

320 MBIO

Microbial Diagnosis

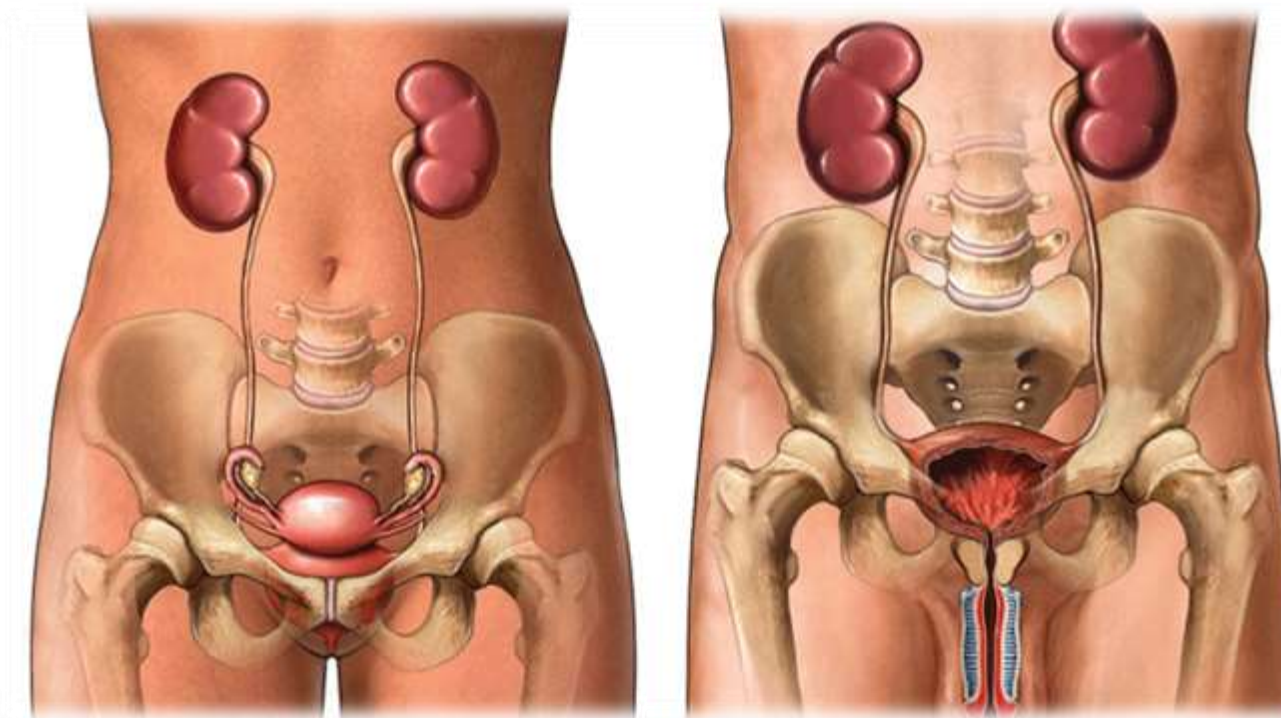
Lab 8

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Pathogens of the Urinary tract

