การติดเชื้อระบบทางเดินปัสสาวะ
URINARY TRACT INFECTION (UTI)

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Clinical Scenarios#1

- 23 y.o. woman presents with 1 day of increased urinary frequency, dysuria and sensation of incomplete voiding
- She is otherwise healthy, takes no medications, and is sexually active.
- she does not have fever, chills, vaginal discharge, or flank pain
- Sexually active with one partner, no hx/o sexually transmitted diseases

Clinical Scenario #1

- She looks a little uncomfortable but is afebrile, with a normal blood pressure
- Her abdominal exam is notable for
  - mild suprapubic tenderness,
  - no RUQ tenderness,
  - no costovertebral tenderness
- Pelvic exam is deferred

Clinical Scenario # 1: Labs

- Urinalysis:
  - pyuria (WBC too numerous to count), RBC and bacteria present
- Urine dipstick: positive leukocyte esterase and nitrite
- Urine culture: not done
- Patient receives 3 days of TMP/SMX for UTI

Outline

- Definitions
- Epidemiology
- Clinical Symptoms and Diagnosis
- Microbiology
- Pathogenesis
  - Host Factors
  - Bacterial Factors
- Clinical Scenario
- Treatment and Prevention

Definitions: UTI

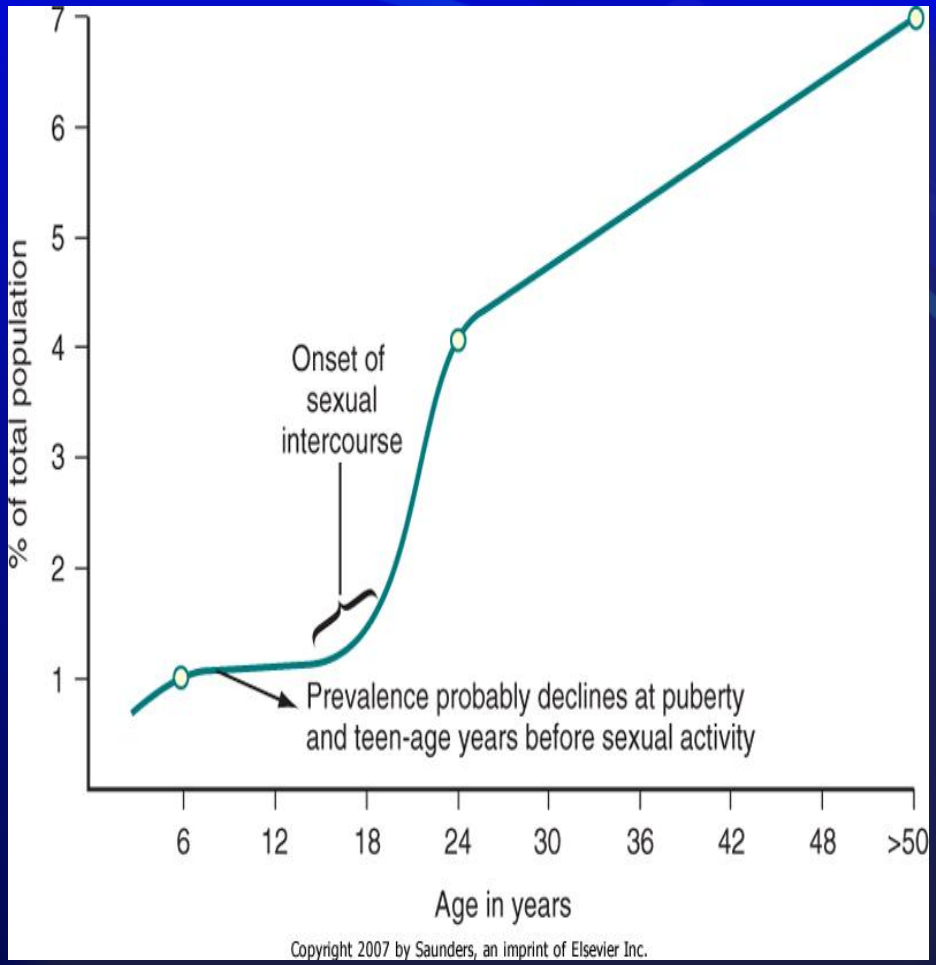
- Colonization of urine with
  - Inflammation
  - Invasion of urinary structures
- Epithelial surfaces are contiguous
  - Entire system at risk
- Wide clinical spectrum

Practical Classification (1)
Important clinical distinction

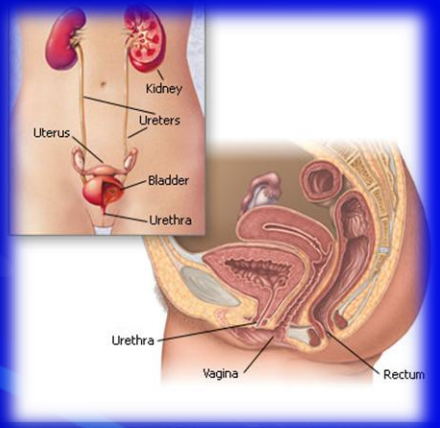
- Uncomplicated UTI
  - Infection in a structurally and neurologically normal urinary tract.
    - Simple cystitis of short (1-5 days) duration
    - None/minimal anatomical evaluation
- Complicated UTI
  - Infection in a urinary tract with functional or structural abnormalities
    - ex. Indwelling catheters and renal calculi
    - Diagnostic and treatment challenge
    - Anatomic evaluation critical

Incidence and Epidemiology: UTI

- Common in all clinical settings
- Out patients
  - > 650,000 MD visits/ year
  - > 270,000 visits to urologists
  - 68% women
- Hospitalized patients
  - Most common nosocomial infection
  - Most common cause of bacteremia



Epidemiology of UTI



- First 3 months; male : female is 3:1
  - Congenital anomaly of GU tract
  - Circumcision reduces UTI rates in male infants about 90%
- Schoolchildren (Female: male ratio: 30:1)
  - Girls: prevalence 1.2%, incidence 0.4%/yr
  - Boys: prevalence 0.04%

Epidemiology of UTI: Adults Women

- Most common group
- Considerable morbidity
  - 25-30% of 20-40 YO: Hx of having been Rx
- Prevalence
  - 3.5% overall in survey studies
  - Increases 1%/decade
  - 10% of women over 70
- Rarely cause significant renal damage

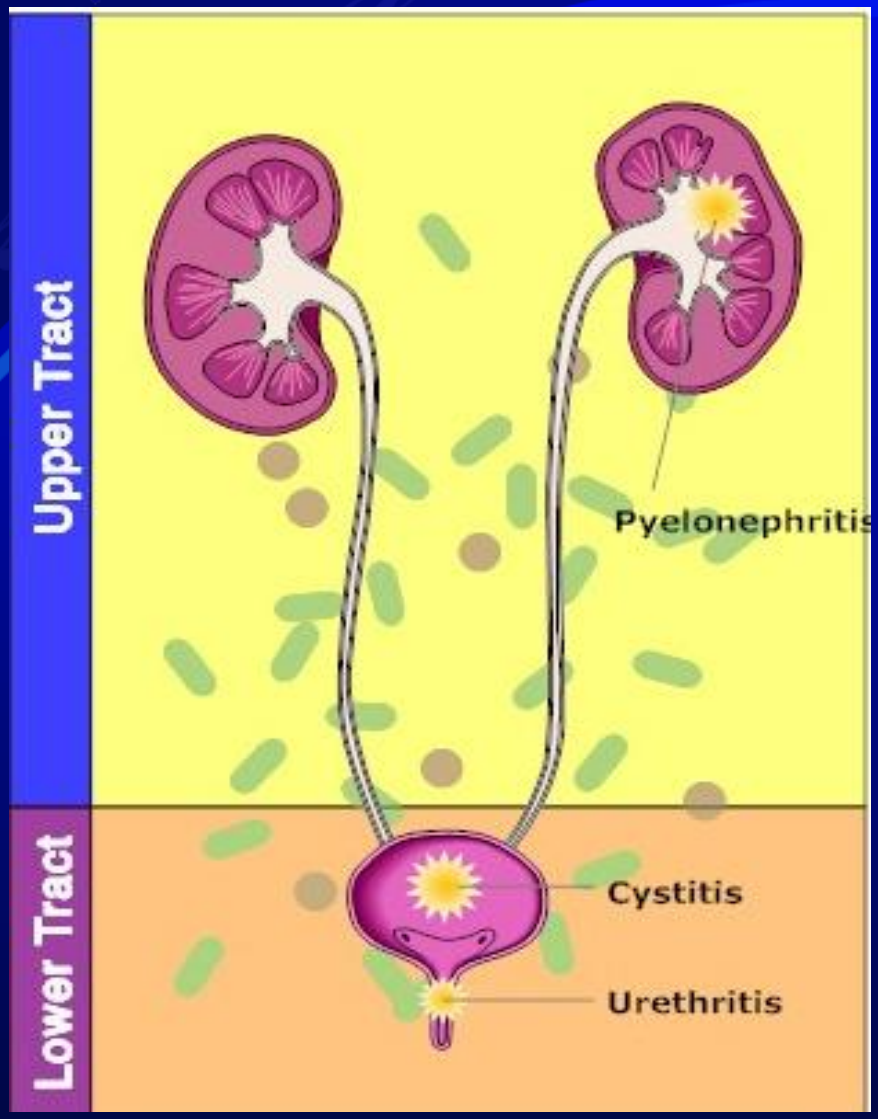
Clinical Classification of UTI (2)

