



Cystitis

Renal Block

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Objectives

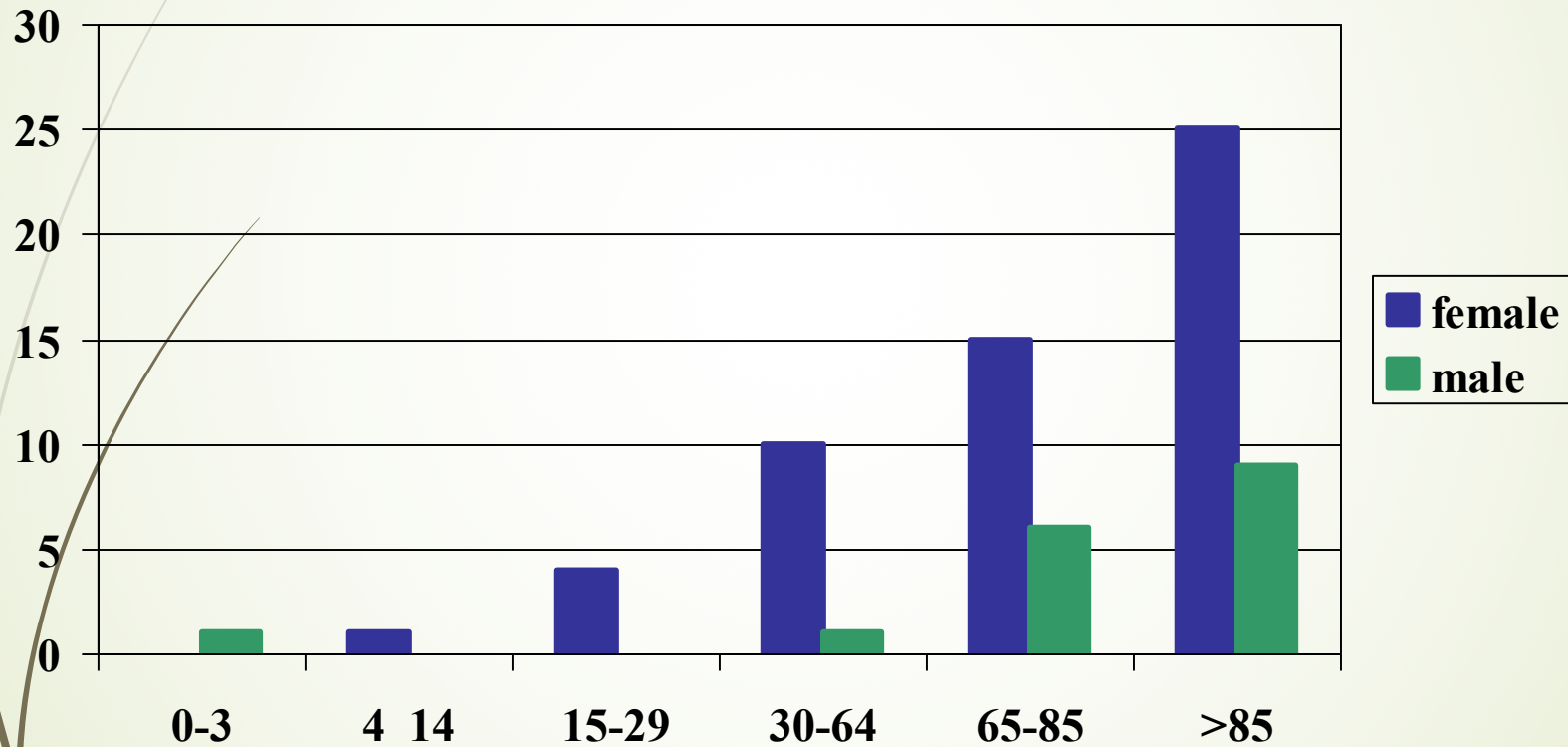
- 1- Define the term cystitis and recall who commonly gets cystitis.
- 2- Describe the pathogenesis and risk factors of cystitis.
- 3- List the most common causative organisms of cystitis
- 4- Recall the different types of cystitis (infectious and non-infectious).
- 5- Describe the clinical presentation of cystitis
- 6- Describe the laboratory diagnosis of cystitis
- 7- Recall the antimicrobial agents suitable for the treatment and prevention of cystitis.



