



M15 -Urogenital and sexually-transmitted infections

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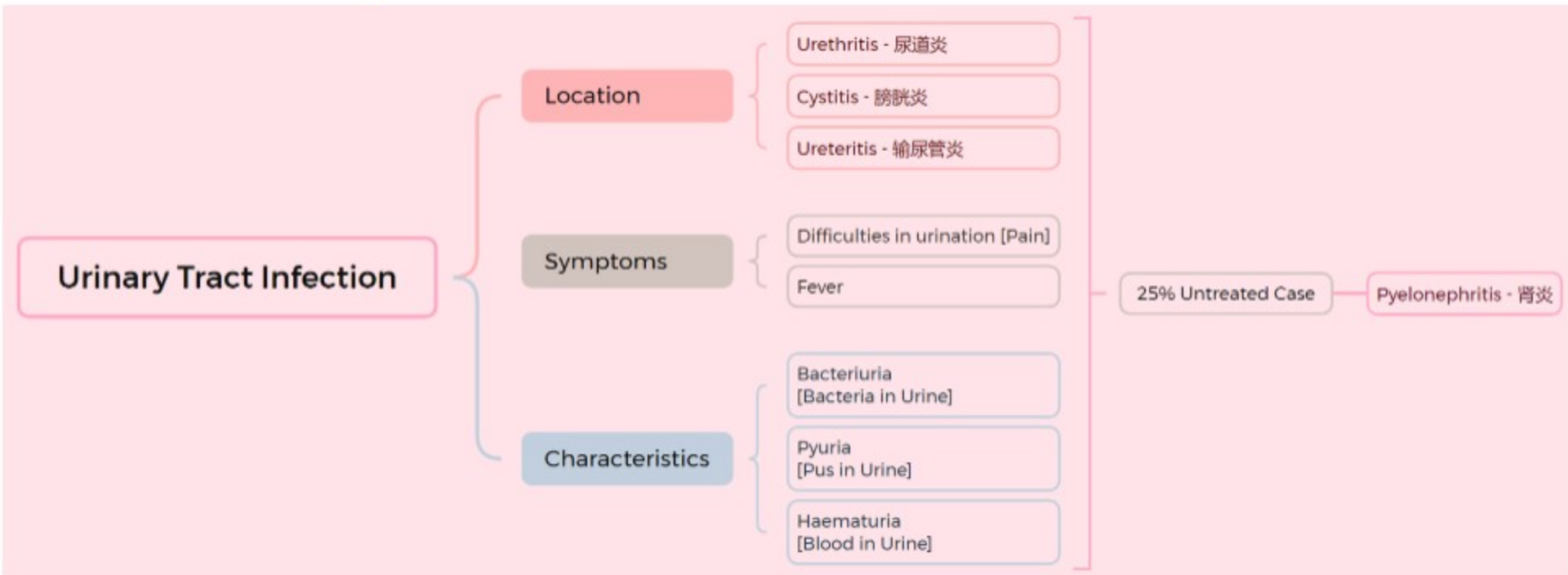
Learning Objectives

- Know what significant bacteriuria and pyuria are and the locations and names of different types of UTIs
- Name the common bacteria causing UTI and their likely sources
- Explain the laboratory diagnosis of UTI
- Know how to collect urine samples properly
- Describe the approach to a patient with an STI
- List the
  - Etiologic agents
  - Symptoms
  - Methods for diagnosis
  - Treatments
- Appreciate that STIs always infect more than one patient

Introduction to the Urogenital Infections

Urinary microbiome **Firmicutes and Bacteroidetes** account for most of the bacterial representations.  
A **disturbance of bacterial representation [Mostly Enterobacteria]** and diversity **triggers a transition from health to disease.**

