



# URINARY TRACT INFECTIONS

# OUTLINES

- Introduction
- Anatomy
- Resident Microflora
- Epidemiology
- Etiology
- Pathogenesis
- Risk factors
- Clinical presentation
- Laboratory Diagnosis



# INTRODUCTION

- The Genitourinary system include organs of the reproductive organs and urinary system
- A portal of entry
- All areas of UT above urethra are sterile
- Urine is sterile
- Urinary tract infection is the most common bacterial infection
- Serious problem in hospitals, cause morbidity
- Pathogens can travel up the ureters and reach the kidneys in a small minority of cases, causing renal damage and kidney failure
- Majority of infections are caused by bacteria, though some are fungal



# ANATOMY

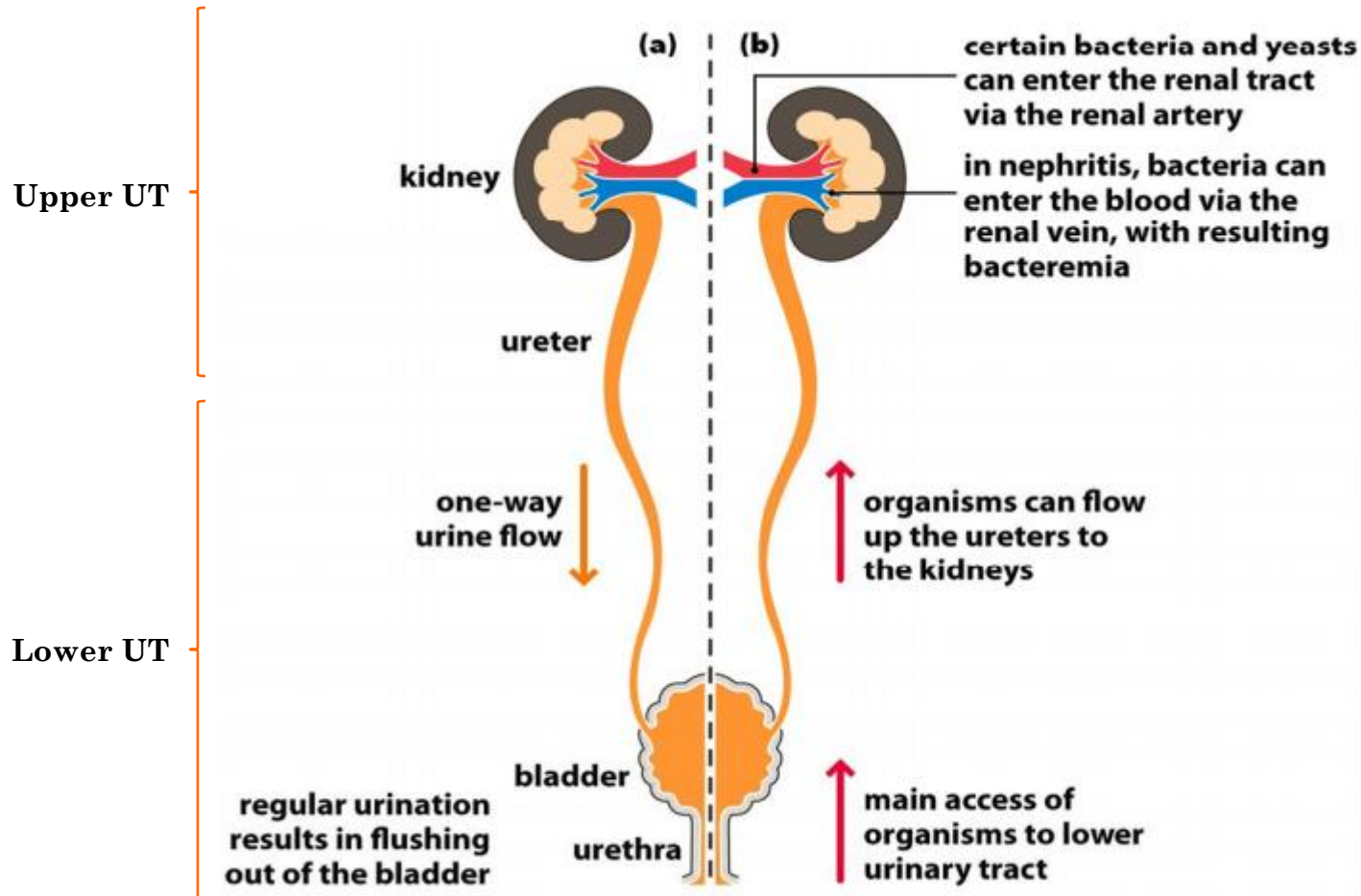


Figure 23.1 Microbiology: A Clinical Approach (© Garland Science)