- First Infection
- Unresolved infection
- Recurrence infection
  - Bacterial persistent (Relapse)
    - by the same organism
  - Reinfection
    - by a different organism after discontinuation of treatment

Recurrence infection

- Culture: confirmed UTI's
  - > 3 in 1 year or > 2 in 6 months
- Relapse is occurrence of bacteriuria with same organism within three weeks of completed therapy
  - Incomplete antibiotic course
  - Antibiotic resistant
  - Failure to eradicate due to renal stones, scars, cystic disease, uncontrolled DM, prostatitis

Classification of UTI



- Upper UTI
  - Pyelonephritis
  - Renal abscess
  - Perinephric abscess

  Fever, nausea, vomits, loin pain
- **Lower UTI**
  - **Cystitis**
  - **Urethritis**
  - **Prostatitis**

  Frequency, dyuria

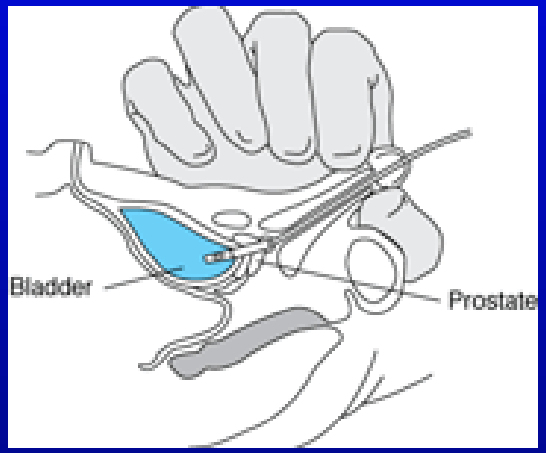
Diagnosis of UTI: Case# 2

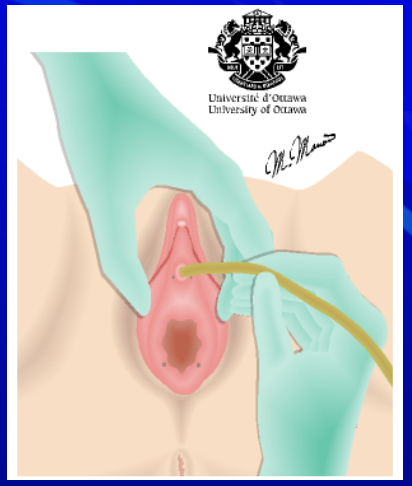
- 32 YO Woman
  - Patient is calling from emergency department
  - " Is it OK? They just gave me antibiotics without even looking at my urine?"

Urine Examination

Urine collection

Middle stream urine





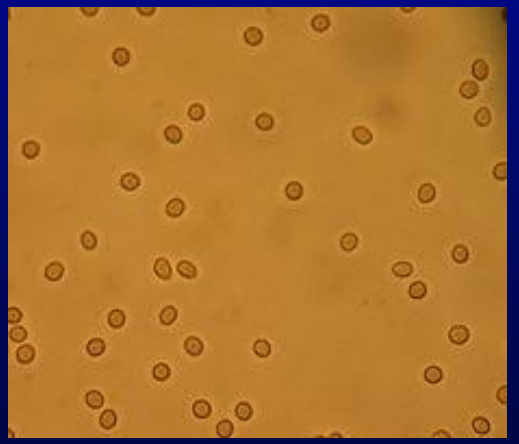
Suprapubic aspiration

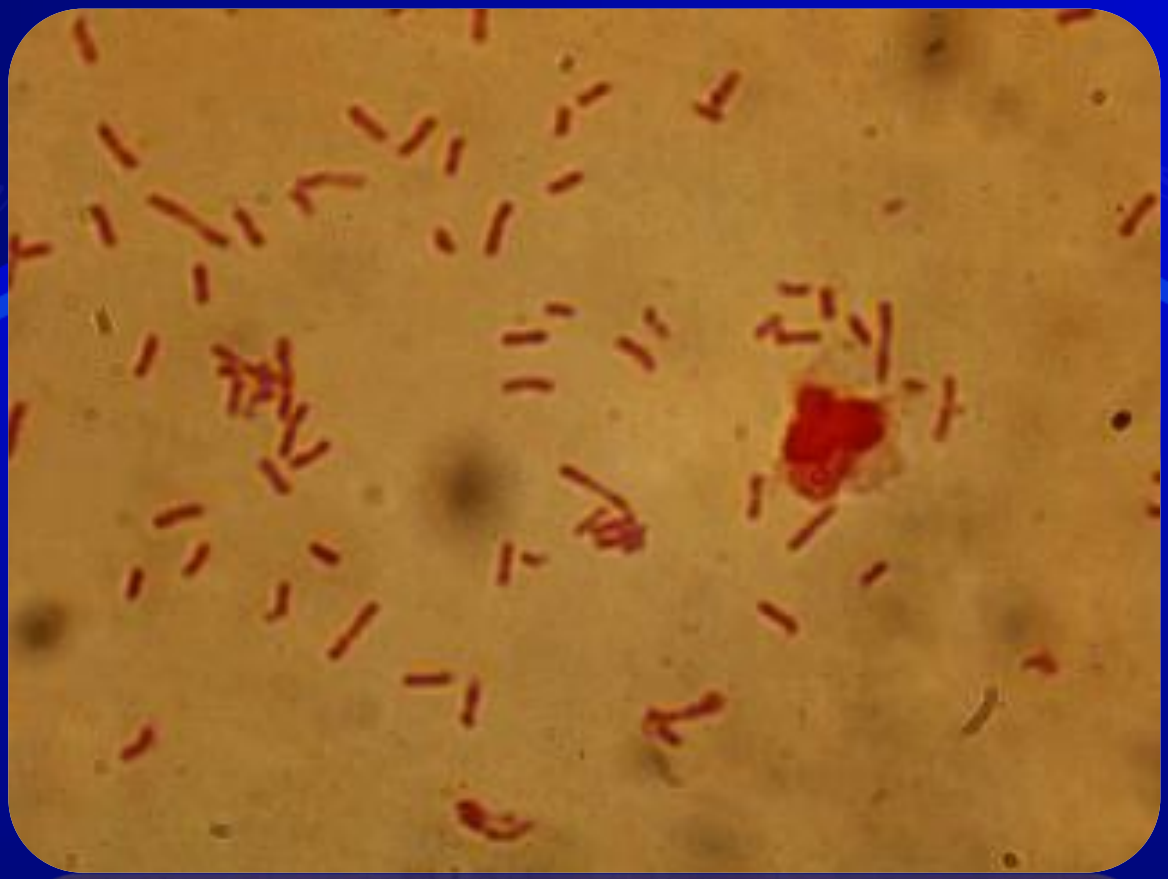
Diagnosis of UTI

- **Urine dipstick test: rapid screening test**
  - leukocyte esterase: pyuria
  - nitrite test: bacteriuria (+ in only 25%)

    nitrate → bacteria → nitrite

- **Urine microscopic examination:**
  - -WBCs, WBC casts, RBCs
  - Bacteria (1 bact/hpf = significant)





Gram stain of Urine numerous Gram-negative rods.

E.Coli grew from this urine specimen

Diagnosis of UTI

Urine culture:

- Indication for urine culture
  - Pyelonephritis
  - Children, pregnant women
  - Patients with structural abnormalities of the urinary tract

Diagnosis of UTI

Urine culture:

- Significant bacteriuria
  - 10^5 cfu/mm^3
  - 10^{2-3} cfu/mm^3 + Symptoms
- False negative :
  - **antibiotics, antiseptics, urethral syndrome, TB kidney, diuresis.**

Case study

- 47 year old woman, history of urolithiasis (Infection stone), Flank pain, fever (39.5), chill, flank tenderness, WBC's, bacteria
- What Imaging Test?