Clinical Features of Urogenital Infections



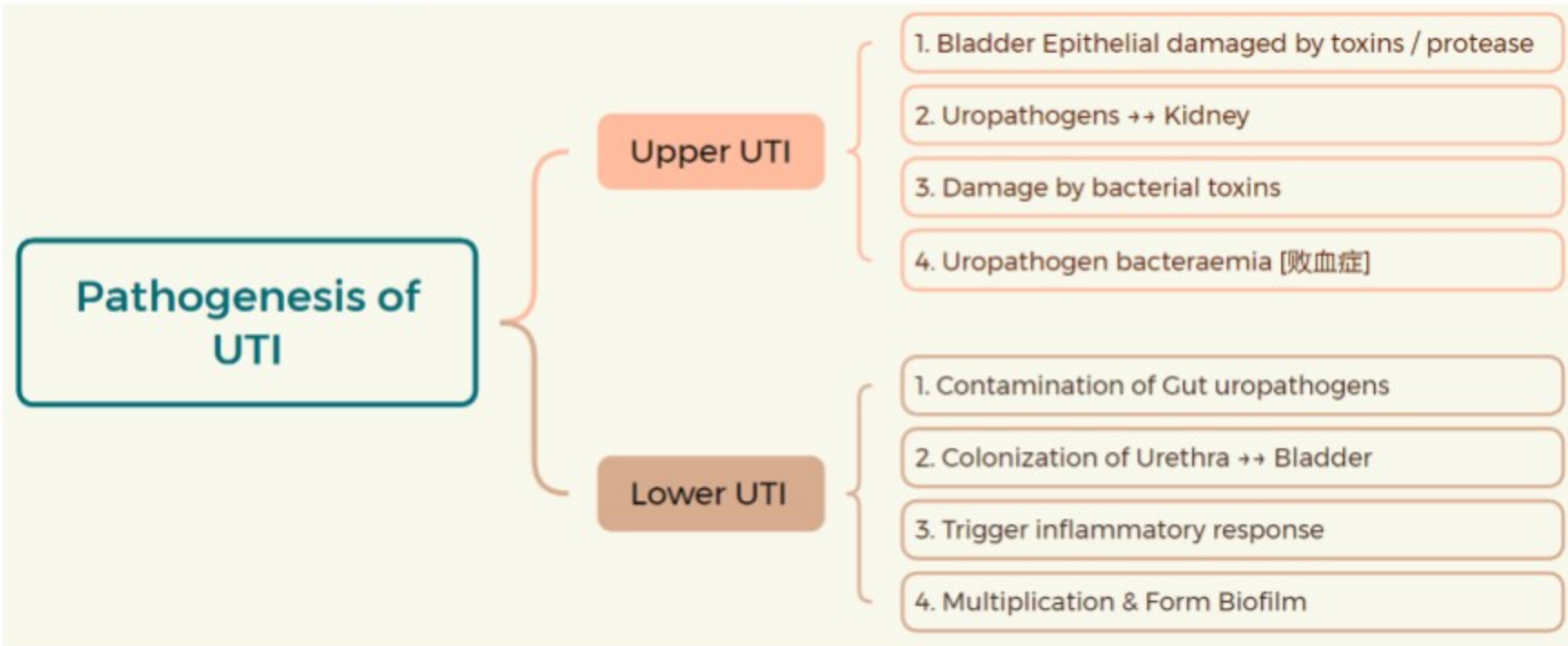
- Text Version
- Urinary Tract Infection  
25% of Untreated case → Pyelonephritis
- Location
    - Urethritis - 尿道炎
    - Cystitis - 膀胱炎
    - Ureteritis - 输尿管炎
  - Symptoms
    - Difficulties in urination [Pain]
    - Fever
  - Characteristics
    - Bacteriuria
    - Pyuria
    - Haematuria

Common Urinary Tract Infection Pathogens

Most of the Urinary Tract Infection Pathogens are Enterobacteria

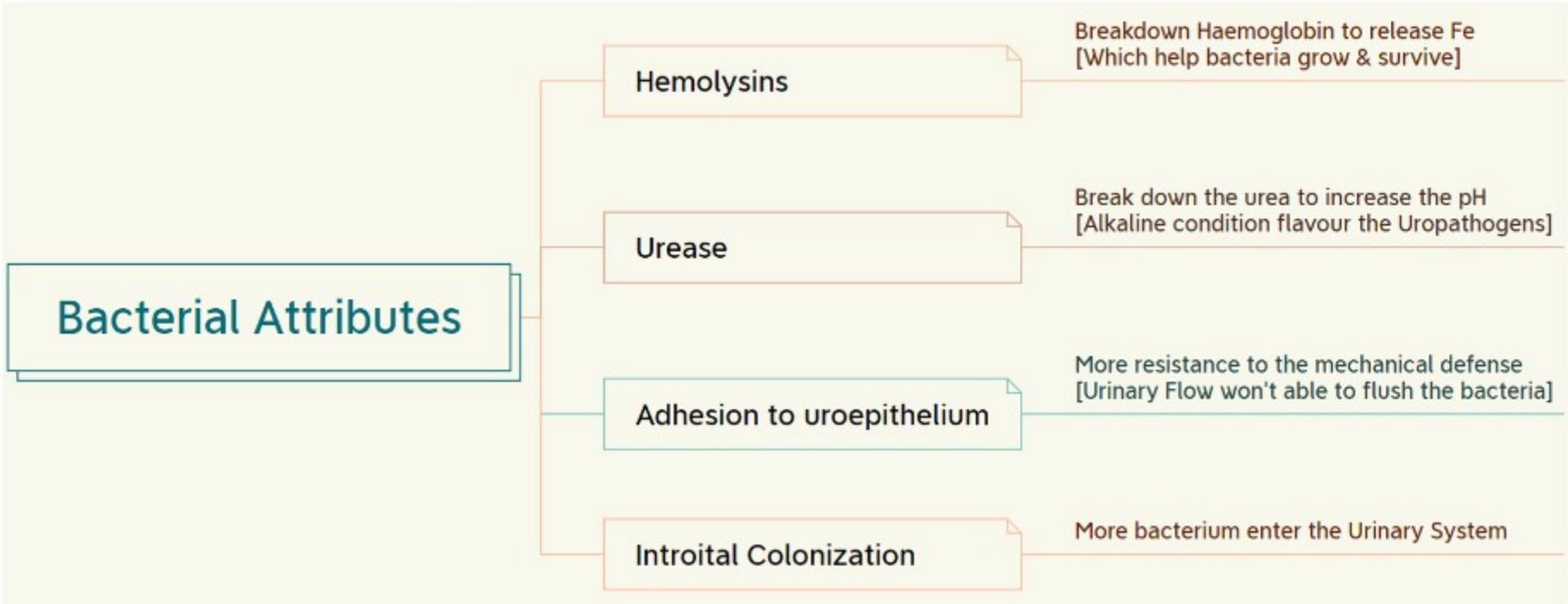
	Community patients	Hospital patients
1st Common	Escherichia coli	Escherichia coli
2nd Common	Staphylococci	Klebsiella Enterobacter Serratia Pseudomonas
3rd Common	Candida	G+ cocci / Proteus

