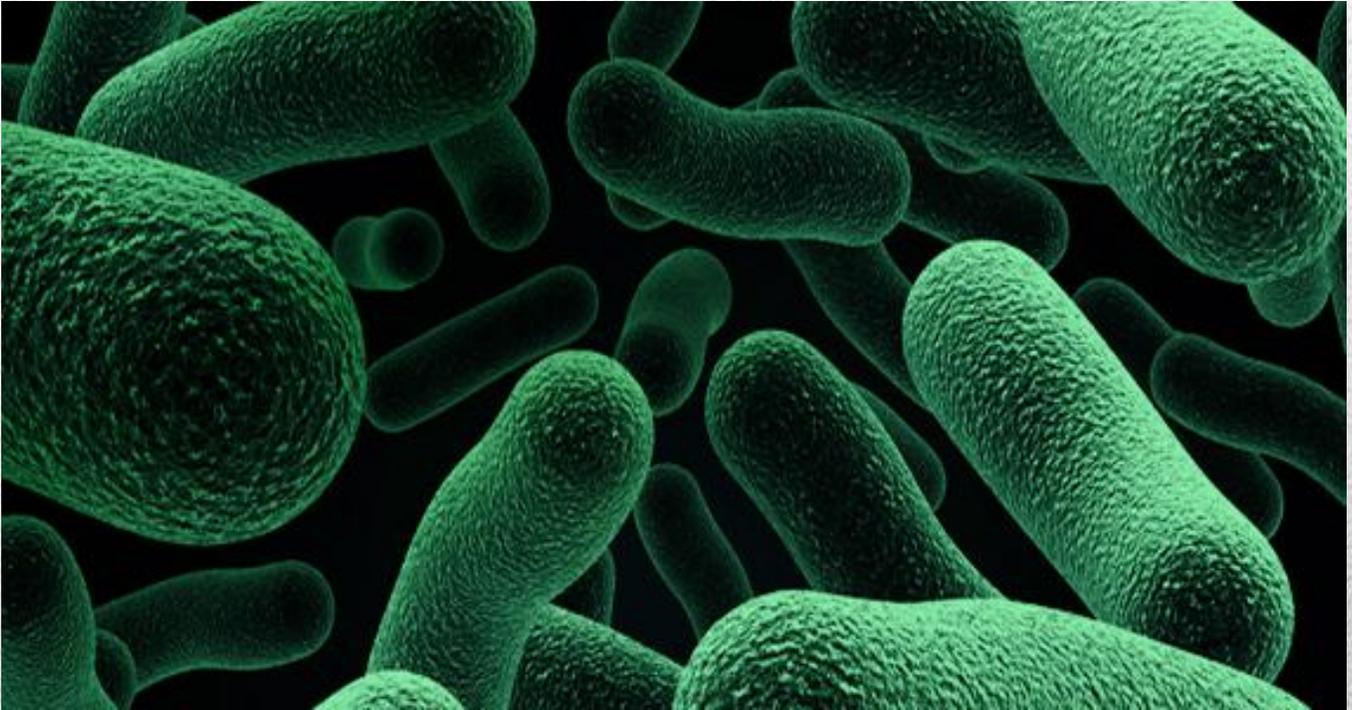


Revision



Microbiology Team – 430

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Comparison between Cystitis and acute pyelonephritis :