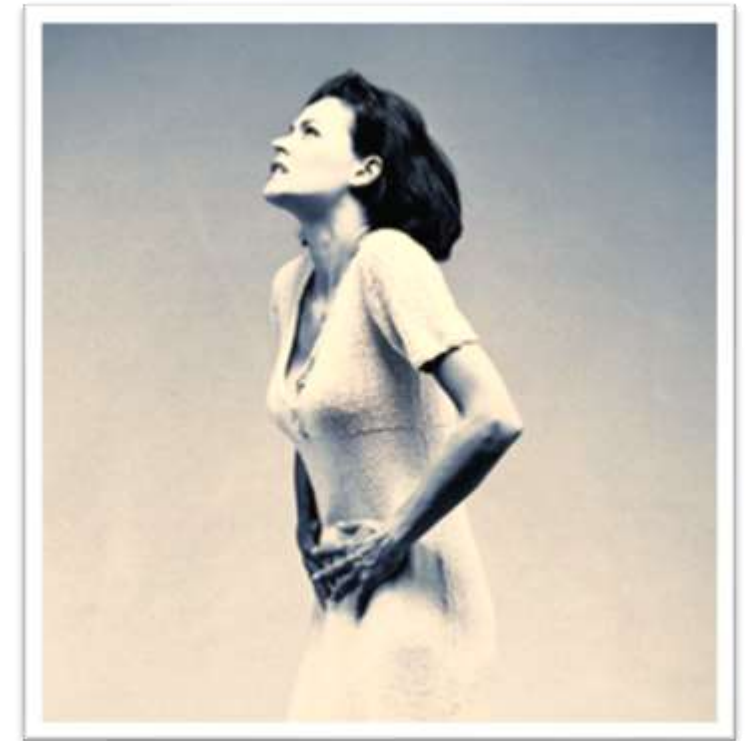


- The urinary system is composed of organs that regulate the chemical composition and volume of the blood and as a result excrete mostly nitrogenous waste products and water.
- Since it provides an opening to the outside environment contacts it allows other microorganisms to occupied the urinary system.
- The urinary system are moist and compared to skin, more supportive of bacterial growth.

- Normal urine is sterile, but it may become contaminated with microbiota of the skin near the end of its passage through the urethra.
- Thus, when we collected urine directly from the urinary bladder has fewer microbial contaminants than voided urine.

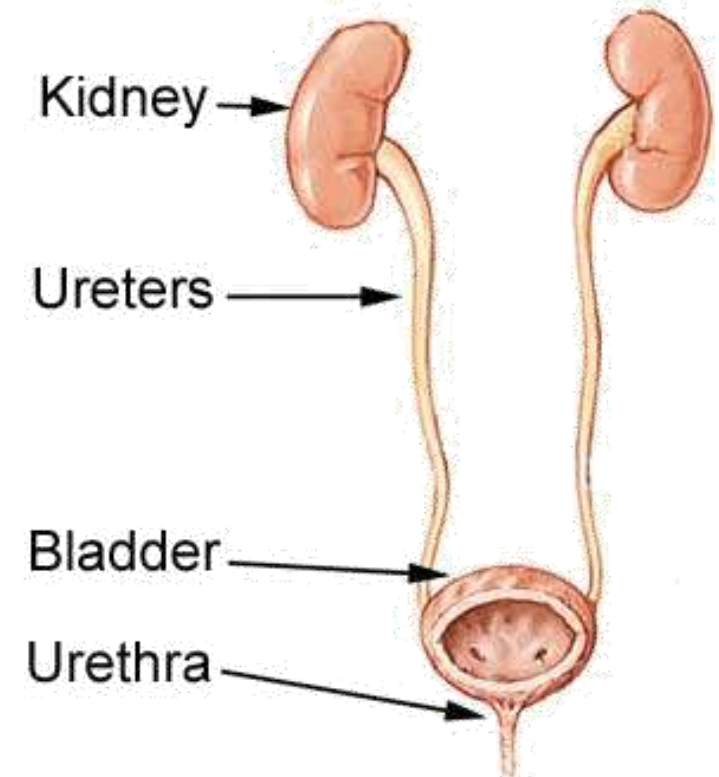


- The resident flora of the system are those microorganisms that live in close proximity to the urethra. Sometimes these organisms, especially the fecal bacteria, ascend the urinary tract and cause infection.



❖ What is the urinary tract infection UTI ?

- An infection of one or more structures in the urinary system, Most UTIs are caused by gram-negative bacteria.



- More than **90%** of UTIs are caused by normal intestinal tract bacteria.
- A UTI (Urinary Tract Infection) is primarily one of two types:

1 Cystitis : Infection of the bladder

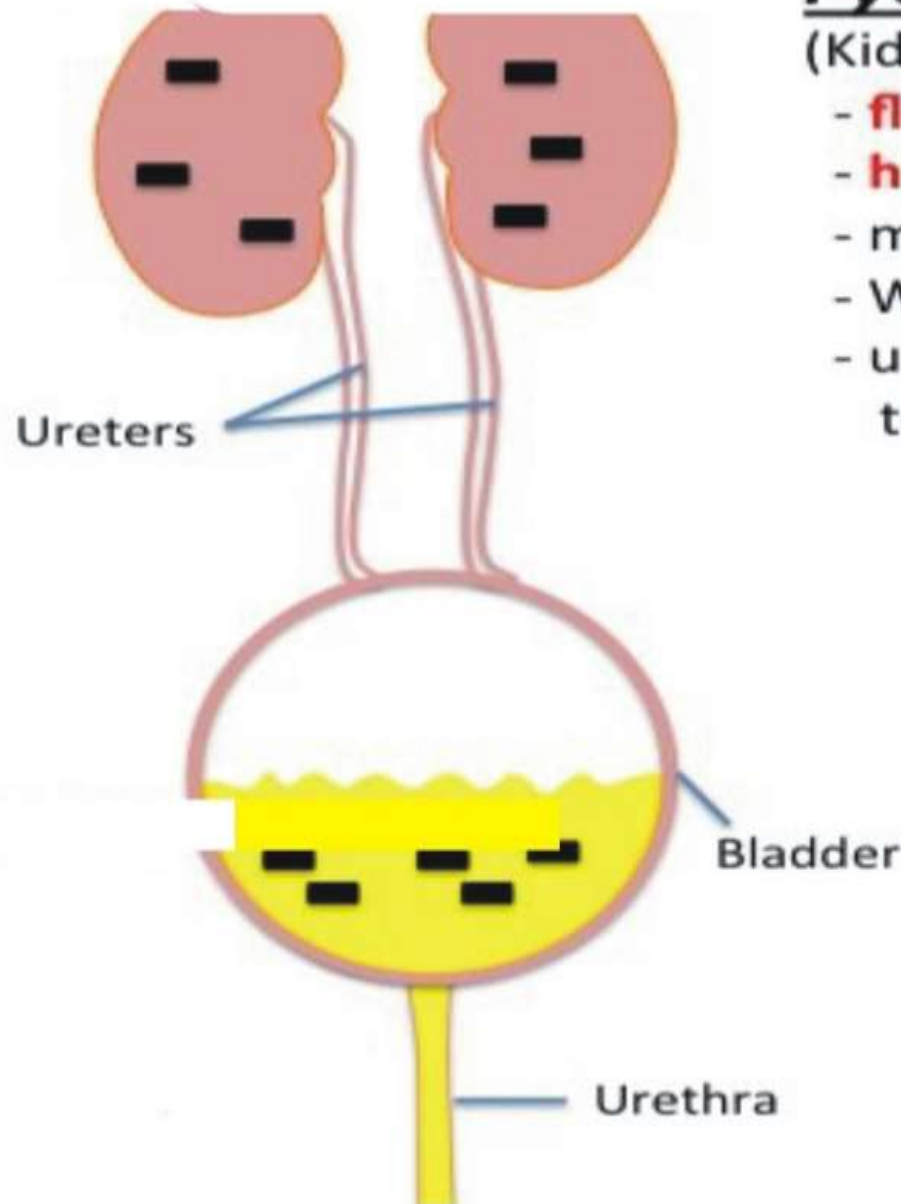
2 Pyelonephritis : Infection of the kidneys

❖ Over view of UTI :

- Most common infectious disease
- Most Numerous specimens are received in the Laboratory, 30 to 40 % of specimens received in Microbiology laboratories, to Identify the Infection.
- Diagnostic information is important for the clinician.
- Appropriate clinical information gives many clues for better diagnostic evaluations.
- Specimen collection is the primary objective in getting an ideal sample.

❖ Symptoms :

- The condition is more common in **women** than in **men**.
- UTI may be asymptomatic but is usually characterized by:
 - Urinary frequency.
 - Burning pain with voiding.
 - If the infection is severe, visible blood and pus in the urine.
 - Fever and back pain often accompany kidney infections.



Pyelonephritis

(Kidney infection)

- **flank pain**
- **high fever**
- malaise
- WBCs & bacteria in urine
- urinary symptoms similar to cystitis