Pathogenesis of Urinary Tract Infection Pathogens



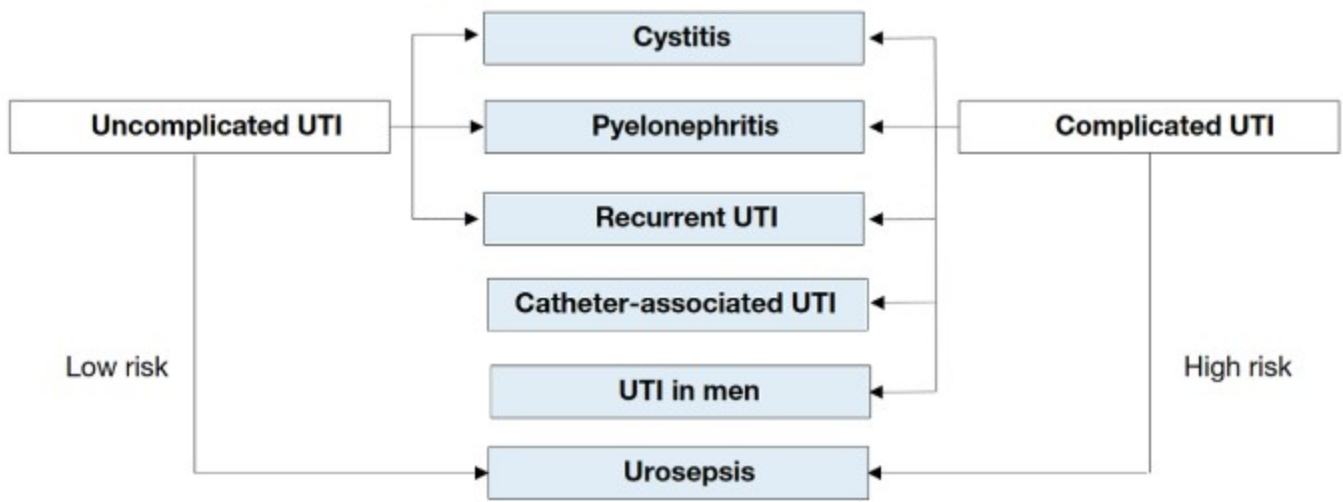
- Text Version
- Upper UTI
    - 1. Bladder Epithelial damaged by toxins / protease
    - 2. Uropathogens → Kidney
    - 3. Damage by bacterial toxins
    - 4. Uropathogen bacteraemia (败血症)
  - Lower UTI
    - 1. Contamination of Gut uropathogens
    - 2. Colonization of Urethra → Bladder
    - 3. Trigger inflammatory response
    - 4. Multiplication & Form Biofilm