Introduction

- Urinary Tract infection (UTI) divided into upper and lower urinary tract infections
- Patient presents with urinary symptoms and significant bacteriuria= 10^5 bacteria/ml
- Asymptomatic bacteriuria when the patient presents with significant bacteria in urine but without symptoms

Prevalence of Bacteriuria in different age groups



Classification

Lower UTIs

Cystitis (infection of the bladder; superficial mucosal infections)

Urethritis (sexually transmitted pathogens)

- urethritis in men & women

Prostatitis and Epididymitis

Upper UTIs Acute pyelonephritis

Chronic pyelonephritis

Uncomplicated UTI (empirical therapy is possible)

Complicated UTI (nosocomial UTI, relapses, structural or functional abnormalities)



Pathogenesis of cystitis

- Due to frequent irritation of the mucosal surfaces of the urethra and the bladder.
- Infection results when bacteria **ascends** to the urinary bladder . These bacteria are residents or transient members of the perineal flora, and are derived from the large intestine flora.
- Toxins produced by uropathogens.
- **Conditions that create access to bladder are:**
 - Sexual intercourse due to short urethral distance.
 - Catheterization of the urinary bladder , instrumentation



Pathogenesis of cystitis

- ▶ **Haematogenous** through blood stream from other sites of infection (less common).
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Cystitis



- ▶ **In women :** cystitis is common due to a number of reasons:
 - Short urethra
 - Pregnancy
 - Decreased estrogen production during menopause.
- ▶ **In men:** mainly due to persistent bacterial infection of the prostate.