	Cystitis	Pyelonephritis
Definition	infection of the bladder; superficial mucosal infections	It is Bacterial infection of the renal pelvis, tubules and interstitial tissue of one or both kidneys
Etiological agent	<ul style="list-style-type: none"> • <i>E. coli</i> • <i>Enterobacteria (klebsiella , protus)</i> • <i>S. saprophyticus</i> • <i>P. aeruginosa</i>(usually with complicated UTI) • <i>Candida species</i>(with diabetic patient and catheterization) • Chlamydia • B strep (in diabetic patient) 	<ul style="list-style-type: none"> • urethra most bacterial causes bowel organisms eg Ecoli • Hospital-acquired infections forms and enterococci • Hematogenous <i>S. aureus</i> • <i>Pseudomonas aeruginosa</i> • <i>Proteus mirabilis</i> • <i>Klebsiella</i>
Risk factors	<p>In women</p> <ul style="list-style-type: none"> • short urethra • pregnancy • decreased estrogen production during menopause <p>In men: mainly due to persistent bacterial infection of the prostate_</p> <p>In both sexes</p> <ul style="list-style-type: none"> • bladder stone • urethral stricture • catheterization • diabetes mellitus 	<ul style="list-style-type: none"> • Vesicoureteral reflux (VUR) common in children • Calculi • Urinary tract catheterisation • Pregnancy • Prostate disease • Immunocompromised states • Diabetes mellitus
Clinical presentation	<ul style="list-style-type: none"> • Dysuria • Frequency • Urgency • Hematuria • Usually no fever • Supra-pubic area • Bacteruria • Cloudy and malodorous urine • Older patient: confusion , hypothermia 	<ul style="list-style-type: none"> • Chills • Fever • Flank pain • Renal angle tenderness • Pyuria • Dysuria • Frequency • Bacteriuria
Laboratory diagnosis	<p>1- <u>Specimen collection:</u></p> <ul style="list-style-type: none"> • Midstream urine (MSU) must be before starting antibiotic_ • Supra-pubic aspiration used in children <p>2- <u>Microscopic examination :</u></p> <ul style="list-style-type: none"> • About 90% of patients have > 10 WBCs /cu.mm <p>3- <u>Chemical screening tests:</u></p> <p>Urine dip stick</p> <p>4- <u>Urine culture:</u> important to identify bacterial cause and antimicrobial sensitivity .Quantitative culture : typical of UTI (>10⁵/cumm)</p>	<p><u>Urinalysis</u></p> <ul style="list-style-type: none"> • 10 WBC/hpf • Positive result on leukocyte esterase • Positive nitrate dipstick test • Urine culture and sensitivity • Blood culture <p><u>Radiological investigations</u></p> <ul style="list-style-type: none"> • CT scan • IVP=intra venous pyelogram

Treatment	<u>Course:</u> 3-7 days (uncomplicated) 10-14 days (complicated , recurrent cystitis)	<u>Course:</u> 10-14 days
	<p>Nitrofurantoin Ciprofloxacin TMP/SMX</p>	<p>Mild or moderate symptoms:(oral treatment): Fluoroquinolone TMP/SMX, if uropathogen is known to be susceptible Gram-positive pathogen(enterococcus faecalis): amoxicillin, or amoxicillin-clavulanate Hospitalized patients:(IV Then orally): <ul style="list-style-type: none"> - ciprofloxacin IV, then orally - Gentamycin ± ampicillin IV, then TMP/SMX (orally) </p>

Cystitis summary :

- ☀ • UTI patients present with urinary symptoms and significant bacteruria = **10⁵bacteria/ml**
- ☀ • Cystitis more common in women than in men because they have short urethra, pregnancy and decrease estrogen production during menopause.
- ☀ • S .aureus can cause UTI by Hematogenous spread (through blood stream) from other of infection.
- ☀☀ • **E coli** is the most common cause of cystitis (complicated and uncomplicated)
- ☀☀ • **Staphylococcus saprophyticus** can cause honeymoon cystitis(usually affect sexually active female (from 18-45 years)).
- The patient who has cystitis usually come with **no fever**
- ☀☀ • Interstitial cystitis is autoimmune attack , **so there is no bacteria in the urine** and the patient doesn't response to antibiotic.
- Catheter urine should not be used for diagnosis of UTI.
- Urine dip stick is auseful chemical test to detect nitrate (which produced by gram (-) bacteria)and leukocyte esterase
- Urine culture: important to identify bacterial cause and antimicrobial sensitivity
- In recurrent cystitis we should do **investigation** such as Intravenous Urogram (IVU) OR ultrasound.
- **Nitrofurantoin** can be used only with lower urinary tract infection like cystitis .
- **Supra-pubic aspiration** is used with children
- ☀ • The best specimen collection used for cystitis diagnosis is **MSU (midstream urine)**.

Pyelonephritis summary :

- ☀• Pyelonephritis is Bacterial infection of the renal pelvis, tubules and **interstitial tissue** of one or both kidneys
- ☀• Pyelonephritis is a **systemic infection** that's why we do **blood culture**, and it's **most common in females. (because of their short urethra).**
 - **prostatic enlargement** is the common cause of pyelonephritis in men
 - The VUR is the most common cause of the pyelonephritis in children
- ☀• The patient who has usually come with **flank pain, chills and fever**, then you examine the urine looking for **pus cells**.
- ☀• Most of the bacteria come from **the gut** and the commonest cause of infection is **E.Coli**. on the other hand the commonest **gram positive** bacteria is **enterococci**, and **S. saprophyticus** cause the **Honeymoon cystitis**.
 - Structural abnormalities to the kidneys and urinary tract is a one of the risk factor of UTI
 - Infection usually **ascends** from the **urethra**
 - Complications of pyelonephritis are **End Stage Renal Disease, hypertension and kidney stone**.
 - **In the infant**, the presentation (symptom) may be **feeding difficulty or fever**.
 - **In the elderly** presentation may be **mental status change like confusion and hypothermia**.
 - Medical management should be according to **culture and sensitive result**.
 - The duration of treatment of pyelonephritis from **10-14 days**
- ☀• Some bacteria come from the blood (Hematogenous) like Staph.Aureus. Once you **find it in urin you should look for associated infection in other organs (like absces)**
- ☀• **Proteus mirabilis** is non lactose forming organism & it breaks s down urea giving ammonia which makes the **urine Alkaline**