Ultrasound ⟶ **Obstruction**

Plain film and IVP

Guideline for Radiology Investigation

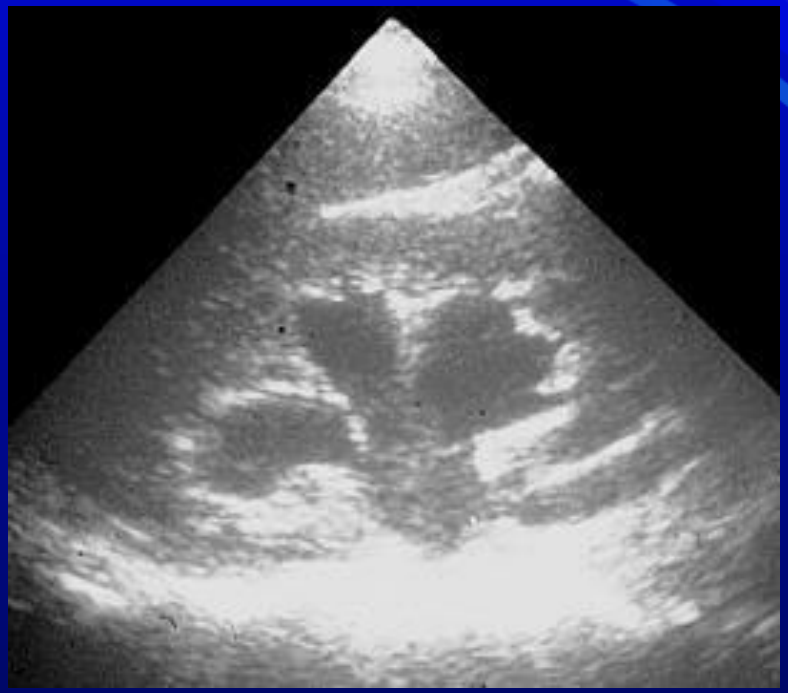
- **Acute or chronic parenchymal infection associated with functional or structural tract abnormality**
  - Rule out obstruction
  - Children with first episode of UTI
  - Resistant to treatment, Relapse

Radiologic Investigation

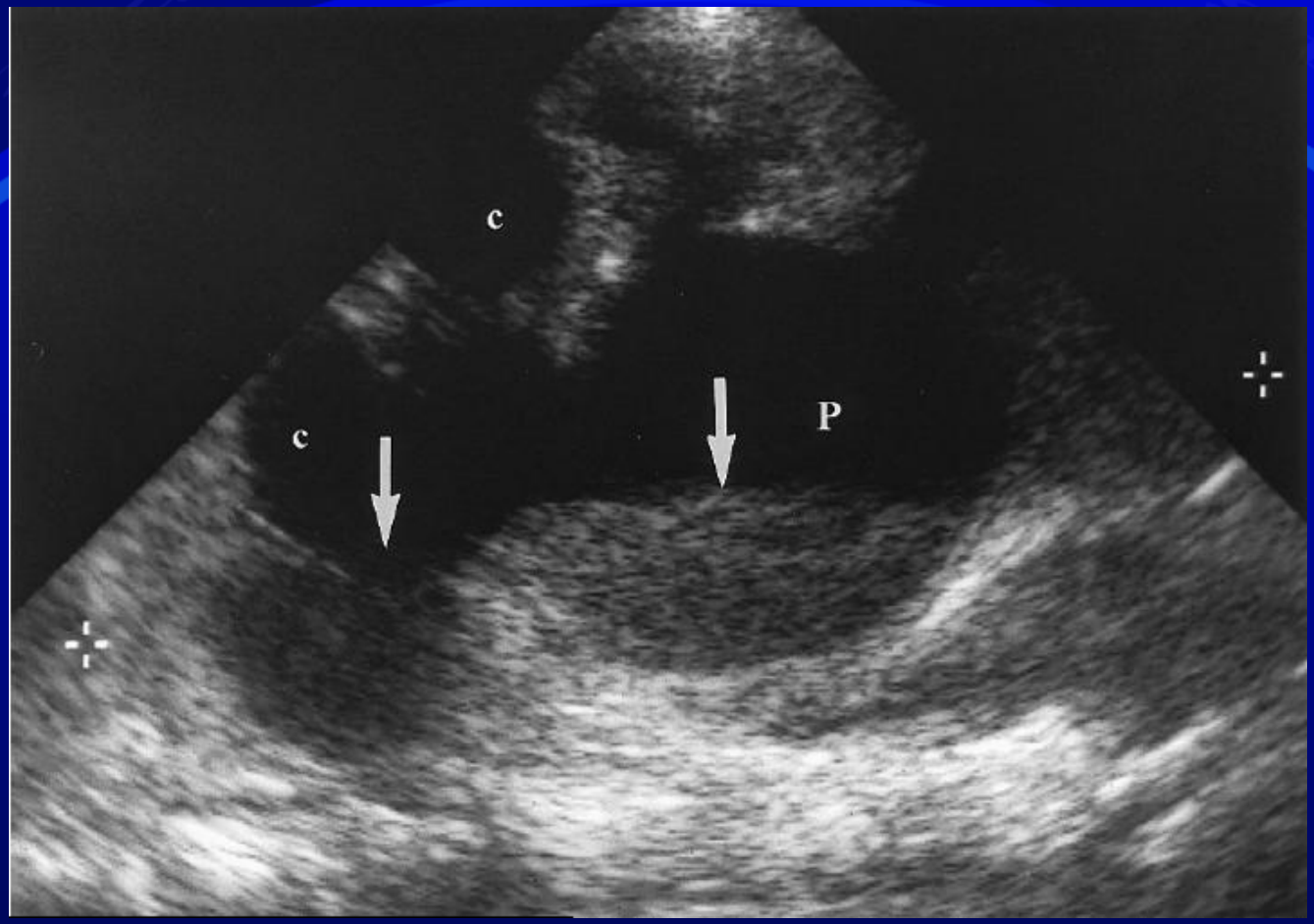
- IVP
- Ultrasound
- Computed Tomography
- Voiding cystourethrography (VCU)

Intravenous Pyelography (IVP)

Ultrasound: Hydronephrosis



Ultrasound: Pyonephrosis



CT scan: Renal abscess

Outline: Urinary Tract Infections

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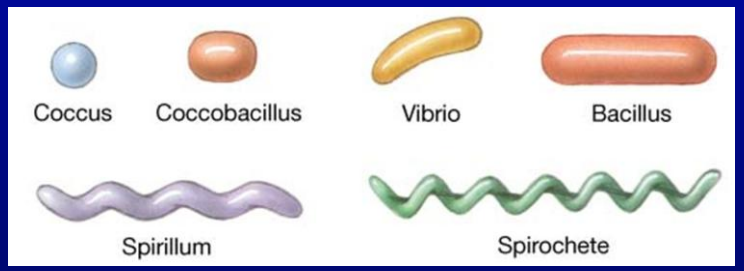
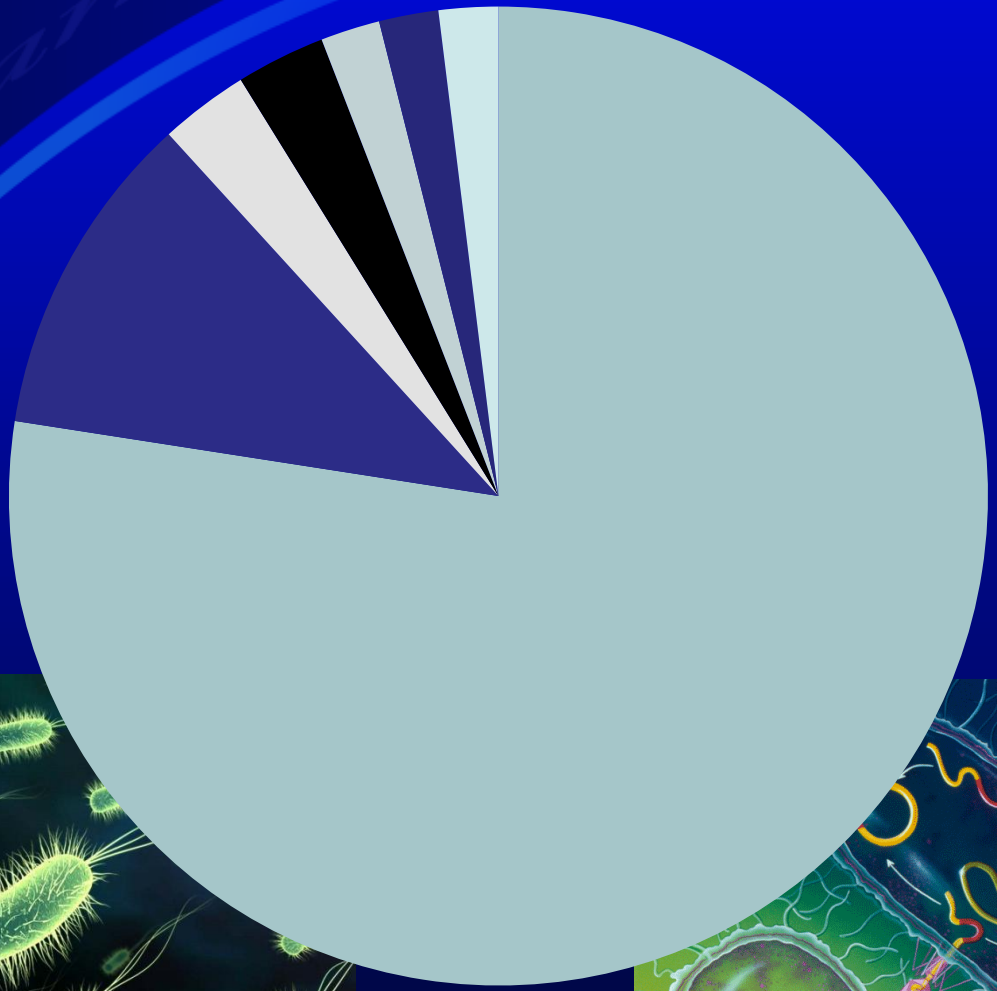
- Clinical Symptoms and Diagnosis
- **Microbiology**
- Pathogenesis
  - Host Factors
  - Bacterial Factors
- Clinical Scenario
- Treatment and Prevention