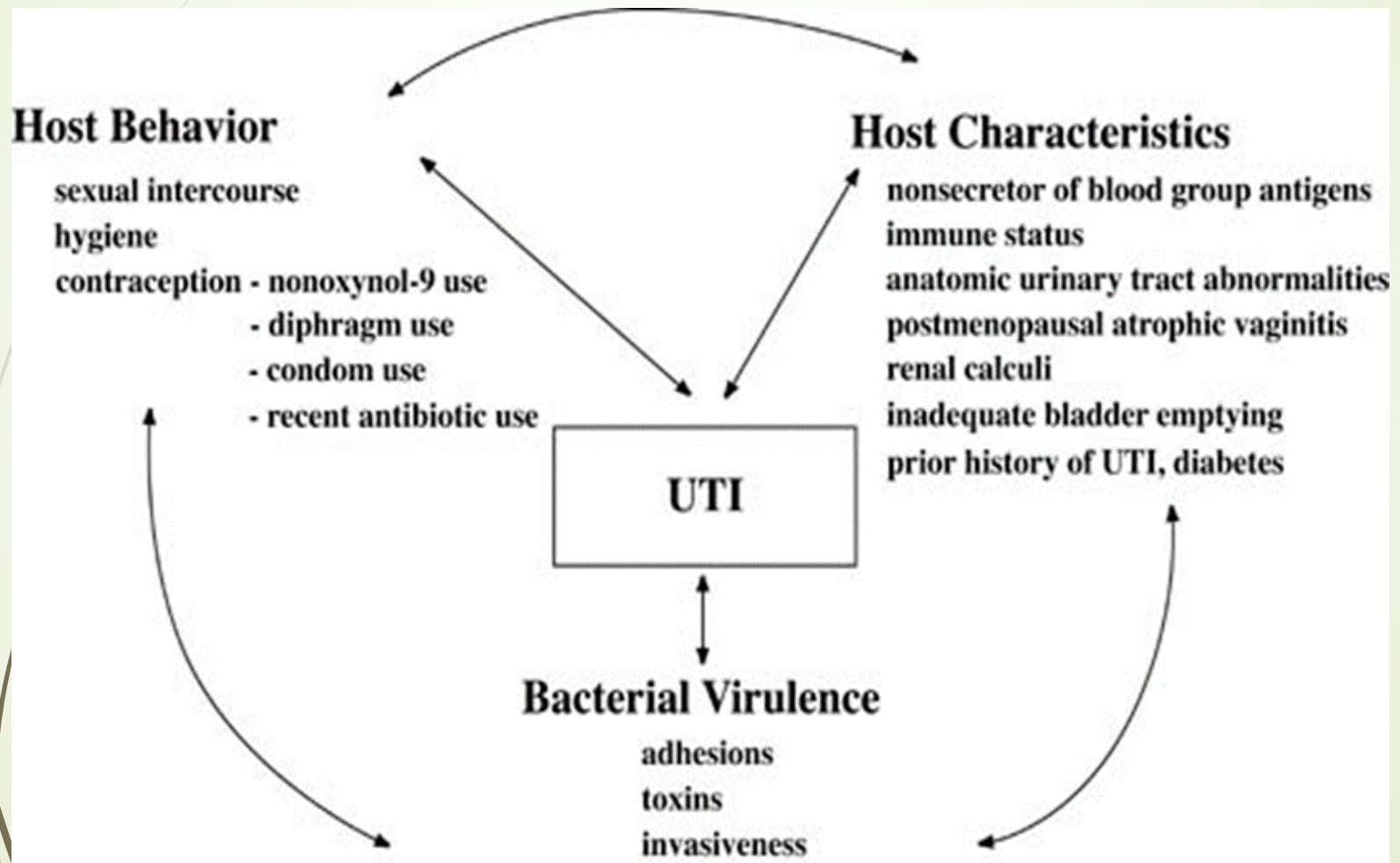
Cystitis



- ▶ **In both sexes:** common risk factors are :
 - Presence of bladder stone
 - Urethral stricture
 - Catheterization of the urinary tract
 - Instrumentation
 - Diabetes mellitus
 - Obstruction
 - Structural abnormalities

- ▶ **Uncomplicated UTI** usually occurs in non pregnant, young sexually active females without structural or neurological abnormalities

Pathogenesis





Etiologic agents

- ***E.coli*** is the most common (90%) cause of cystitis. Other *Enterobacteriaceae* include (*Klebsiella pneumoniae*, *Proteus* spp.) Other gram negative rods eg. *P.aeruginosa*.
- **Gram positive bacteria:** *Enterococcus faecalis*, group B *Streptococcus* and *Staphylococcus saprophyticus* {honeymoon cystitis}.
- *Candida* species
- Venereal diseases (gonorrhoea, Chlamydia) may present with cystitis.
- *Schistosoma haematobium* in endemic areas.

Pathogens involved

Uncomplicated UTI

E. coli 64%
Enterobacteriaceae 16%
Enterococcus spp 20%
Pseudomonas spp <1%
S. aureus <1%

Special cases

S. epidermidis
S. saprophyticus
Yeasts (catheter related)
Viruses (Adenovirus, Varicella)
Chlamydia trachomatis

Complicated UTI

E. coli
Enterobacteriaceae
Pseudomonas spp
Acinetobacter spp

(% is not possible to

judge, often multi-resistant strains)

Clinical presentation

Symptoms usually of acute onset.

- Dysuria (painful urination)
- Frequency (frequent voiding)
- Urgency (an imperative call for toilet)
- Hematuria (blood in urine) in 50% of cases.
- Usually no fever.



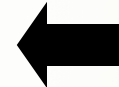


Vaginitis (5%)
Candida spp.
T. vaginalis



**Dysuria and
frequency**

Urethritis (10-15%)
C. trachomatis,
N. gonorrhoeae
H. simplex
Other bacteria?



Non-infectious (<1%)
Hypoestrogenism
Functional obstruction
Mechanical obstruction
Chemicals



Cystitis (80%)
E. coli,
S. saprophyticus
Proteus spp.
Klebsiella spp.





How to differentiate between cystitis and urethritis ?

- Cystitis is of more acute onset
- More sever symptoms
- Pain, tenderness on the supra-pubic area.
- Presence of bacteria in urine (*bacteriuria*)
- Urine cloudy, malodorous and may be bloody



Differential diagnosis (types of cystitis)

➤ Non-infectious cystitis such as:

1. **Traumatic cystitis** in women
2. **Interstitial cystitis** (unknown cause, may be due to autoimmune attack of the bladder)
3. **Eosinophilic cystitis**
4. **Hemorrhagic cystitis** due to radiotherapy or chemotherapy.