Bacterial Attributes & Pathogenesis



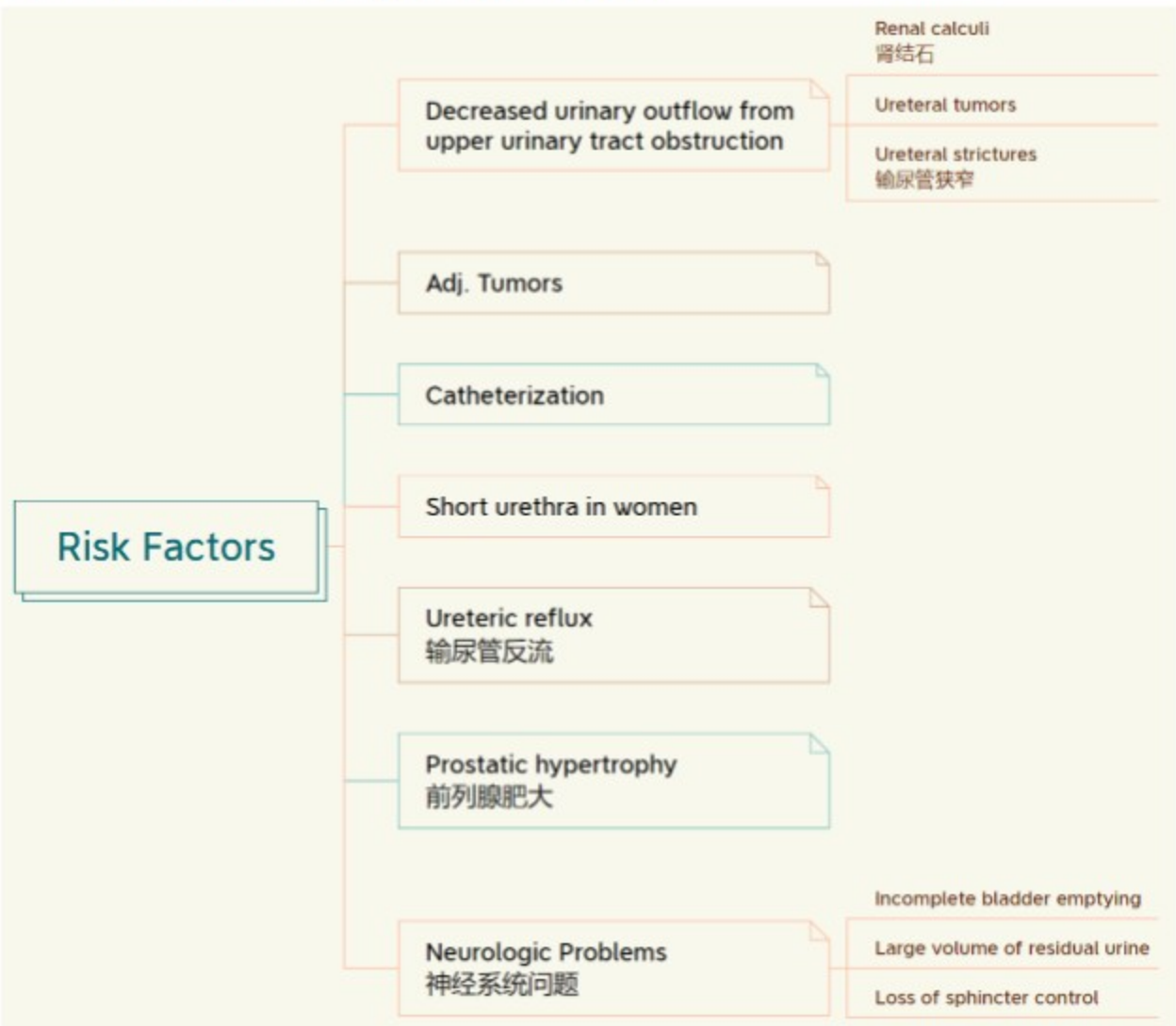
- Text Version
- Hemolysins

Classification of Urinary Tract Infections



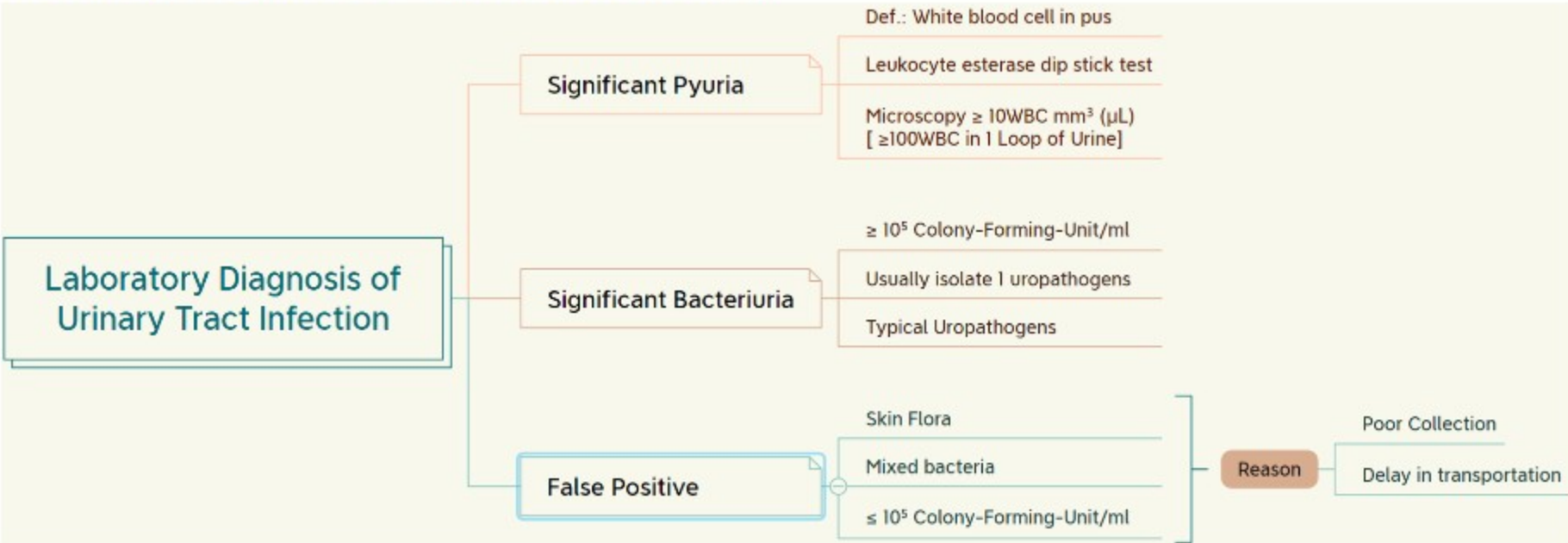
Uncomplicated UTIs	- Acute, sporadic - Uncomplicated cystitis, and/or - Uncomplicated pyelonephritis - Limited to non-pregnant women with no known abnormalities.
Complicated UTIs	急性、散发性或目前的下尿路感染（无复杂性膀胱炎）和/或上尿路感染，仅限于未怀孕的妇女，其尿路内没有已知的相关解剖和功能异常或异常。 - All Apart from uncomplicated. - Increased chance of a complicated course - Cause: Indwelling urinary catheters, renal diseases, immunocompromising diseases
Recurrent UTIs	极大机会出现复杂的医疗情况；原因：导尿管堵塞、肾脏疾病、免疫功能低下疾病 A frequency of at least three UTIs per year or two UTIs in the last six months.
Catheter-associated UTIs	Urinary tract is currently catheterized or has had a catheter in place <b>within the past 48 hours</b> .
Urosepsis 尿路败血症	By Dysregulated host response to infection originating from the urinary tract / genital organs. 病因宿主对来自泌尿道和/或男性生殖器官感染的反应失调。

