urinary bladder caused by a bacterium..rarely Candida/ virus.. High fever.. may result in blood sepsis & kidney failure.
- It can also arise by hematogenous spread (sepsis, pneumonia). In contrast to cystitis.. Pyelonephritis is an invasive disease.. With severe consequences.
- **Blood Sepsis** may complicate UTI.. Common in children & women, following surgery, compromised patients.. Infection of upper part of UT

# Urinary Tract Infections-4

- **UTIs** caused by aerobic bacteria spp. of fecal origin.. 90% of acute community UTIs .. Developed in patients with normal anatomic structure and function caused by certain strains of *E. coli*
- Coagulase-negative & positive ve *Staphylococcus* caused about 10 %.. other G-ve Klebsilla-Enterobacter group, Proteus or G+ve Enterococci fecalis & others (5-10%).
- Hospitalized patients acquired often UT infection with multidrug resistance G-ve bacteria due to presence MDR bacteria in their intestine & Hospital environment & following using Foleys chatter.. Nosocomail infection 5-15% .
- Common: *P. aeruginosa, Proteus spp., Kelbsiella-Enterobacter group Enterococcus* spp.

# Urinary Tract Infections-5

- **UTI's**.. rank second to respiratory infections in general incidence. The majority of cases seen in outpatients clinics among Females (F/M ratio 30:1).
- 90% of all married women have at least one episode of a UTI at some time during their productive years.
- **Pregnancy** & women sexual activity increase UTIs 10 times..Up to 20 % of young women with acute cystitis develop Recurrent UTI's.
- Males develop increasing UTIs after ≥ 50s. mostly due to prostate gland hypertrophy..underlying diseases, catheterization, diabetes mellitus, Immunosuppressed patients
- In children congenital urinary tract abnormalities.
- kidney stones can injury urethra or form a blockage & causing UTI.

# Lab **Diagnosis-1**

- Routine Microscopic Analysis:

  - Clean-catch **Midstream Urine** should be collected.. Early morning & examined within one hour of collection or refrigerated up to ≤ 24h.

  - Symptomatic UTI**..** Acute Infection/ Significant Bacteriuria: 100,000 colony-forming units ($10^5$CFU/ml) & Numerous WBCs ( ≥ 10 WBSc /HPF)

  - **Hematuria**: Few RBCs in urine of women is not significant.. But in men is Significant .. should be investigated for other diseases.

  - Presence of few Bacteria /Yeast cells.. 10-50000 Cells/ml is part urethral normal flora..**Not significant.**

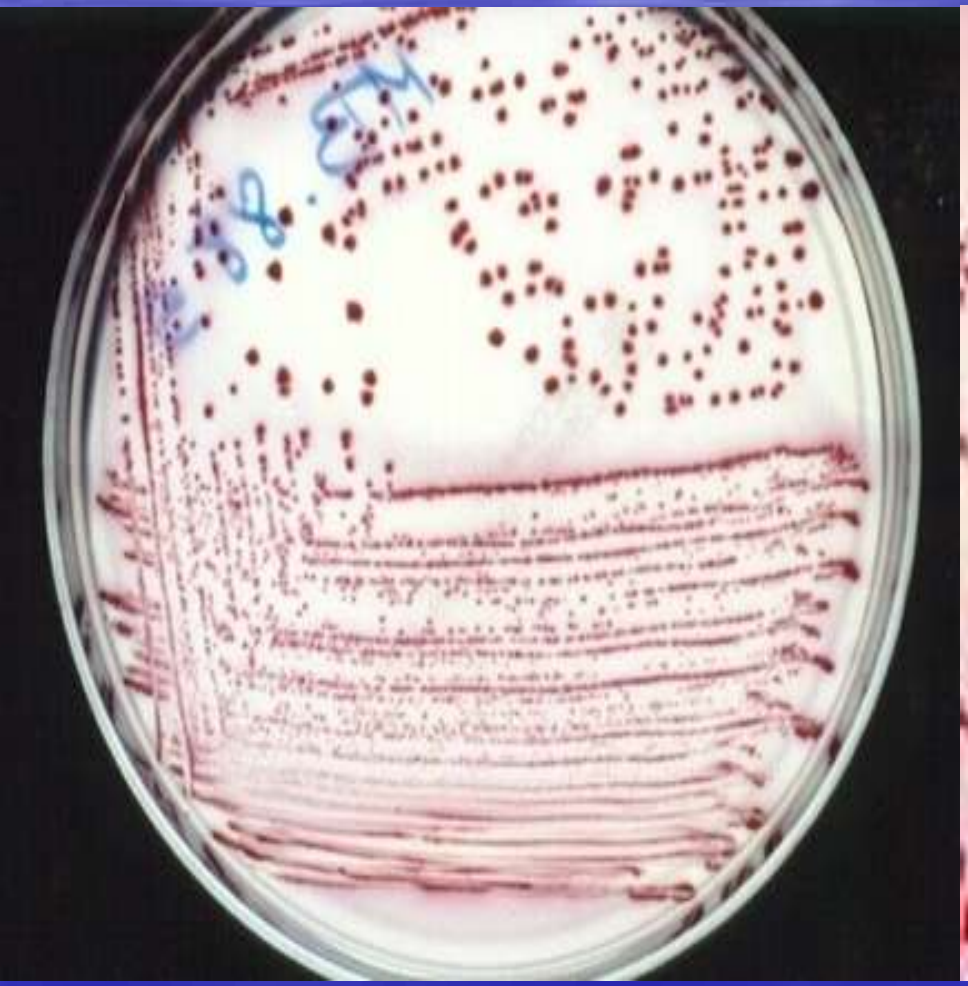
  - **Other important factors**: Color, Protein, Sugar, pH (5.5 to 6.5), Casts, Specific gravity etc.