Cystitis

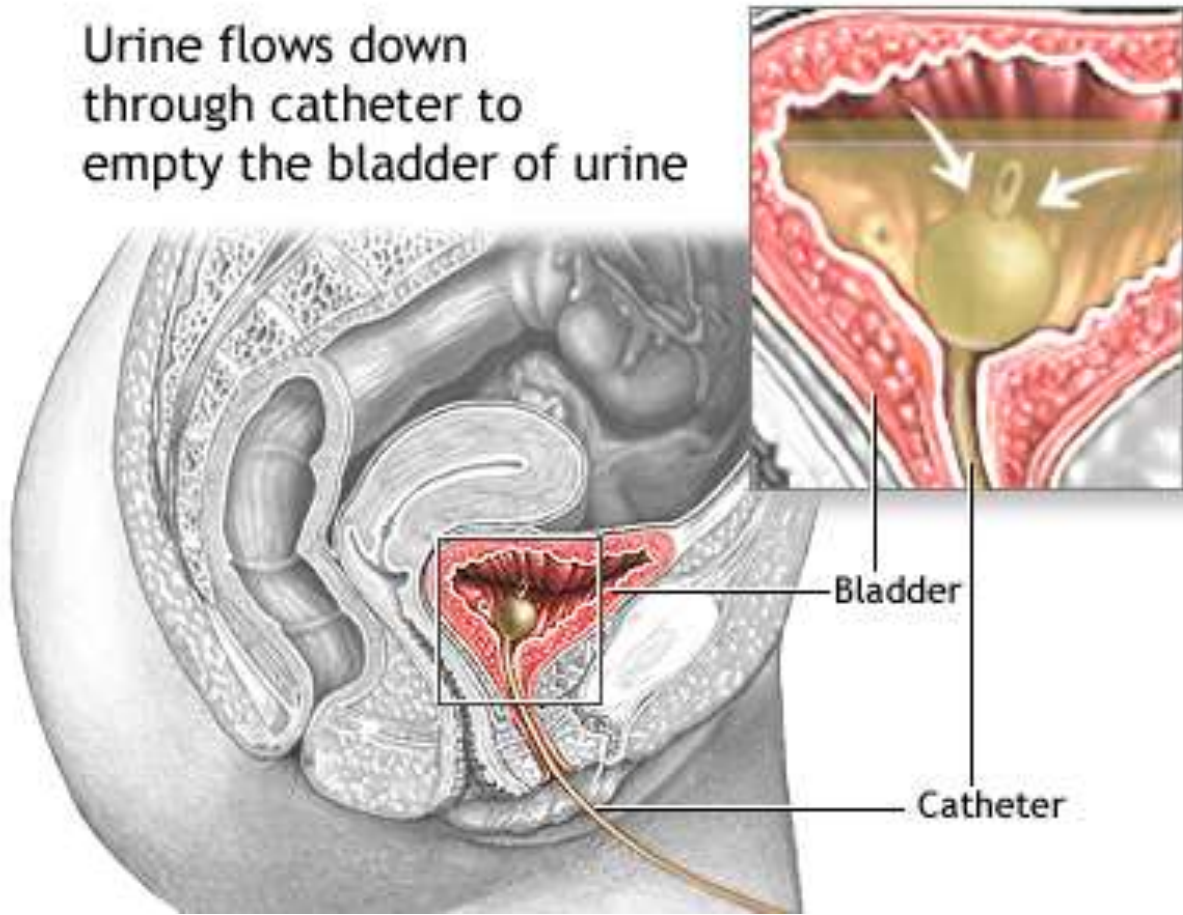
(Bladder infection)

- increased urinary frequency
- urgency
- dysuria (painful urination)
- pain above the pubic region
- WBCs & bacteria in urine
- more common in women

Specimen Type

- 1. Random** : most common, taken any time
- 2. First morning** : has a greater con. of substances, taken in morning.
- 3. Clean catch midstream** : genitalia is cleaned, urine is tested for microorganisms or presence of infection.
- 4. Timed** : specific time of day, always discard first specimen before timing.
- 5. 24 hour** : used for quantitative and qualitative analysis of substances.
- 6. Catheterized** : by insert a Foley catheter into the bladder through the urethra to collect the urine specimen.