Risk Factors & Urinary Tract Infection



- Text Version
- Decreased urinary outflow from upper urinary tract obstruction
    - Renal calculi  
肾结石
    - Ureteral tumors
    - Ureteral strictures  
输尿管狭窄
  - Adj. Tumors
  - Catheterization
  - Short urethra in women
  - Ureteric reflux  
输尿管反流
  - Prostatic hypertrophy  
前列腺肥大
  - Neurologic Problems  
神经系统问题
    - Incomplete bladder emptying
    - Large volume of residual urine
    - Loss of sphincter control

Laboratory Diagnosis of Urinary Tract Infection



- Text Version
- Significant Pyuria
    - Def.: White blood cell in pus



- Breakdown Hemoglobin to release Fe [Which help bacteria grow & survive]
- Urease
  - Break down the urea to increase the pH [Alkaline condition flavors the Uropathogens]
- Adhesion to uroepithelium
  - More resistance to the mechanical defense [Urinary Flow won't able to flush the bacteria]
- Introital Colonization
  - More bacterium enter the Urinary System

- Leukocyte esterase dip stick test
  - Microscopy ≥ 10WBC mm³ (µL) [ ≥100WBC in 1 Loop of Urine]

	True Positive	False Negatives
CFU/ml	≥ 10 <sup>5</sup>	≤ 10 <sup>2</sup>
Number of Type	Usually one	Mixed bacteria
Type	Typical Uropathogens	Skin Flora

Introduction to Sexually Transmitted Infections [STI]

Accurate Diagnosis → Compliance → Treatment on epidemiological → Follow up → Screening and contact tracing → Education

Remarks: 精确的诊断 → 遵守治疗 → 基于流行病学的治疗 → 后续随访 → 筛查和接触者追踪 → 教育

- 💡 Remarks:
- Diseases that are transmitted mainly, but **NOT EXCLUSIVELY**, by sexual contact
  - STI can be transmitted through **Horizontal Transmission & Vertical Transmission**
  - **History Contact is important → Prevent re-infection & Break the chain of transmission → Treat Asymptomatic Infection**

