

# Urinary tract infections (UTI)



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# Introduction

**INTRODUCTION**

**ACQUISITION AND ETIOLOGY OF UTI**

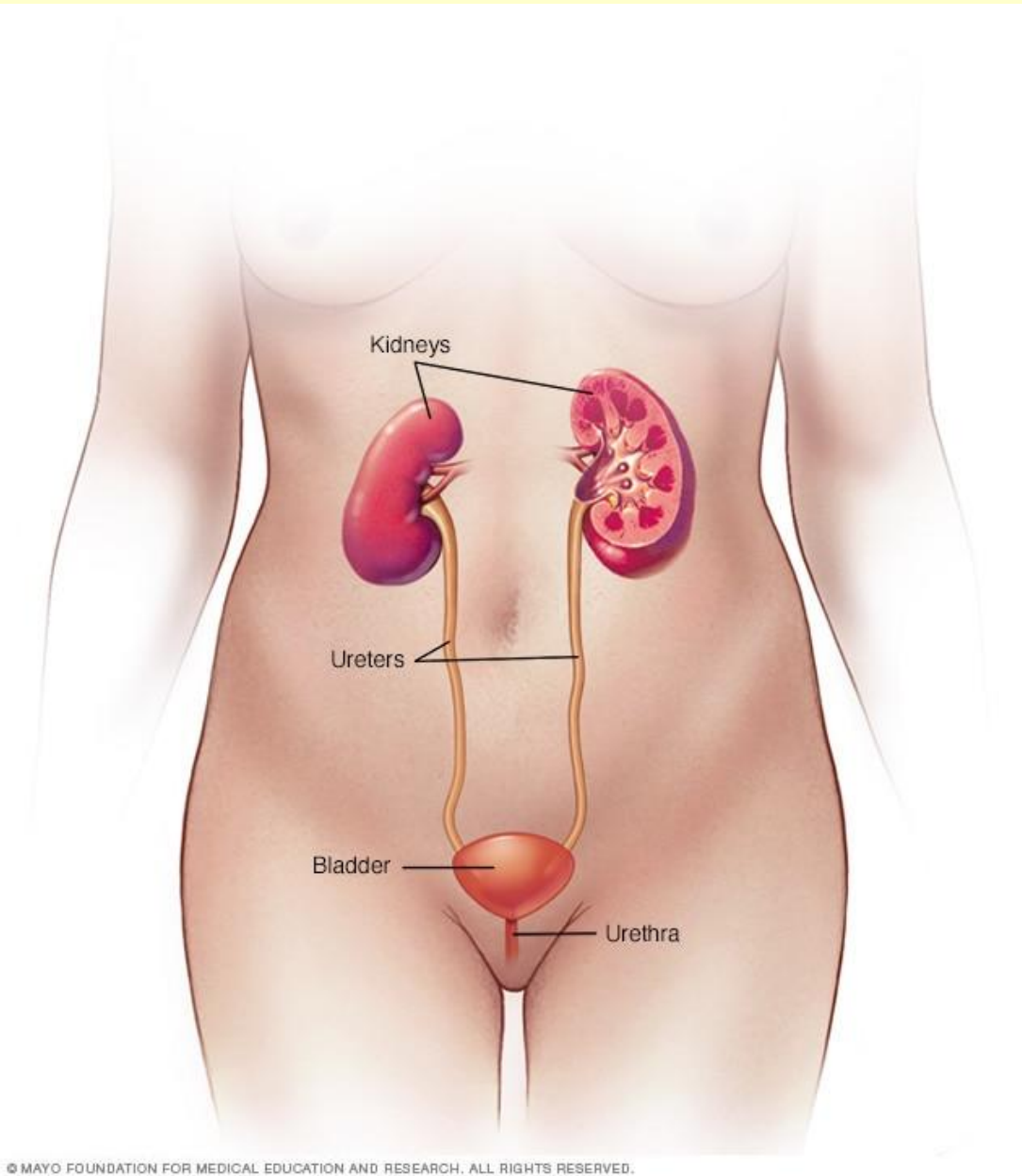
**PATHOGENESIS**

**CLINICAL FEATURES AND COMPLICATIONS**

**LABORATORY DIAGNOSIS**

**TREATMENT OF UTI**

**PREVENTION**



# Anatomy of urinary tract

# ***INTRODUCTION***

- \* The second most common infectious disease in the body**
- \* Women – up to 20% have UTI at some time in their life and a significant number of recurrent infections**

## ***ACQUISITION AND ETIOLOGY OF UTI***

- \* Ascending: urethra – bladder – kidney.**  
Occasionally bacteria infecting the UTI invade the bloodstream to cause **septicemia (urosepsis)**.
- \* Hematogenous: spread from any organ to the kidney.**

# **BACTERIAL ETIOLOGIC AGENS**

## **ASCENDING INFECTIONS**

\* Community acquired: *Escherichia coli*, other enterobacteria (e.g. *Proteus mirabilis* – often associated with urinary stones, it produce urease to produce ammonia, rendering the urine alkaline.)