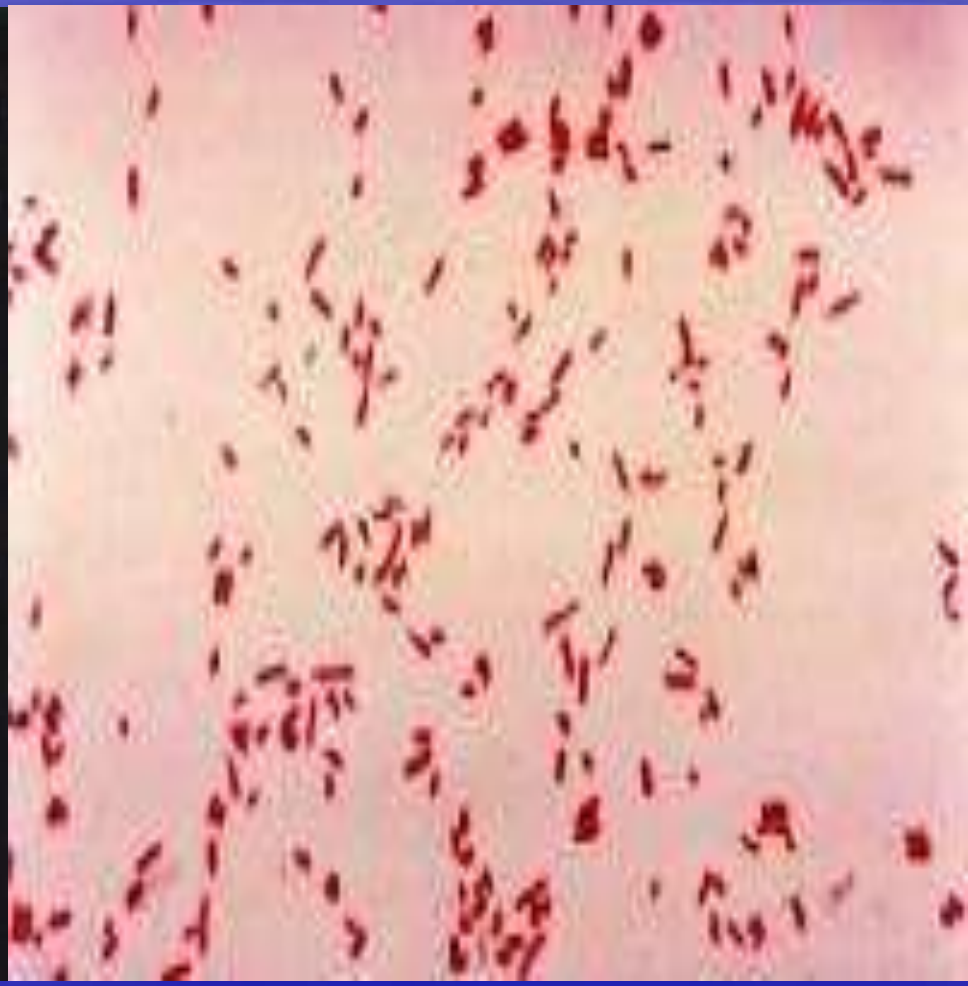
# Lab **Diagnosis-2**

- Asymptomatic /Chronic Infection: 10.000-100,000 CFU/ ml of midstream urine..Few pus cells.. 99% Pure Growth of one facultative anaerobic bacteria species .
- Presence 20.000 CFU/ ml or less with absence WBCs.. Mostly not significant.
- Mixed Bacterial Cultures are mostly contamination except in case obstruction in UT/malignancy
- Suprapubic Urine .. Any pure bacterial count in Infants & Young children is significant
- Fresh urine samples should be cultured on Blood & MacConkey agar for recovery of both Gram+ve and Gram-ve & Yeast,35-37C Incubation ..24-48 Hrs.

# E. coli – Lactose Fermenter

## Gram-stain & Culture on MacConkey agar





# Antimicrobial Treatment -1

- UTI clinical manifestations , previous history of infection, antibiotic susceptibility should quid the initial step Antimicrobial Therapy.
- Community acquired infection /Outpatients
  - A febrile patients experiencing first time uncomplicated symptomatic.. Acute cystitis is usually treated empirically for three days..
  - **First line:** Augumentin, Nitrofurantoin, Cotrimoxazole , Nalidix acid.
  - **Second line**: Fluoroquinolones..Norfloxacin/ Ciprofloxacin, 2nd-generation Cephalosporins ..Cefrouxime .
  - Antibiotic prophylaxis against UTI should be given only in in selected clinical cases.

# Antimicrobial Treatment -2

-Recurrence of UTI's within 2-3 months require performing urine culture and antimicrobial susceptibility test.. Often infection associated with R- bacteria strains.

- Hospital acquired UTI's is often associated MDR bacteria.. require culture and susceptibility test.

- **Pyelonephritis** is more serious & difficult to cure..may be associated septicemia.. followed reoccurrence UTI due to relapse (treatment failure) or re-infection, mostly with the same bacteria spp.
- **Serious UTI :** Patients experiencing high fever, shaking chills or abdominal pain with symptoms of lower UTI, should be hospitalized and treated with intravenous drugs.

# Treatment & Prevention

- A large number of pregnant women develop asymptomatic bacteriuria.
- Up to 30% with asymptomatic bacteriuria will develop acute pyelonephritis if not treated.
- Treatment of asymptomatic bacteriuria in pregnant women decreases the risk of pyelonephritis, preterm birth & baby low birth weight.
- Urine samples should be obtained periodically from pregnant women to determine if they have bacteriuria.
- Asymptomatic bacteriuria in infants and Jung children might be observed by crying, abdominal pain or unexplained fever.