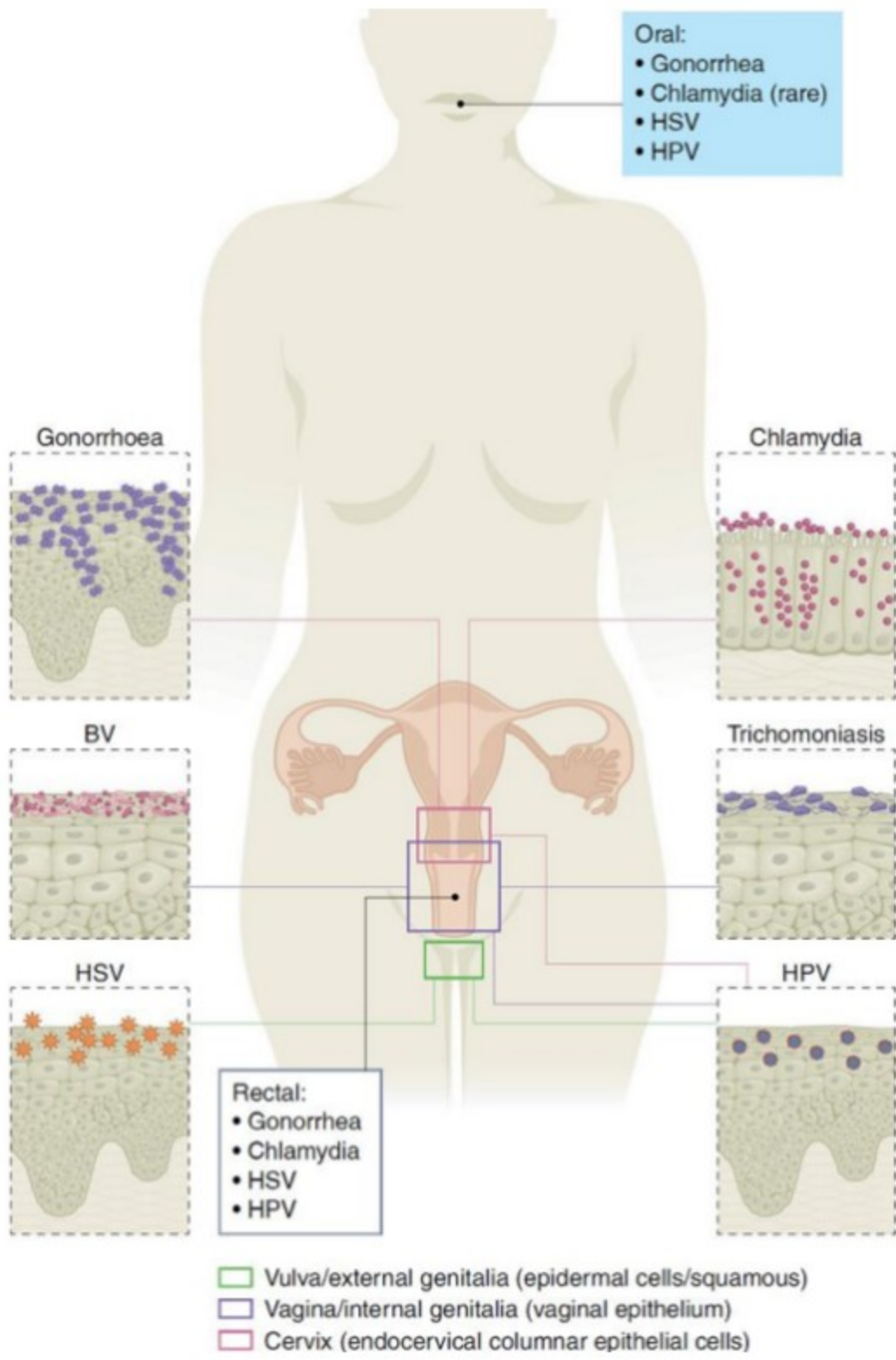
Most common STI

Pathogen	Disease	Chinese Translation	Treatment	Remarks
Chlamydia trachomatis (D-K serotypes)	Non-specific UTI	非特异性尿道炎	Doxycycline, azithromycin	
Trichomonas vaginalis (Parasites)	Vaginitis, urethritis	阴道炎、尿道炎	Metronidazole	
Neisseria gonorrhoeae	Gonorrhea	淋病	Common antibiotic	
HIV	AIDS	艾滋病	HAART	
Papillomavirus	Genital warts	生殖器湿疣	Surgical	HPV16, HPV 18 → cervical cancer (子宫颈瘤)
Herpesvirus [HSV-2/HSV-1]	Genital herpes	生殖器疱疹	Acyclovir	Latency 潜伏性
Treponema pallidum	Syphilis	梅毒	Penicillin	
C. trachomatis (L1, L2, L3 serotypes)	Lymphogranuloma venereum	性病淋巴结瘤	Doxycycline, erythromycin	Tropical regions
Candida albicans	Vaginal thrush	阴道鹅口疮	Nystatin, fluconazole	Predisposing factors 诱发因素
HBV	Hepatitis	肝炎	Lamivudine	Male homosexual
Hemophilus ducreyi	Chancroid	甲状旁腺疳积	Erythromycin	Mainly tropical

Female anatomical sites affected by more common STIs

Pathogens	Infected Location	Located Cell Type
Gonorrhoea	- Cervix - Oral - Rectal	Intermediate endocervical columnar epithelial cells
Chlamydia	- Cervix - Oral [Rare] - Rectal	Basal endocervical columnar epithelial cells
Bacterial vaginosis	- Vagina / Internal genitalia	Vaginal Epithelium
Trichomoniasis	- Vagina / Internal genitalia	Vaginal Epithelium
HSV	- Vulva / External Genitalia - Oral - Rectal	Epidermal Cell Squamous Epidermal Cell
HPV	- Vulva / External Genitalia - Oral - Rectal	Epidermal Cell Squamous Epidermal Cell

- ▼ Remarks:
- Gonorrhoea and chlamydia typically present as cervicitis 淋病和衣原体通常表现为宫颈炎
  - Bacterial vaginosis (BV) and trichomoniasis **CAN ALSO cause cervicitis**, but more commonly manifest as vaginitis. 细菌性阴道病 (BV) 和滴虫病也会引起宫颈炎，但更常见的表现为阴道炎。
  - HSV and HPV most typically affect the vulva or external genitalia of women HSV 和 HPV 最常影响女性的外阴或外生殖器官



More About Sexually Transmitted Infections

Neisseria Gonorrhoeae



- Neisseria spp. is **diplococci β-hemolytic**
- Need to be cultured in **Thayer-Martin medium culture**



Gonorrhoea

Male Patients	Female Patients
Painful urination	Initial: Asymptomatic
Discharge of pus	Later: Spread to the fallopian tubes [ Salpingitis ] 扩散到输卵管[输卵管炎]
Blockage of the urethra	Important reservoirs → Multiple sexual partners
Sterility	

Nongonococcal Urethritis (NGU)

NGU is any inflammation of the urethra **NOT CAUSED by N. gonorrhoeae**.