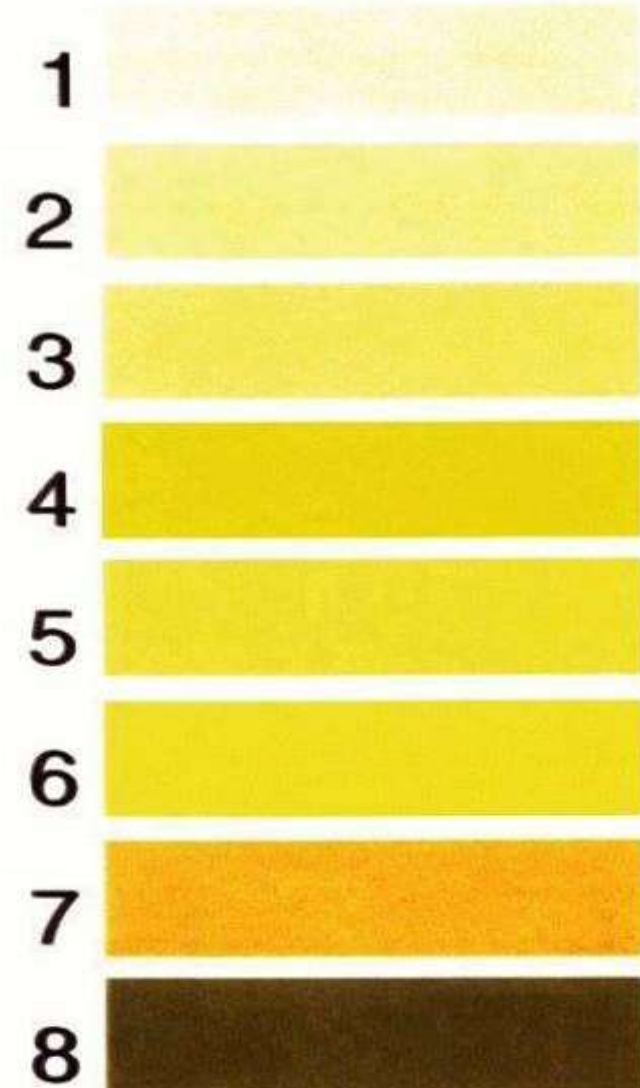
Urine flows down through catheter to empty the bladder of urine



- 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)



Am I Hydrated? Urine Color Chart



This urine color chart is a simple tool your can use to assess if you are drinking enough fluids throughout day to stay hydrated.

If your urine matches the colors numbered **1, 2, or 3 you are hydrated.**

If your urine matches the colors numbered **4 through 8 you are dehydrated** and need to drink for more fluid.

Be Aware! If you are taking single vitamin supplements or a multivitamin supplement, some of the vitamins in the supplements can change the color of your urine for a few hours, making it bright yellow or discolored.



This typically contains:

| | |
|------------------|--------|
| Uric acid | 0.6 g |
| Bicarbonate ions | 1.2 g |
| Creatinine | 2.7 g |
| Potassium ions | 3.2 g |
| Sodium ions | 4.1 g |
| Chloride ions | 6.6 g |
| Urea* | 25.5 g |