*Staphylococcus saprophyticus* – young sexually active women

\* Health-care associated: e.g. *Klebsiella*, *Serratia*, *Pseudomonas*, *Enterococcus* their resistance favours their selection

**HEMATOGENOUS SPREAD:** *S. aureus*, *Salmonella Typhi*, *Mycobacterium tuberculosis*

# ***VIRAL ETIOLOGIC AGENTS***

**Polyomaviruses BK** and **JC** are **ubiquitous viruses** with high seroprevalence rates in general population. Following primary infection, polyomaviruses BK and JC **persist latently** in different sites, particularly in the **reno-urinary tract**. Reactivation from latency may occur in normal subjects with asymptomatic viruria, while it can be associated to **nephropathy (polyomavirus-associated nephropathy, PVAN) in kidney transplant recipients**. PVAN may occur in 1%-10% of renal transplant patients with loss of the transplanted organ in 30% up to 80% of the cases. Etiology of PVAN is mainly attributable to BK virus, although approximately 5% of the cases may be due to JC.

**Hantaviruses** – reservoir/rodents – benign or serious (fatality 10%)

# OTHER ETIOLOGIC AGENS

## Other bacteria

***Leptospira*** – reservoir/rodents, febrile infection, damage epithelium of blood vessels, renal and hepatic failure, Dg-serology, **therapy** - doxycycline

***M. tuberculosis*** – irregular leukocyturia, Dg- culture, PCR

## Yeast, fungi

***Candida spp.*** etiology around 7% of UTI.

All invasive fungi (e.g., *Cryptococcus neoformans*, *Aspergillus sp*, *Mucoraceae sp*, *Histoplasma capsulatum*, *Blastomyces sp*, *Coccidioides immitis*) may infect the kidneys as part of systemic or disseminated mycotic infection. Their presence alone indicates infection.

## Parasites

***Schistosoma hematobium*** result in inflammation of the bladder and commonly hematuria. The eggs penetrate the bladder wall (obstruction of the ureter can lead to hydronephrosis)

# ***FACTORS FAVOURING UTI***

## **Bacterial attributes**

- 1. Capsular antigens**
- 2. Hemolysins**
- 3. Urease**
- 4. Adhesions to uroepithelium - P fimbriae *E. coli***

## **Host factors**

- 1. Renal calculi**
- 2. Ureteric reflux (tumors, pregnancy, bladder stones, neurologic disorders – residual urine)**
- 3. Prostatic hypertrophy**
- 4. Short uretra**
- 5. Catheterization**



# ***PATHOGENESIS OF UTI***

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# ***LABORATORY DIAGNOSIS OF UTI***

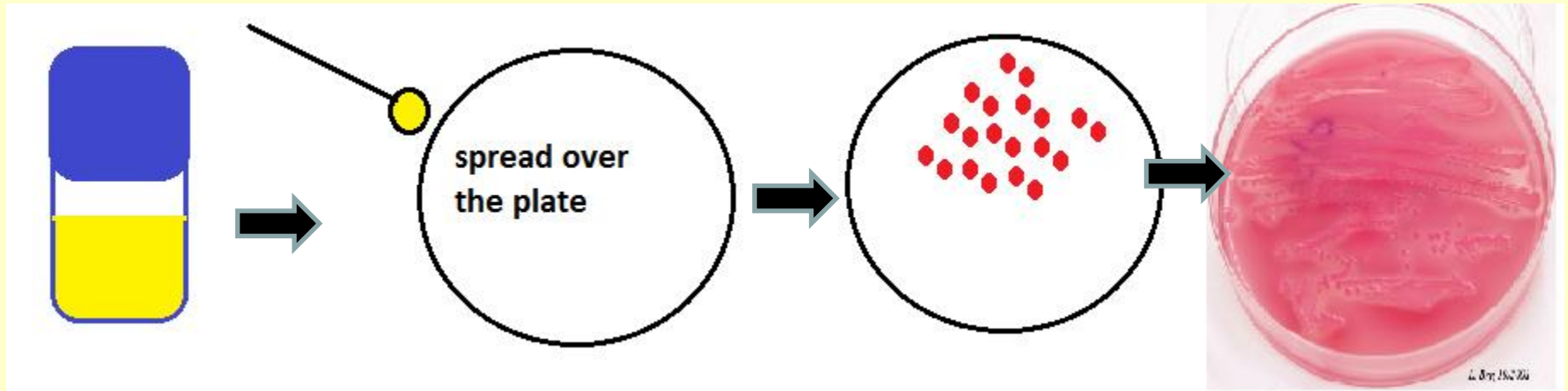
## **Specimen collection**

Distal uretra is colonized commensal –periurethral and faecal organisms

**Specimen transport** – middle stream urine after cleaning of external genitalia with water and soap, should be processed within 1 hour or held at 4C for not more than 18 hours

**Significant bacteriuria** – result and interpretation <  $10^3$  ml contamination (not infection), >  $10^5$  ml significant bacteriuria (infection), **exception** – this number is modified by the clinical situation, the sampling technique and the identity of the suspected pathogen, for example a CFU of  $10^2$  is considered significant when urine is sampled by suprapubic puncture, **upper urinary tract infections** – pyelonephritis could be lower

# LABORATORY DIAGNOSIS OF UTI



Urine

agar inoculation

10<sup>3</sup> bacteria/ml

10<sup>5</sup> bacteria/ml



Identifikace (MALDI TOF)



antibiotic  
susceptibility  
test

treatment

# ***TREATMENT OF UTI***

## **Lower UTI**

3 days – cotrimoxazol or quinolones

5 days – betalaktams (aminopenicillines, cephalosprins of 1st and 2nd generation) or nitrofurantoin

## **Upper UTI**

Pyelonephritis - 2 weeks one of the listed below:

cotrimoxazol, quinolones, betalaktams

(aminopenicillines, cephalosprins 2nd generation)