Pathogens	- Chlamydia trachomatis (L1, L2, L3 serotyps) - Ureaplasma urealyticum - Mycoplasma hominis
Symptoms	- Milder than Gonorrhoea - Urethral discharge - Dysuria
Complications	- Salpingitis - Sterility

Treponema pallidum / Spirochete - Syphilis

- Cannot be cultured in vitro
1. Fluorescent treponemal antibody-absorption test
  2. VDRL test - By using Patient's serum

- Initial Infection
  - Multiplication of treponemes at site of infection
- Primary syphilis
  - Proliferation of treponemes in regional lymph nodes
- Secondary syphilis
  - Multiplication and production of lesions in lymph nodes, liver, muscle, skin and mucous membrane
- Latent Syphilis
  - Treponemes dormant in liver and spleen
- Tertiary Syphilis

Transmission Method	Direct contact of intact mucous membrane
	Direct contact of breaks in skin with lesions
Primary	Lesion: Chancre [A firm, painless ulcer] Chancre can heals spontaneously, without treatment Invade the blood & lymphatic system Enlarged inguinal lymph nodes
Secondary	Flu-like illness Generalized Mucocutaneous rash on skin Myalgia - 肌肉痛 Headache, Fever
Tertiary	Neurosyphilis Cardiovascular syphilis Progressive destructive disease



Chancre



Generalized Mucocutaneous rash on skin

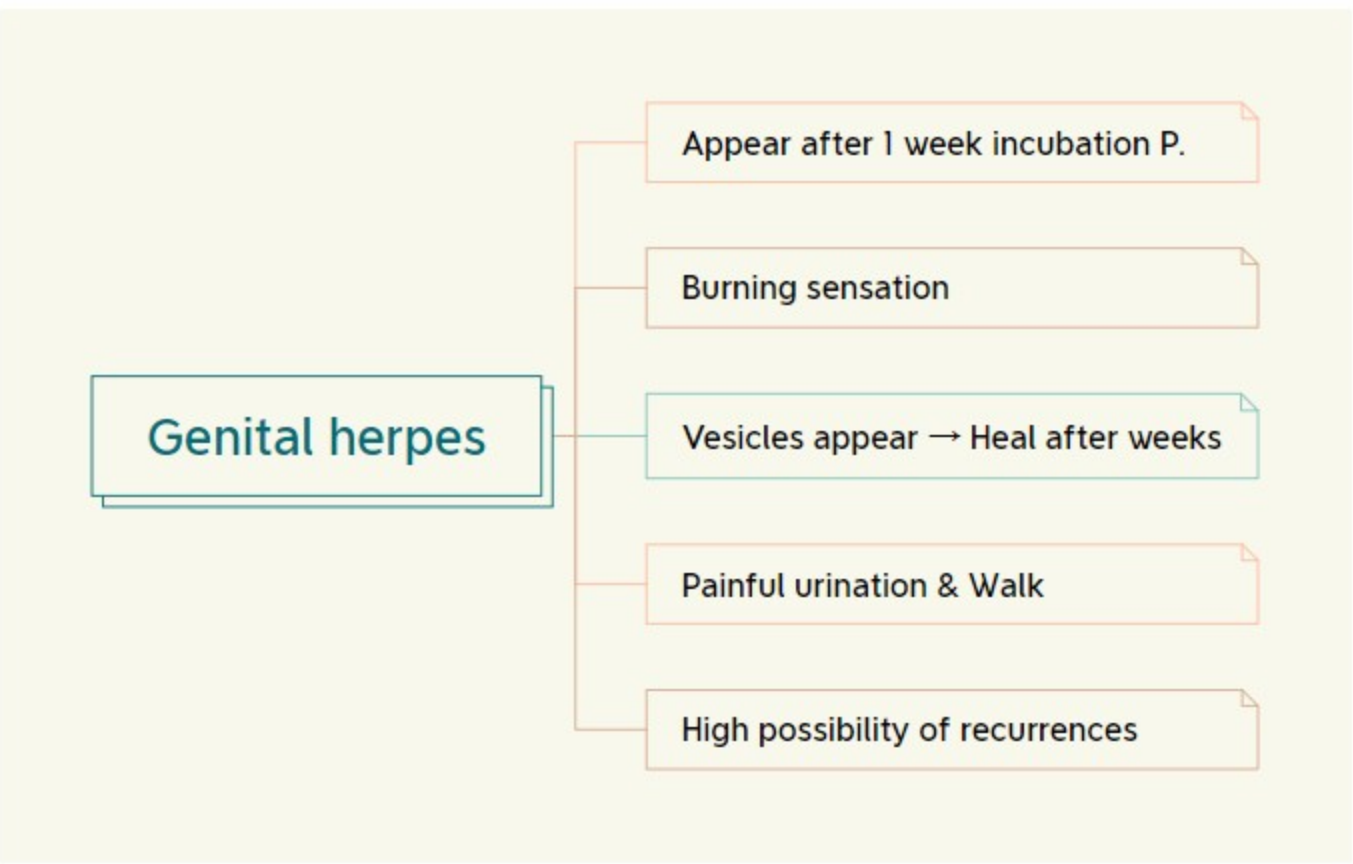
- ▼ Remarks:
- Not to be confused with chancroid, which is typically very, very painful and is caused by Haemophilus ducreyi.