# RESIDENT MICROFLORA

- Coagulase-negative staphylococci (excluding *S. saprophyticus*)
- Viridians & non-hemolytic streptococci
- Lactobacilli
- Diphtheroids (*Corynebacterium* spp.)
- Nonpathogenic *Neisseria* spp.
- Anaerobic cocci
- *Propionibacterium* spp.
- Anaerobic gram-negative bacilli
- Commensal *Mycobacterium* spp.
- Commensal *Mycoplasma* spp.



# EPIDEMIOLOGY

- Age and sex dependent
- KSA data (1995):
  - *Escherichia coli* (50.11%)
  - *Klebsiella* spp. (28.33%)
  - *Pseudomonas* spp. (7.84%)
  - *Proteus* spp. (4.91%)
  - *Enterococcus* spp. (3.98%), *Acinetobacter* spp., *Staphylococcus aureus*, *Enterobacter* spp., *Staphylococcus epidermidis*, *Haemolytic streptococci B* and *Salmonella paratyphi A*



# EITOLGY

## ○ Most frequent

- *Escherichia coli*
- *Enterobacteriaceae*
- *Enterococci*
- *Streptococcus agalactiae* (Gr B strept.)
- *Pseudomonas*
- *Streptococcus pyogenes* (Gr A strept.)
- *Staphylococcus aureus*
- *Staphylococcus saprophyticus*
- *Candida* species

## ○ Less frequent

- *Gardnerella vaginalis*
- *Ureaplasma urealyticum*
- *Mycoplasma hominis*
- *Mobiluncus*
- *Leptospira*
- *Mycobacterium* species
- *Chlamydia trachomatis*



# EITOLGY

## ○ Often associated with multisystem diseases

- *Schistosoma haematobium*
- *Cryptococcus neoformans*
- *Trichosporon beigeli*
- *Trichomonas vaginalis*
- Aspergillus
- Penicillium
- Adenovirus
- HSV





# PATHOGENESIS

- Routes of infection:
  - **Ascending**
  - Hematogenous
  - Lymphatic pathways
- The host-parasite relationship:
  - Host defense
    - Urine
    - Normal voiding
    - Bladder mucosal surface
    - Valvelike mechanism
    - Cytokines and complement cascade activation