Etiology of Uncomplicated UTI: Sexually active women



- E.coli 79%
- S.saprophyticus 11%
- Klebsiella 3%
- Mixed 3%
- Proteus 2%
- Entericoccus 2%
- Other 2%

Outline

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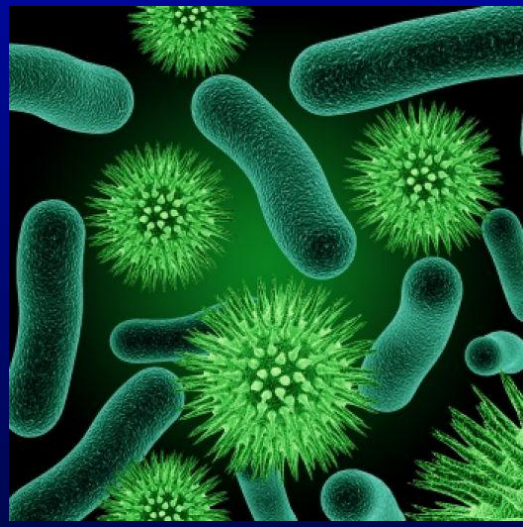
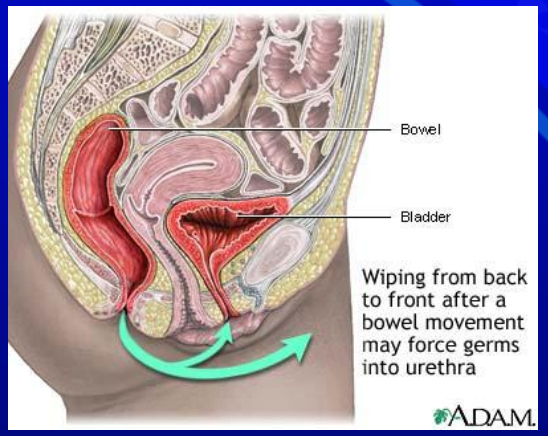
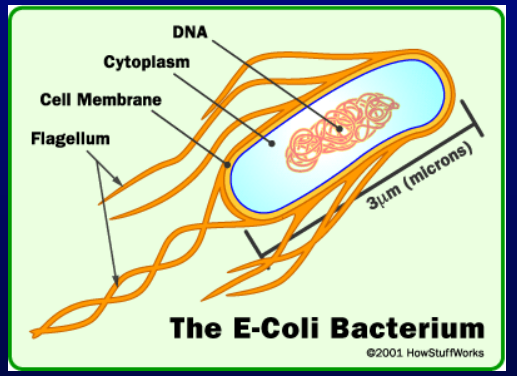


Pathogenesis of UTI

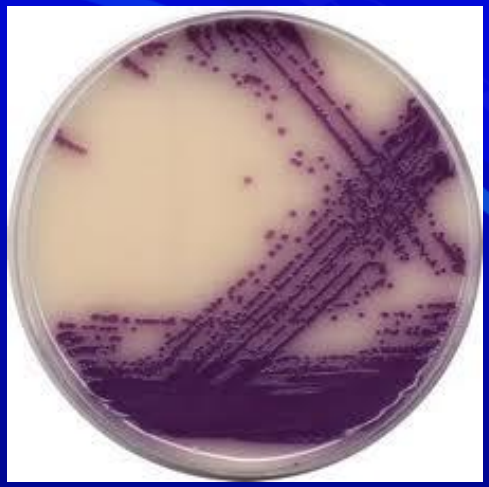
- **Ascending route of infection-usually >95%**
  - Enterobacteriaceae that colonize at genitalia
  - Colonization of the vaginal introitus
  - Colonization of the urethra
  - Entry into the bladder
- **Hematogenous**
  - Salmonella, Mycobacterium tuberculosis
- **Continuous structures**
- **Lymphatics**



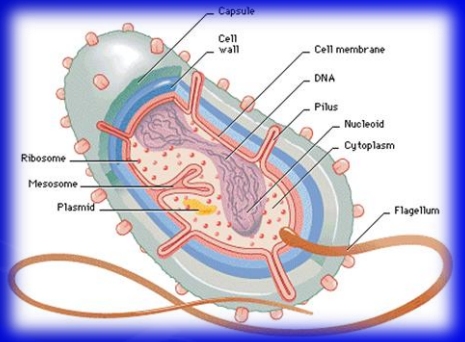


Host Factors Predisposing to Infection

- Extra-renal obstruction
  - Posterior urethral valves
  - Urethral strictures
- Renal calculi
- Incomplete bladder emptying
- Neurogenic bladder
- Immunocompromised individuals (e.g. DM, transplant recipients)



Pathogenesis of UTI: Bacterial virulence factors

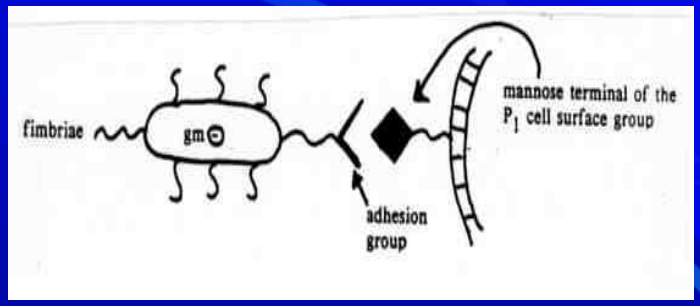


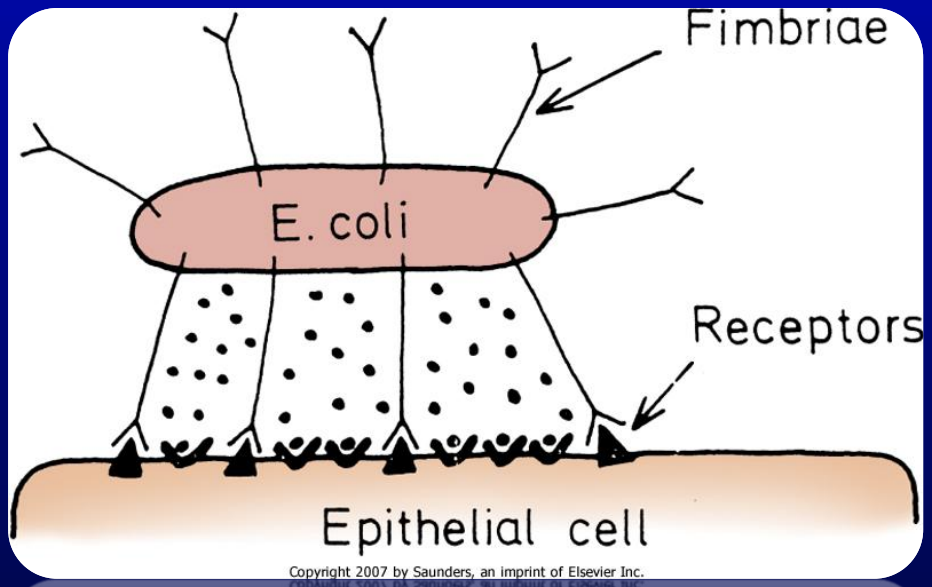
- Uropathogenic E.coli virulence factors:
  - fimbriae :enalble adherence to urethral epithelium
  - Secrete hemolysin & aerobactin (cytotoxic damage cells)
  - Resist serum bacterical action.
  - Have higher K capsular antigen: Capsular polysaccharide inhibit phagocytosis
- Adherence is important in other bacteria.