*nitrogenous breakdown product of protein metabolism

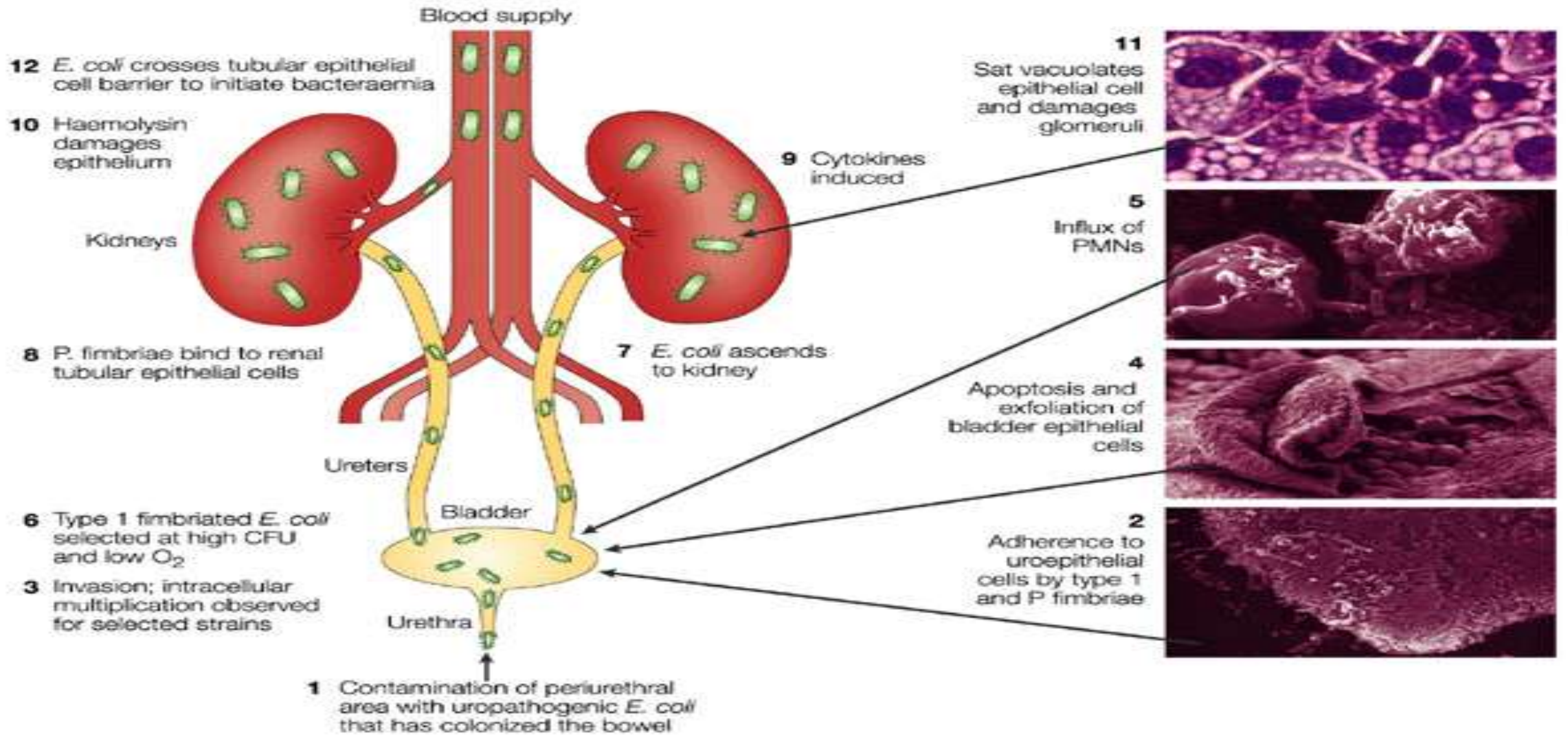


❖ UTI causing by microorganisms :

- UTIs are casually caused by one predominant bacterium, most of them caused by members by the family **Enterobacteriaceae**.
- From this family, *Escherichia coli* is the predominate pathogen in both uncomplicated and complicated infections.