Viral Sexually Transmitted Infections

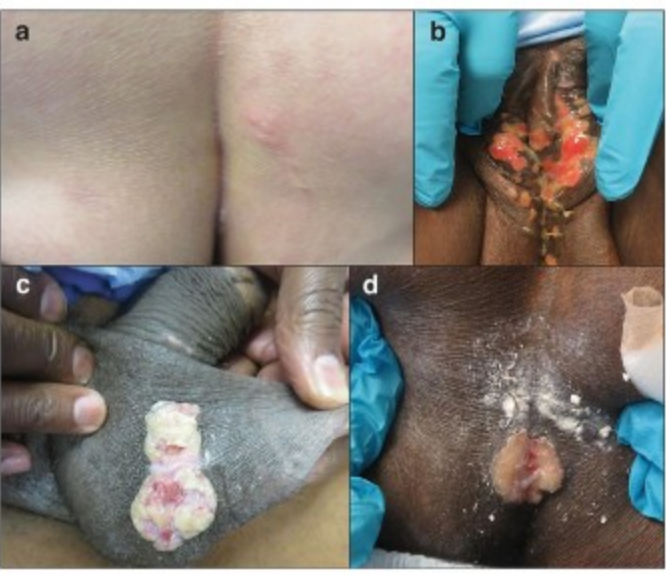


Herpesvirus - Genital herpes

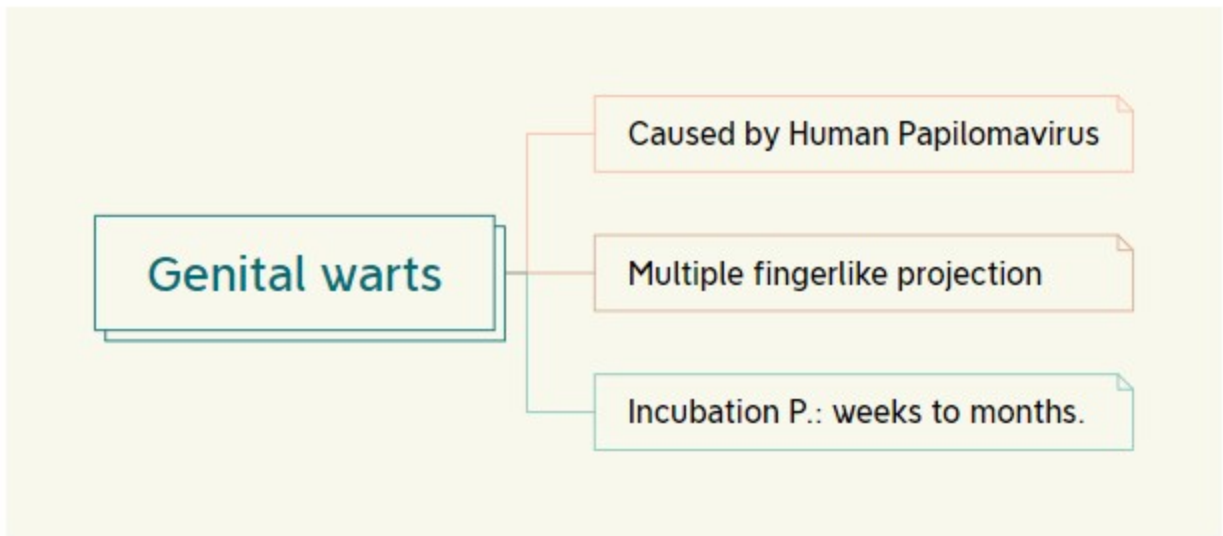
HSV-2 is more common than HSV-1



- Text Version
- Lesions appear after an incubation period of about 1 week and cause a burning sensation.
  - Vesicles appear.
  - Painful urination and discomfort while walking.
  - Vesicles usually heal in a couple of weeks.
  - About 88% of HSV-2 patients and 50% of HSV-1 patients will have recurrences in 3-6 month intervals.



Human Papillomavirus - Genital warts



- Text version
- Genital warts are caused by papillomaviruses.
  - Warts are multiple fingerlike projections
  - The incubation time is weeks to months.
  - Leads to cervical cancer