Treatment of urinary tract infection :

- ☀️ • In case of asymptomatic bacteruria (no symptoms but bacterial count high) , we don't treat Pt. **except if she is pregnant or Pt in the O.R or after transplantation.**
- Duration of antibiotics:
 1. **Cystitis** either complicated or uncomplicated → **3 to 7 days.**
 2. **Pyelonephritis** either complicated or uncomplicated → **10 to 14 days.**
- E.coli is the most resistant against ampicillin & the least resistant to Nitrofurantoin, ciprofloxacin & Co-trimoxazole.
- Drugs that we use in UTI:
 - Ampicillin, Gentamicin, Cephalosporin (first & second generation), Nitrofurantoin, Doxycycline (used in urethritis against Chlamydia), fluroquenolone or Co-trimoxazole.
- ☀️➤ **Enterococcus.fecealis is resistant to all these drugs except ampicillin (because it's the only gram + bacteria).**
- Postcoital antibiotics :
 - **A single preventive** dose taken immediately after intercourse.
- Pregnant women :
 - ☀️ - Pregnant women should **NOT** take Quinolone(**Fluoroquinolone**),or **Nitrofurantoin in the last 2 weeks of pregnancy.**
 - Pregnant women with asymptomatic bacteruria have 30% risk for acute pyelonephritis, **that's why we have to treat her immediately with antibiotics.**
- **UTI in children** is serious because they might have **VUR** which can lead to pyelonephritis & kidney damage.
 - **Surgery** used to **correct VUR** and **antibiotics** used to **prevent infections.**
- catheter-induced UTI
 - **Catheter should not be used unless absolutely necessary and they should be removed as soon as possible.**
 - Catheterized patients who develop symptomatic UTI are **at risk for sepsis & should be treated for each episode with antibiotics + remove catheter if possible.**
- ☀️ • Patients with two or more symptomatic UTIs within 6 **need preventive therapy.**
- Choice of antibiotic depend on **susceptibility pattern.**

The Drugs:

1. Cephalosporin:
 - First generation: Cephalexin & cephradine.
 - Second generation: cephuroxim axetil
 - 3rd generation: ceftriaxone & cefaxim.
2. Fluoroquinolone:
 - Ciprofloxacin, norfloxacin, Gatifloxacin, moxifloxacin.

Cases

Case 1

A 25 years old non pregnant female presented with **dysuria** , **frequency** and **urgency**. Urine sample was recommended and it appeared **cloudy** and **malodorous**. And **blood** was found in the urine.

Under the microscopy **WBCs** were **more than 10/HPF** also **bacteria** was found (bacteriuria).

The patient was diagnosed to have uncomplicated UTI (cystitis).

For treatment she was given Ampicillin for **3 days**.

What is the urine sample that should be used for diagnosis?

- **Midstream Urine (MSU)**

Case 2

A 33 years old pregnancy women presented to the emergency with **high fever** , **chills** and **there is flank pain** . She has complained of **dysuria** and **frequency** for the last 24 hours . her urine analysis positive to bacteriuria and pyuria. She was diagnosed to have acute pyelonephritis .

- **which of the following drugs are contraindications:**
- Nitrofurantoin (only contraindicate in the last 2 weeks).
- TMP-SMX
- **Fluoroquinolone.**

Case 3

diabetic pregnant women came to gynecology for follow up, without any symptoms, and when we did the urine culture, we found a significant bacteriuria.

- She is having??
 - Asymptomatic bacteriuria.
 - Should we treat her???
 - Yes because she has a 30% risk for acute pyelonephritis in the second or third trimester.
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Case 4

Patient was diagnosed with acute urinary retention & he had a urinary catheterization as a part of the management. Now he is recovered from this disease but he has developed UTI. The best choice of his treatment is:

- Co- trimoxzole
- Gentamicin.
- Remove the catheter.