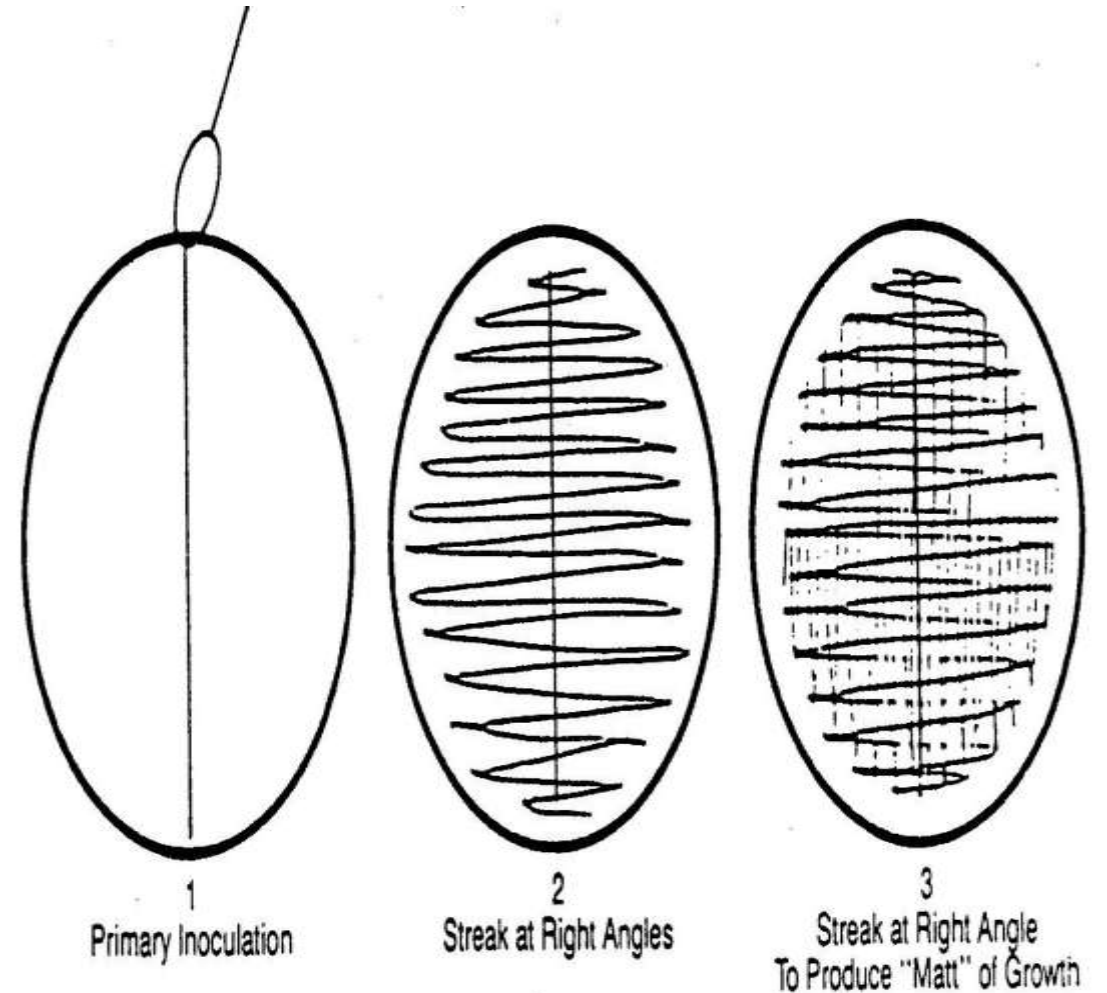
Urinary Tract Pathogens

| Common | Uncommon |
|---|--|
| <ul style="list-style-type: none"> • <i>Escherichia coli</i> • <i>Other Enterobacteriaceae</i> (<i>Klebsiella, Enterobacter, Proteus, Citrobacter</i>) • <i>Pseudomonas aeruginosa</i> • <i>Staphylococcus aureus</i> • <i>Candida</i> | <ul style="list-style-type: none"> • <i>Haemophilus influenza.</i> • <i>Neisseria gonorrhoeae</i> • <i>Mycobacterium tuberculosis</i> |



❖ Inoculating the Culture plate with urine :

- Plate: provide large surface for isolation and observation of colonies
- Using a sterile loop or a sterile swab streak your sample on the petri plate
- Important let your sterilized loop cool before you pick up your sample



❖ Urine Culture Medium :

- Blood Agar.
- MacConkey's Agar.
- CLED Agar.
- Chrome Agar.



1. Cysteine lactose electrolyte deficient agar (CLED)

- It is also an excellent universal culture medium owing to its wide spectrum of nutrients, lack of inhibitors and the fact that it allows a certain degree or **differentiation** between the colonies.



- It contains **lactose** as a reactive compound which, when degraded to **acid**, causes **bromothymol blue** to change its color to **yellow**.
Alkalization produces a deep blue coloration.
- The lack of **electrolytes** suppresses the **swarming** of *Proteus*.



- CLED Agar is recommended in the spread plate technique or a dip slide for detection of bacteria in urine. This medium supports the growth of urinary pathogens and provides distinct colony morphology.
- CLED Agar lacks an electrolyte (salt), necessary for growth and other characteristics of certain bacteria.

2. Chrome Agar

- The major target of this medium is the detection of urinary tract pathogens but CHROMagar has a broader application as a general nutrient agar for the isolation of various microorganisms.




- CHROMagar Orientation can also be used to differentiate various microorganisms in other infected areas; e.g. scars.
- In addition, CHROMagar is useful when supplemented with various antibiotics in detecting increasingly important nosocomial and multidrug resistant microorganisms .
- It presents an instant palette of colors to obtain a large spectrum of differentiation of species.