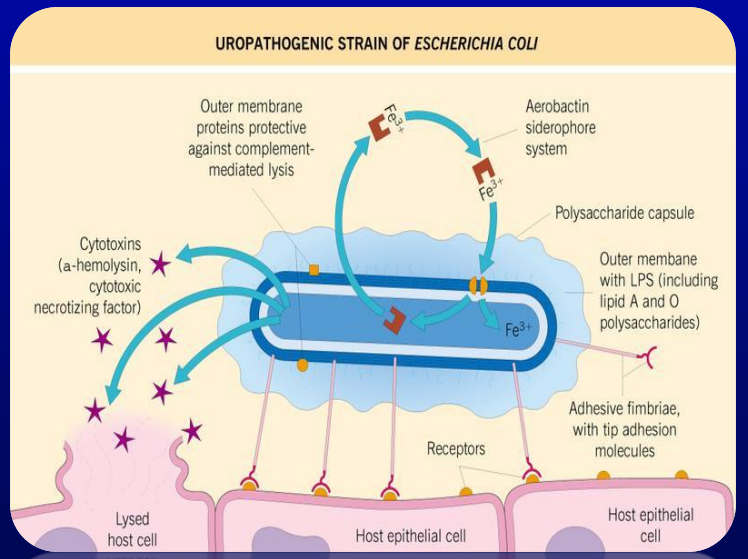
Risk Factors for UTI in Women

Bacterial Adhesion

Urothelial receptor density
E.coli adhesin







Risk Factors for UTI in Women

- Urothelial receptor density
  - E.coli adhesin
- Lewis blood group non-secretor (Blood group antigen on Membrane of Uroepithelial cell membrane)
  - Le (a+b-) and Le (a-b-)
- Vaginal factors
  - Alkalinized of pH
  - Antibiotic-induced alterations of normal flora

UTI in Women: Factors Predisposing to Infection

- Short urethra
- Sexual intercourse & lack of post coital voiding
- Diaphragm, spermicide use
- Estrogen deficiency
- P1 blood group - upper UTI

UTI: CLINICAL SYMPTOMS & PRESENTATION

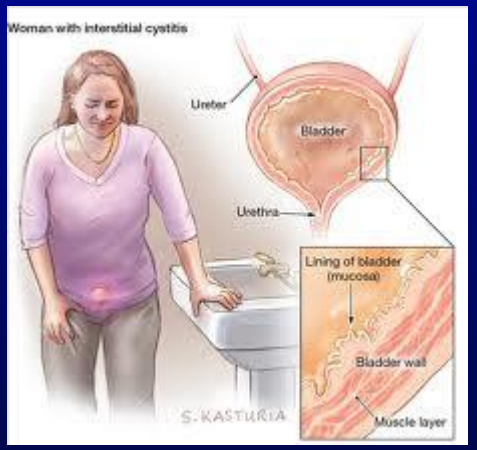
Cystitis

Upper tract infections

Lower tract infections

Cystitis

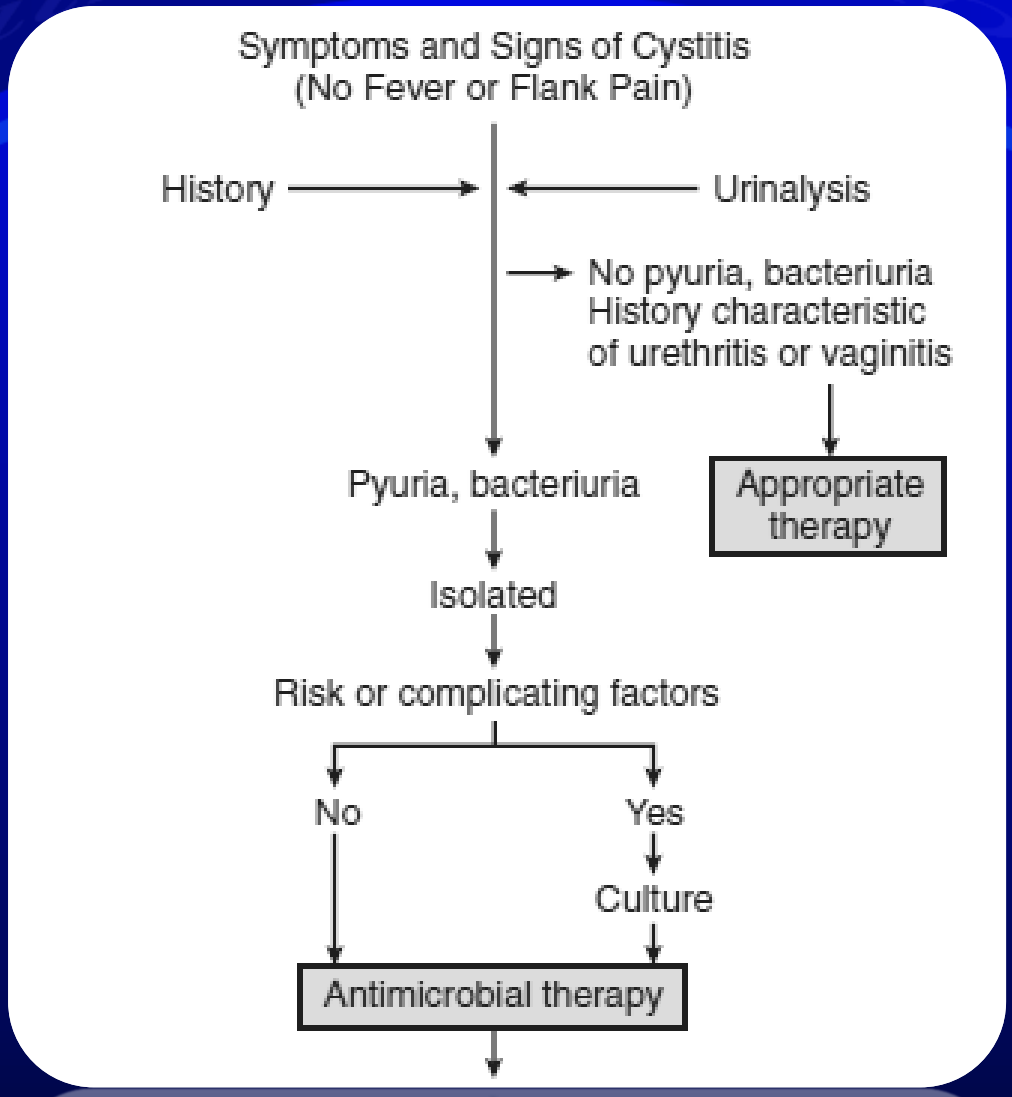
- Dysuria (burning or discomfort on urination)
- Frequency
- Nocturia
- Suprabubic discomfort



UTI: Bladder

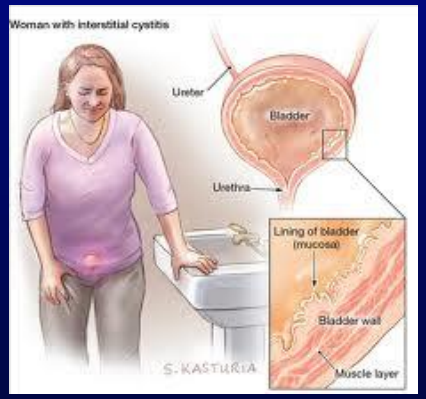
- Uncomplicated cystitis
- Complicated cystitis
- Asymptomatic bacteriuria
- Unresolved UTI

acute uncomplicated cystitis



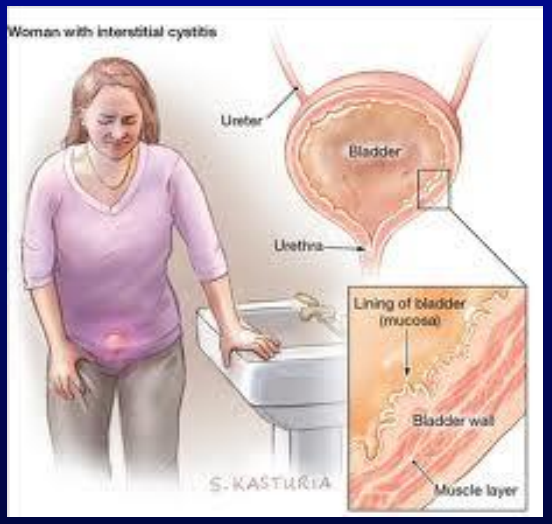
Treatment of acute uncomplicated cystitis

- Half of patients will have spontaneous clinical and microbiologic resolution with in a few days or weeks
- Antimicrobial treatment shorten the duration of symptom
  - 97% symptom improvement by 48 hours



Treatment of acute uncomplicated cystitis

- young females: 3 days of oral therapy (fluoroquinolone, cotrimoxazole, cefuroxime,augmentin)
- In females: symptoms x 7 days or history of previous infection → 7 days therapy.
- In males : oral therapy for 7-10 days.