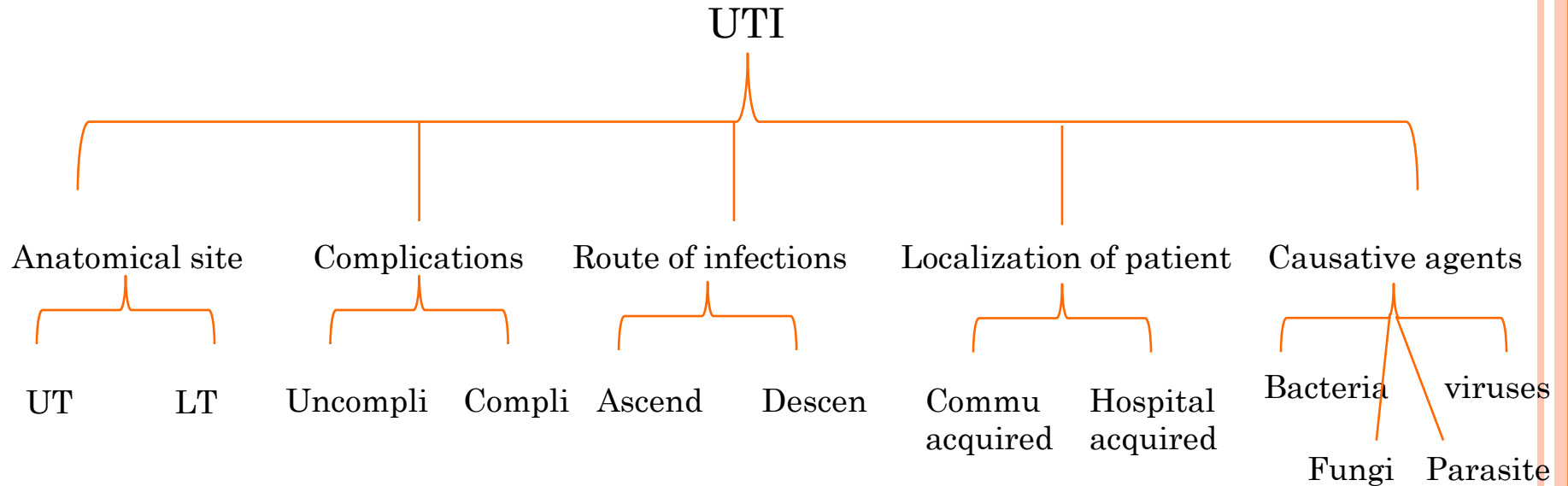


# RISK FACTORS

	Female	Male
All ages	<ul style="list-style-type: none"> <li>Previous UTI</li> <li>Urological instrumentation or surgery</li> <li>Urethral catheterization</li> <li>Urinary tract obstruction</li> <li>Neurogenic bladder</li> <li>Renal transplantation</li> </ul>	<ul style="list-style-type: none"> <li>Lack of circumcision</li> <li>Urological instrumentation or surgery</li> <li>Urethral catheterization</li> <li>Urinary tract obstruction</li> <li>Neurogenic bladder</li> <li>Renal transplantation</li> <li>Homosexuals</li> </ul>
Adults	<ul style="list-style-type: none"> <li>Sexual intercourse</li> <li>Spermicidal contraceptive jellies</li> <li>Diaphragm use</li> <li>Pregnancy</li> <li>Lower socioeconomic group</li> <li>Diabetes</li> <li>Kidney stones</li> <li>Sickle cell trait in pregnancy</li> <li>HIV +</li> </ul>	
Older age	<ul style="list-style-type: none"> <li>Estrogen deficiency</li> <li>Loss of vaginal lactobacilli</li> <li>Bladder prolapse</li> </ul>	<ul style="list-style-type: none"> <li>Functional &amp; mental impairment</li> <li>Prostatic enlargement</li> <li>Condom catheter drainage</li> </ul>



# TYPE OF INFECTIONS



# CLINICAL PRESENTATION

- Urethritis

- *Chlamydia trachomatis*
- *Trichomonas vaginalis*
- *Neisseria gonorrhoeae*

- Ureteritis

- Asymptomatic bacteriuria

- Cystitis

- Acute urethral syndrome

- Pyelonephritis

- Urosepsis



# LABORATORY DIAGNOSIS

- Specimen collection
  - Clean-catch Midstream Urine
  - Straight Catheterized Urine
  - Suprapubic Bladder aspiration
  - Indwelling Catheter
  - Specimen transport



# LABORATORY DIAGNOSIS

- Screening procedure
  - Gram stain
  - Pyuria
  - Indirect indices
  - Automated and semiautomated systems
- Urine culture
  - Inoculation and Incubation of Urine Culture
  - Interpretation of Urine Culture



# SETUP OF URINE CULTURE

- Setup
  - 1 Selective agar: MacConkey
  - 1 Nonselective agar: Blood
  - OR Bi-Plate



# URINE CULTURE PROCEDURE

- Inoculation using either a 0.001ml(x1000) OR a 0.01 ml (x100) loop onto selective/nonselective media, such as BA and MAC
- Dip calibrated loop into well-mixed urine. Quickly make a single streak down the middle of the BA with the loop containing urine
- Streak back and forth across the plate perpendicular to the original inoculum, this creates a “lawn”
- With the same calibrated loop, do the same with the MAC plate
- Incubate at 35°C for 24-48 hours





# INTERPRETATION OF URINE CULTURES

- If no growth:
  - At 24 hours:
    - Preliminary report: no growth at 24 hours
    - Reincubate plates
  - At 48 hours:
    - Final report: no growth at 48 hours
    - Discard plates



# INTERPRETATION OF URINE CULTURES

- If there is growth
  - BA only: rules out the enteric GNR's, colonies may be GPC, GPR, GNDC
  - BA and MAC: most likely an enteric GNR or Pseudomonas.
  - If multiple colony types, a gram stain must be done.



# INTERPRETATION OF URINE CULTURES

- general interpretive guidelines for urine culture

Table 73-2