- **CHROMagar has several advantages over traditional media:**

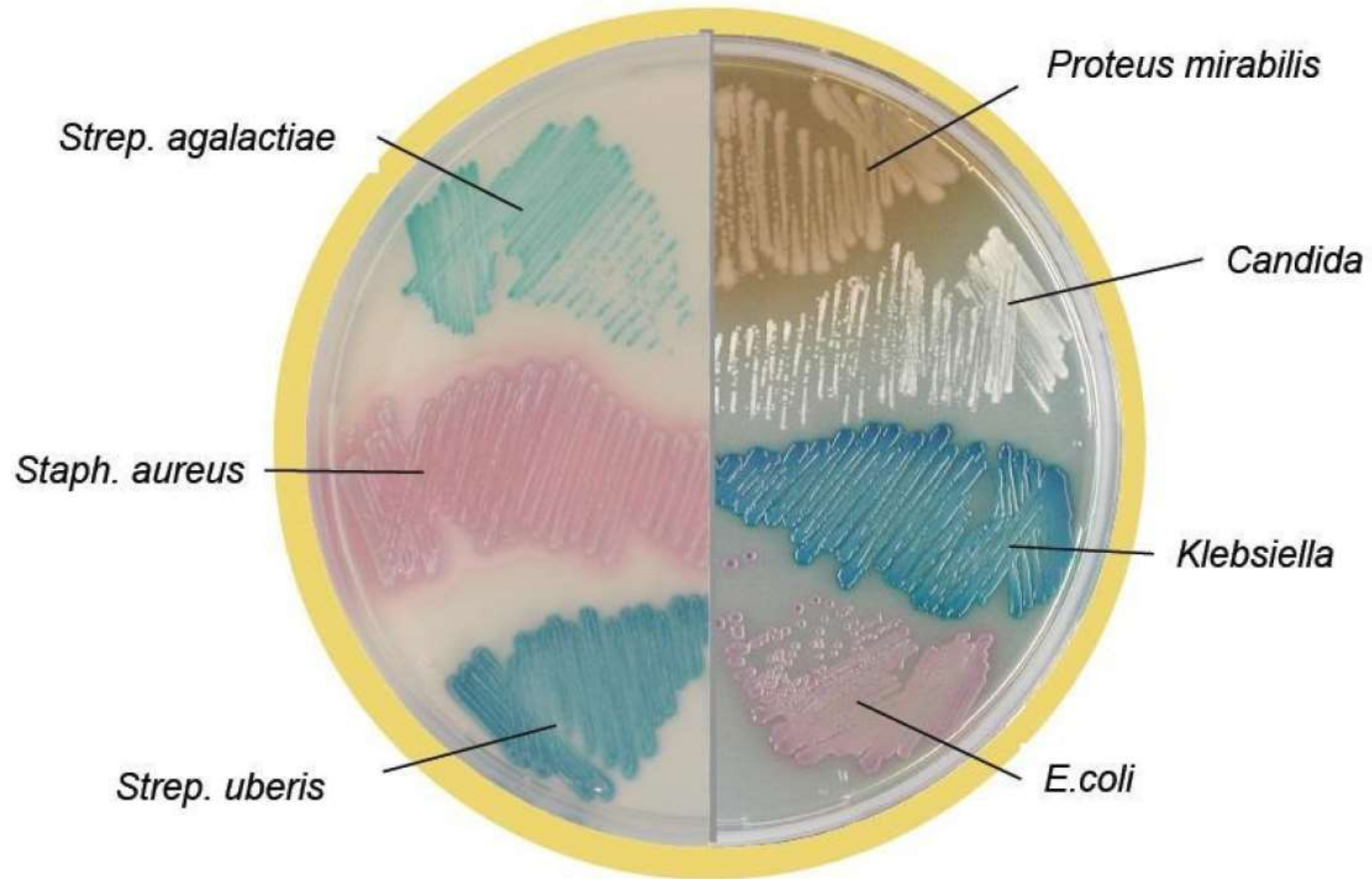
1. Allows in most cases full differentiation of the pathogens
2. Allows for reliable detection, enumeration and presumptive identification of urinary tract pathogens
3. Easier recognition of mixed growth
4. Provides higher detection rates



Typical Appearance of Microorganisms

| Microorganisms | Morphology | |
|--|-----------------------|--|
| <i>E. Coli</i> | Dark pink to reddish |  |
| <i>Enterococcus</i> | Turquoise blue | |
| <i>Klebsiella, Enterobacter, Citrobacter</i> | Metallic blue | |
| <i>Proteus</i> | Brown halo | |
| <i>Pseudomonas</i> | Cream, translucent | |
| <i>Staphylococcus aureus</i> | Golden, opaque, small | |
| <i>Staphylococcus saprophyticus</i> | Pink, opaque, small | |







Any Questions