Complicated Cystitis

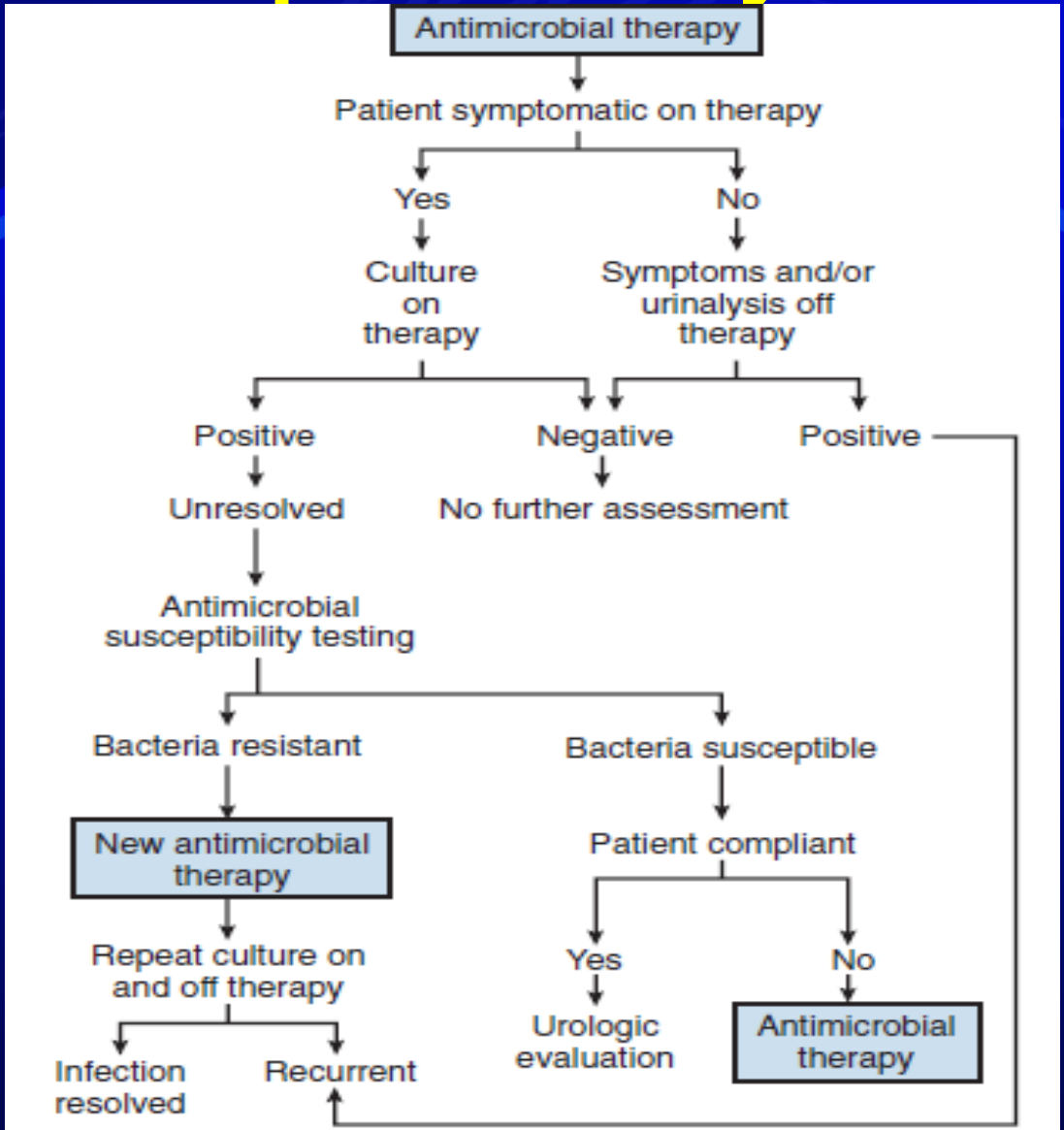


Figure 10–13. Management of acute cystitis.

Cystitis: Prevention Strategies

- Increase fluid intake
- Void at 2-3 hours interval
- Void at bed time and after coitus
- Avoid diaphragm or spermicide use
- Avoid diapers
- Antibiotic prophylaxis

CLINICAL PRESENTATION OF UTI

Cystitis

Upper tract infections

Lower tract infections

Clinical Scenario #3

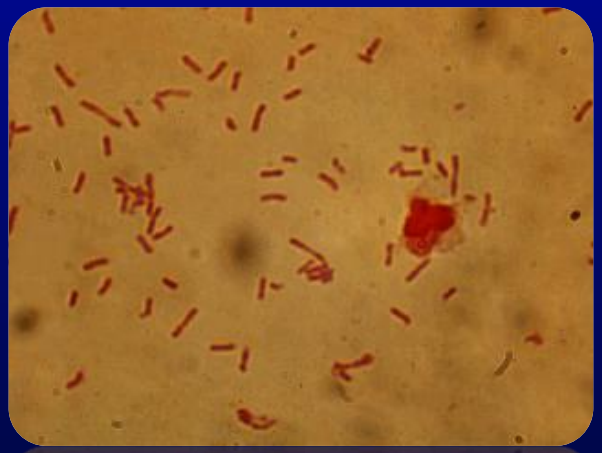
- 43 y.o woman with DM presents to the ER complaining of chills, nausea and low back pain for the past 2 days. Earlier in the week she developed increased urinary frequency and dysuria.
- Recognizing the symptoms of UTI she took two days of TMP/SMX but was unable to finish treatment because of nausea and vomiting
- No hx/o STDs, no vaginal discharge

Clinical Scenario #3

- She looks unwell and appears uncomfortable
- She is febrile to 101.2, tachycardia to 100 with a BP 100/60
- On exam her mucous membranes are dry; there is suprapubic tenderness, and severe right flank and right costovertebral tenderness
- Urinalysis, Urine microscopic examination and urine culture are performed: pyuria, hematuria, bacteriuria
- Blood cultures are drawn
- Patient is admitted to the hospital for IV antibiotics and pain management

Clinical Scenario #3

- The next day, urine and blood cultures show Gram-negative rods
- After 72 hours of hydration and intravenous antibiotics, your patient is still febrile and repeat urine examination is still notable for pyuria and bacteriuria
- You are concerned about
  - urinary obstruction
  - intrarenal/perinephric abscess
  - infection with resistant organism



Clinical Scenario #3

- Microbiology lab informs you that the the pathogen is an *E.coli sensitive to* fluoroquinolones, resistant to TMP/SMX
- Renal CT is notable for a large renal abscess
- Diagnosis: pyelenephritis complicated by a renal abscess in a diabetic patient

UTI: Upper Tract Disease

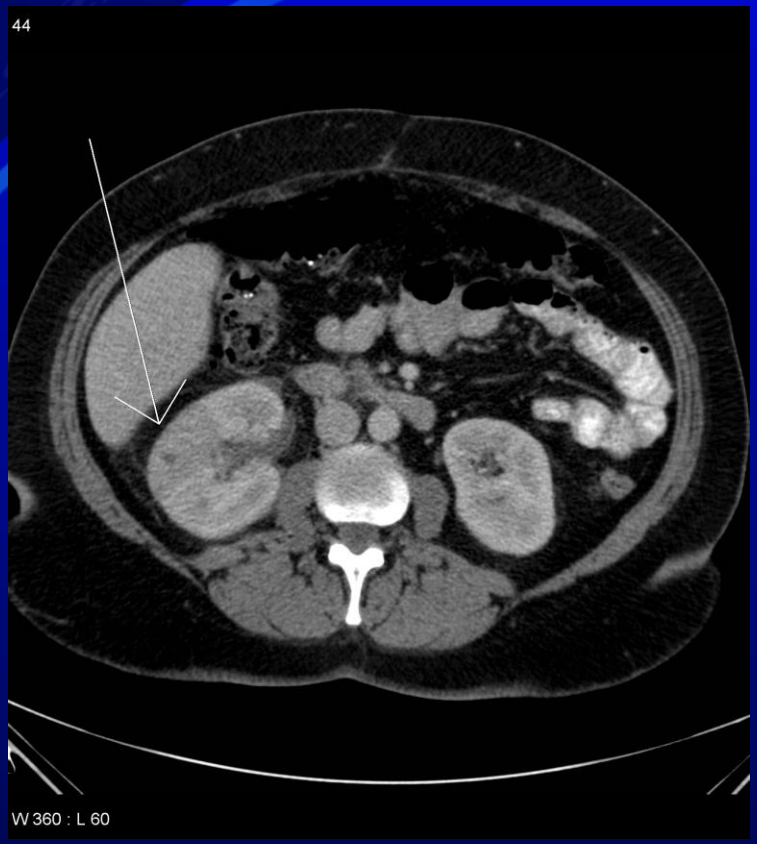
- Pyelonephritis
- Emphysematous Pyelonephritis
- Renal Abscess
- Perinephric abscess
- Xanthogranulomatous pyelonephritis

UTI: Clinical Symptoms & presentation

Acute pyelonephritis (upper UTI) in the adult:

- Fever, abdominal pain, vomiting.
- Dysuria ,frequency , and nocturia
- Flank or loin tenderness
- In elderly: symptoms are often atypical.
- Bacteremia is common
  - Signs and symptoms of dehydration, hypotension

Acute pyelonephritis



Treatment of Acute pyelonephritis

- **Mild infections are treated orally.**
  (fluoroquinolones,co-trimoxazole,cefuroxime)
- **Moderate - severe infections – parenteral trt.**
  (aminoglycosides,ceftriaxone,aztreonam,tazocin)
- **Therapy**→marked decline in bact.count after 48hrs.

- Persistant fever, +ve blood culture after 3 days of therapy..R/O obstruction, abscess.
- After defervescence..change to oral therapy to complete 2 weeks.
- In males look for a predisposing cause.
- FU urine cultures 2 weeks after end of therapy.

UTI: Upper Tract Disease

- Pyelonephritis
- **Emphysematous Pyelonephritis**
- Renal Abscess
- Perinephric abscess
- Xanthogranulomatous pyelonephritis

Emphysematous Pyelonephritis

- “An acute necrotizing parenchymal and perirenal infection cause by gas-forming uropathogen”
- 80% of women are diabetic
- Mainly E.coli infection
- Diagnosis by gas formation
- Broad-spectrum i.v. antibiotic therapy
- Nephrectomy (Therapy of choice)

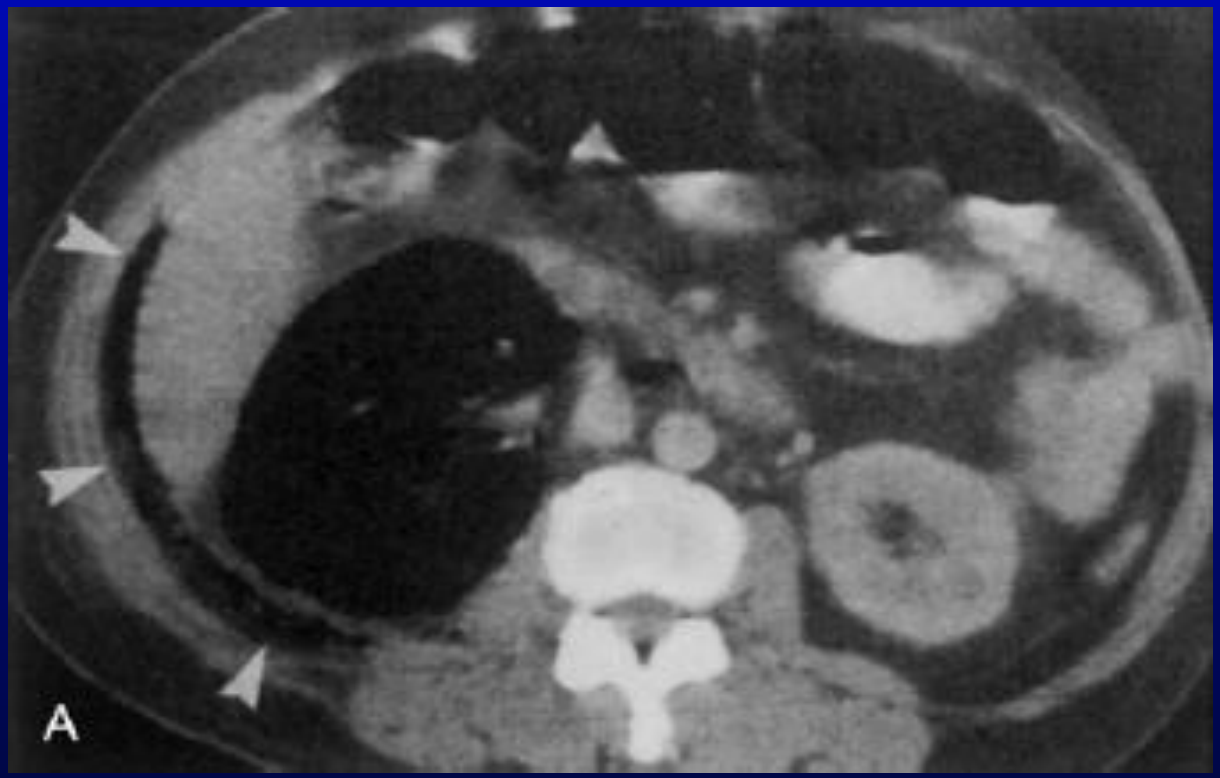
Emphysematous Pyelonephritis

Plain KUB film

- intraparenchymal gas
- extensiveperinephric gas

CTscan: emphysematous pyelonephritis

- complete renal destruction
- gas extend ออกมา beyond renal fascia

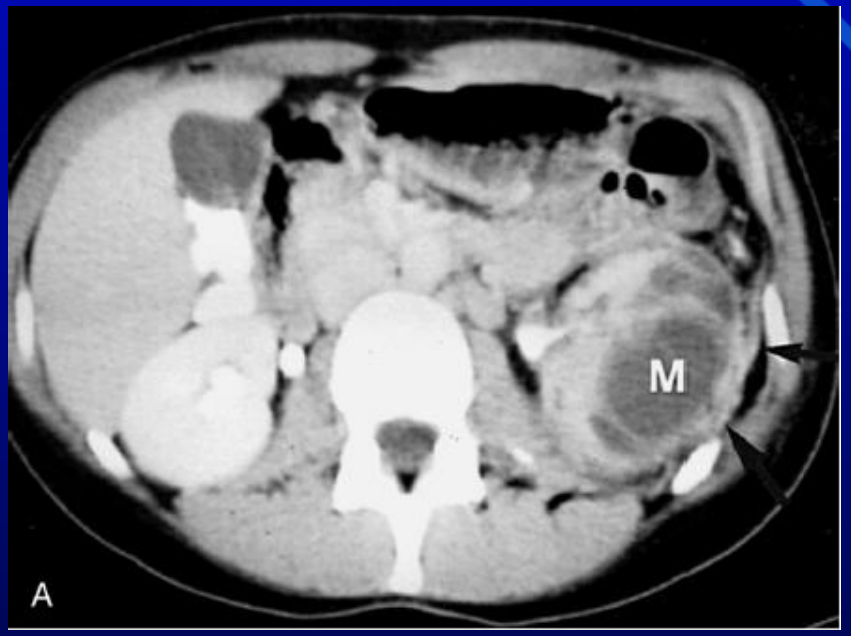


UTI: Upper Tract Disease

- Pyelonephritis
- Emphysematous Pyelonephritis
- **Renal Abscess**
- Perinephric abscess
- Xanthogranulomatous pyelonephritis

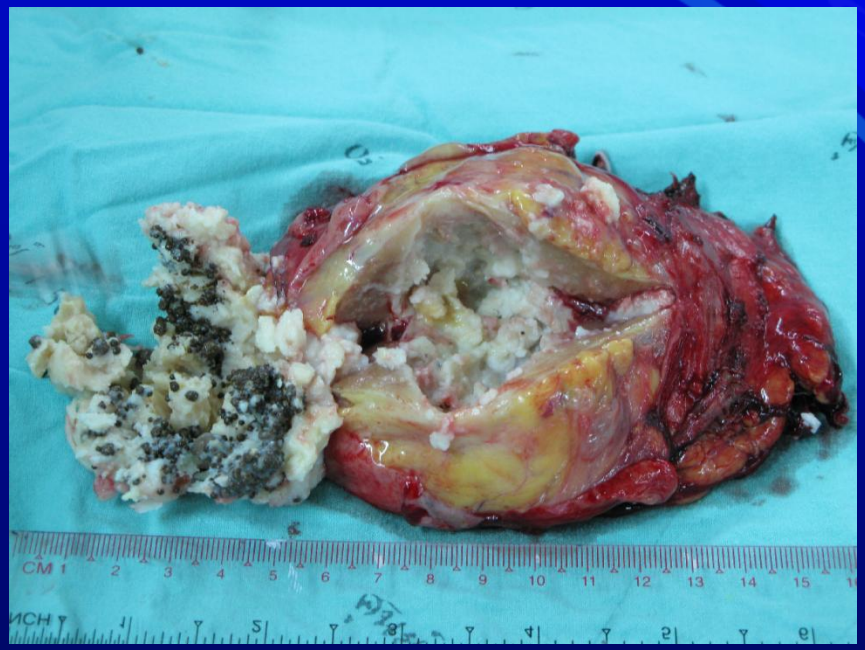
Renal Abscess

- "A collection of purulent material confined to the renal parenchyma"



CT-scan

Kidney Abscess



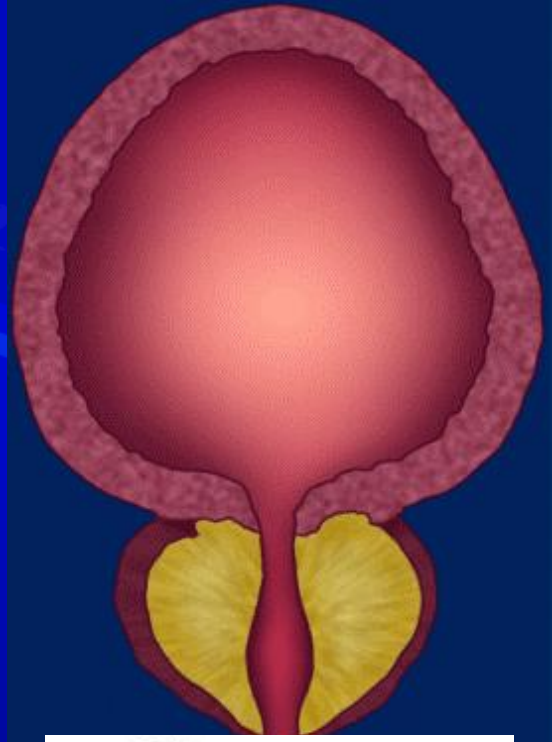
CLINICAL PRESENTATION OF UTI

Cystitis

Upper tract infections

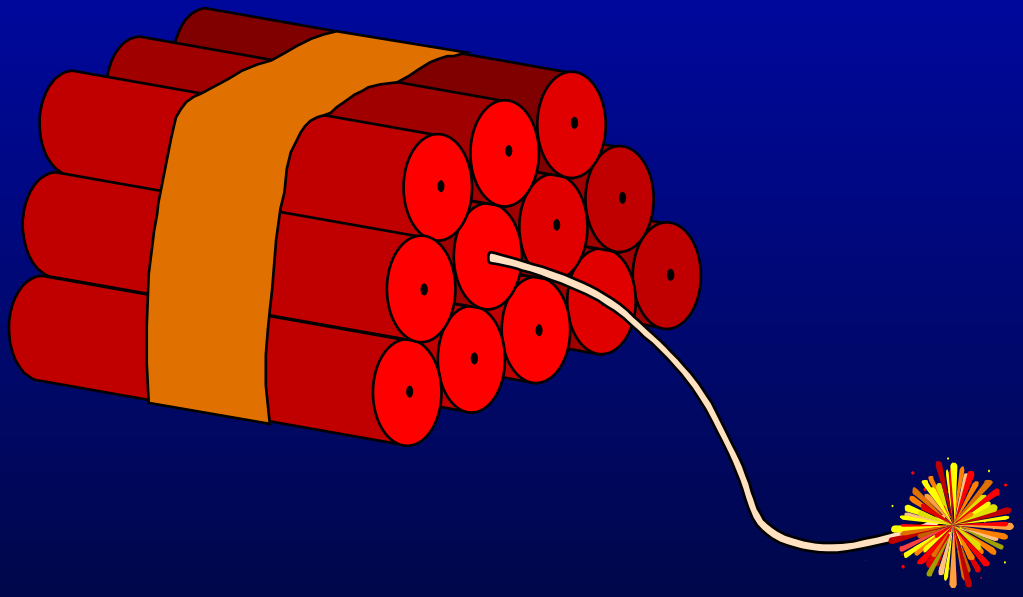
Lower tract infections

PROSTATE



- Acute bacterial prostatitis
- Prostatic abscess
- Chronic bacterial prostatitis
- Non-bacterial prostatitis
- Prostatodynia

EPIDIDYMOORCHITIS



ACUTE EPIDIDYMOORCHITIS

ACUTE EPIDIDYMOORCHITIS

1. SEXUALLY TRANSMITTED

- GC., *C.TRACHOMATIS*

2. NON-SEXUALLY TRANSMITTED

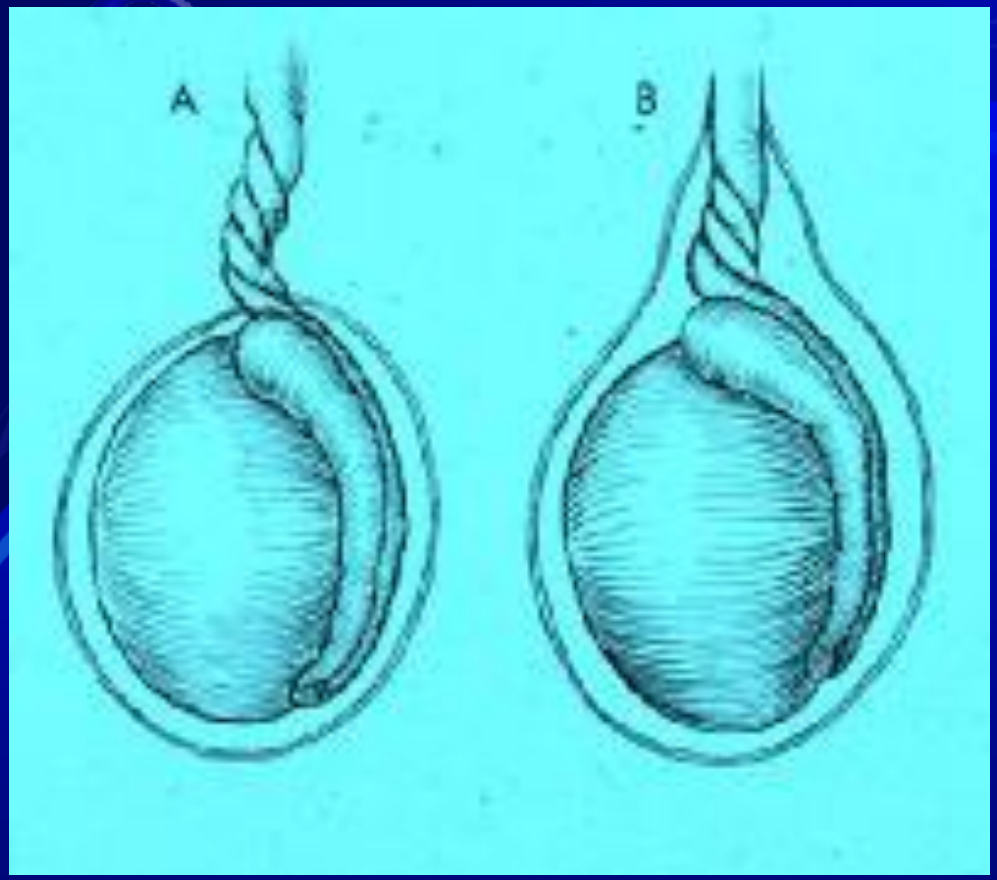
- UTI

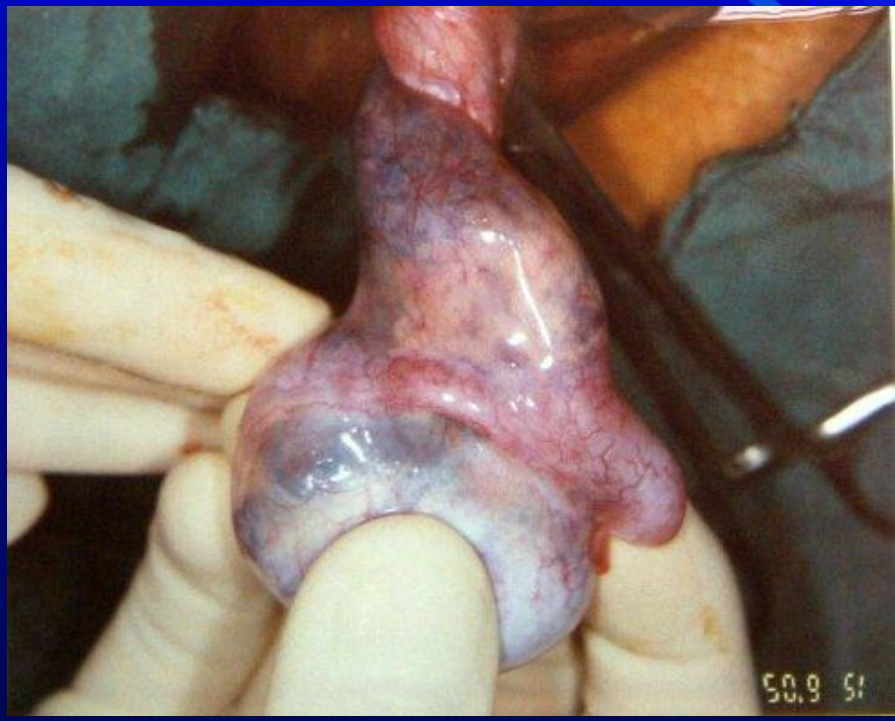
- PROSTATITIS

- MUMPS ORCHITIS

DIFFERENTIAL DIAGNOSIS

- **TORSION TESTES**
- **TORSION OF APPENDAGE OF TESTES**
- **TB. EPIDIDYMITIS**
- **TESTICULAR TRAUMA**


A
B



URINARY TRACT INFECTION (UTI)

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