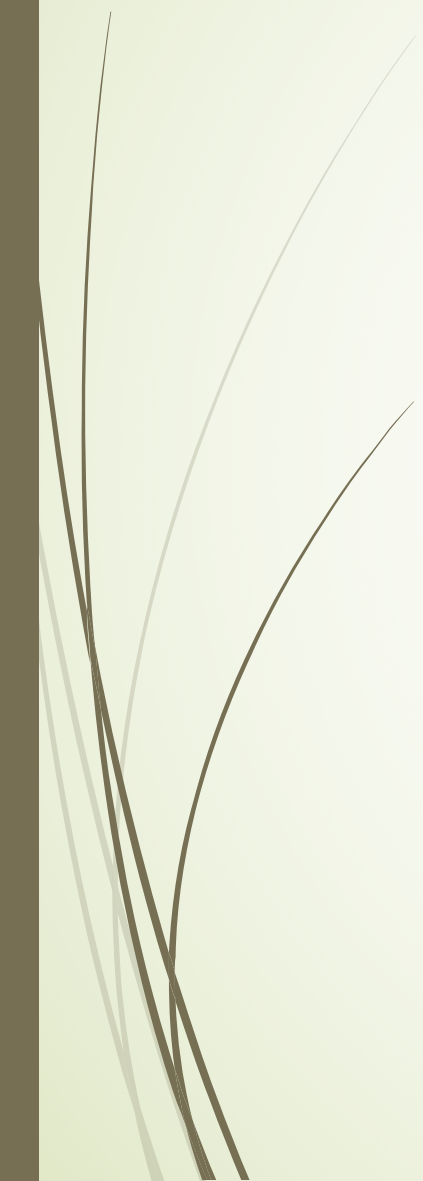
Laboratory diagnosis of cystitis

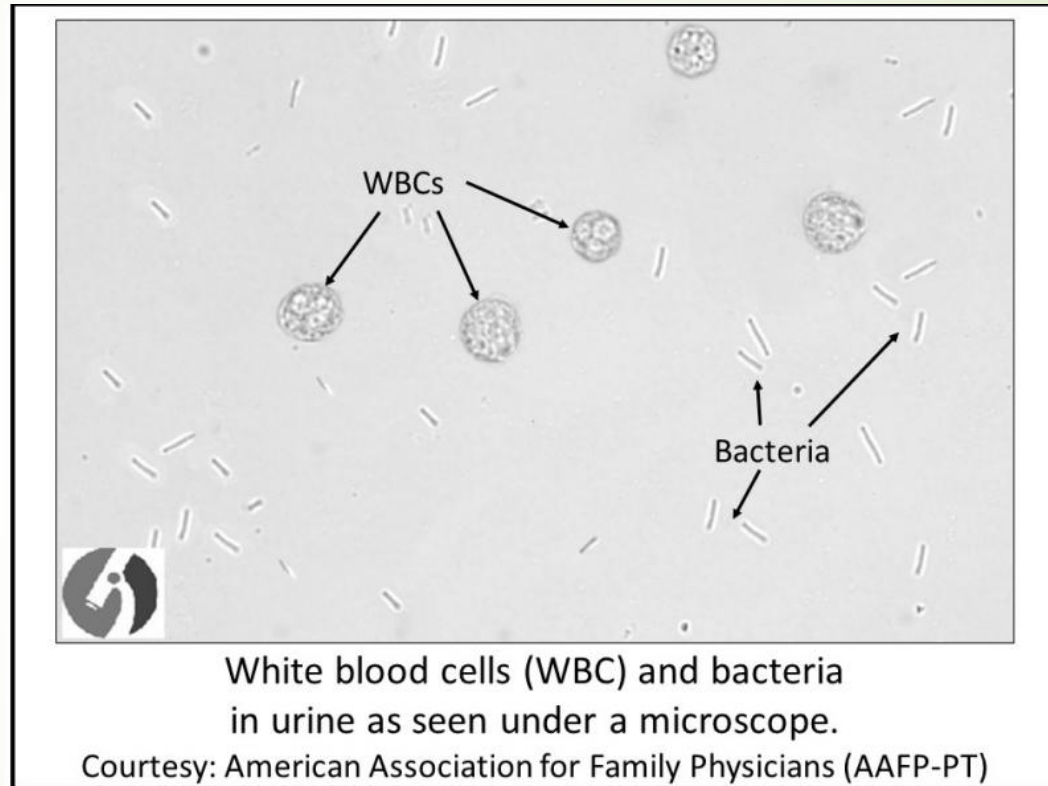
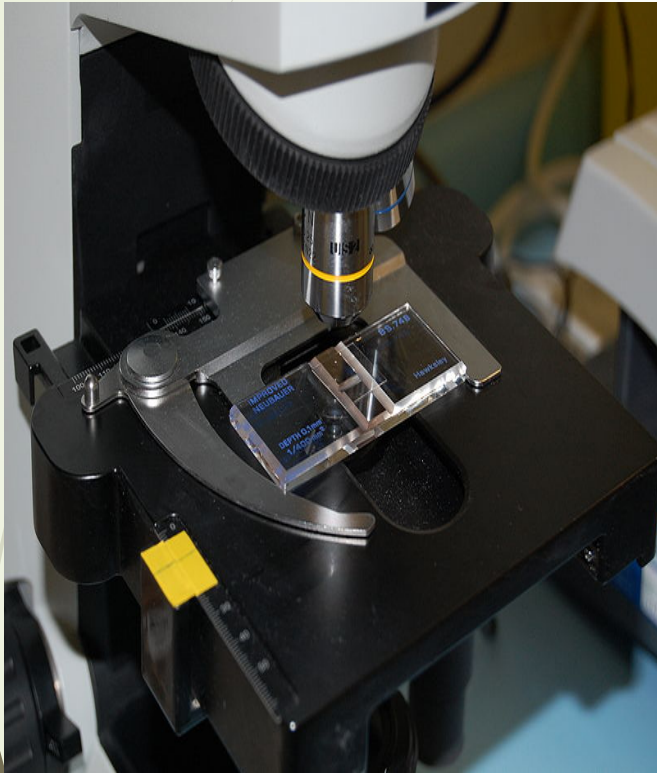
1. Specimen collection:

- Most important is clean catch urine [Midstream urine (**MSU**)] to bypass contamination by preneal flora *and must be before starting antibiotic.*
- **Supra-pubic aspiration** or **catheterization** may be used in children.
- Catheter urine should not be used for diagnosis of UTI.



2- **Microscopic examination:**

- About 90% of patients have **> 10 WBCs /cu.mm**
 - Gram stain of uncentrifuged sample is sensitive and specific.
 - One organism per oil-immersion field is indicative of infection.
 - Blood cells, parasites or crystals can be seen
- 



White blood cells (WBC) and bacteria
in urine as seen under a microscope.

Courtesy: American Association for Family Physicians (AAFP-PT)



3- Chemical screening tests:

- **Urine dip stick** –rapid, detects *nitrites* released by bacterial metabolism and *leukocyte esterase* from inflammatory cells. Not specific.

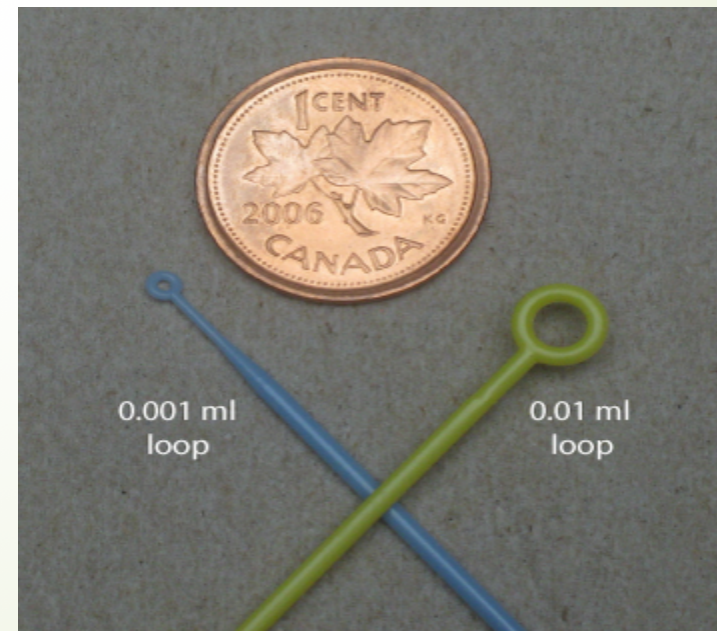
4- Urine culture: important to identify bacterial cause and antimicrobial sensitivity .

- **Quantitative culture** typical of UTI (>100,000 cfu/ml)
Lower count (<100,000 or less eg. 1000 cfu/ml) is indicative of cystitis if the patient is *symptomatic*.



Urinalysis (sample collected after fluid therapy)

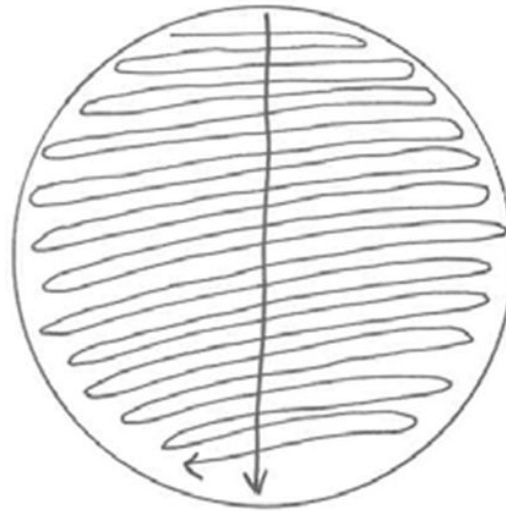
Specimen	Cystocentesis
Color	Yellow
Appearance	Cloudy
Specific gravity	1.014
pH	5.5
Protein	Trace
Glucose	3+
Ketones	1+
Bilirubin	1+
Blood	2+
Urobilinogen	0.2
Bacteria	Negative
Epithelial cells	0-3



Quantitative urine culture

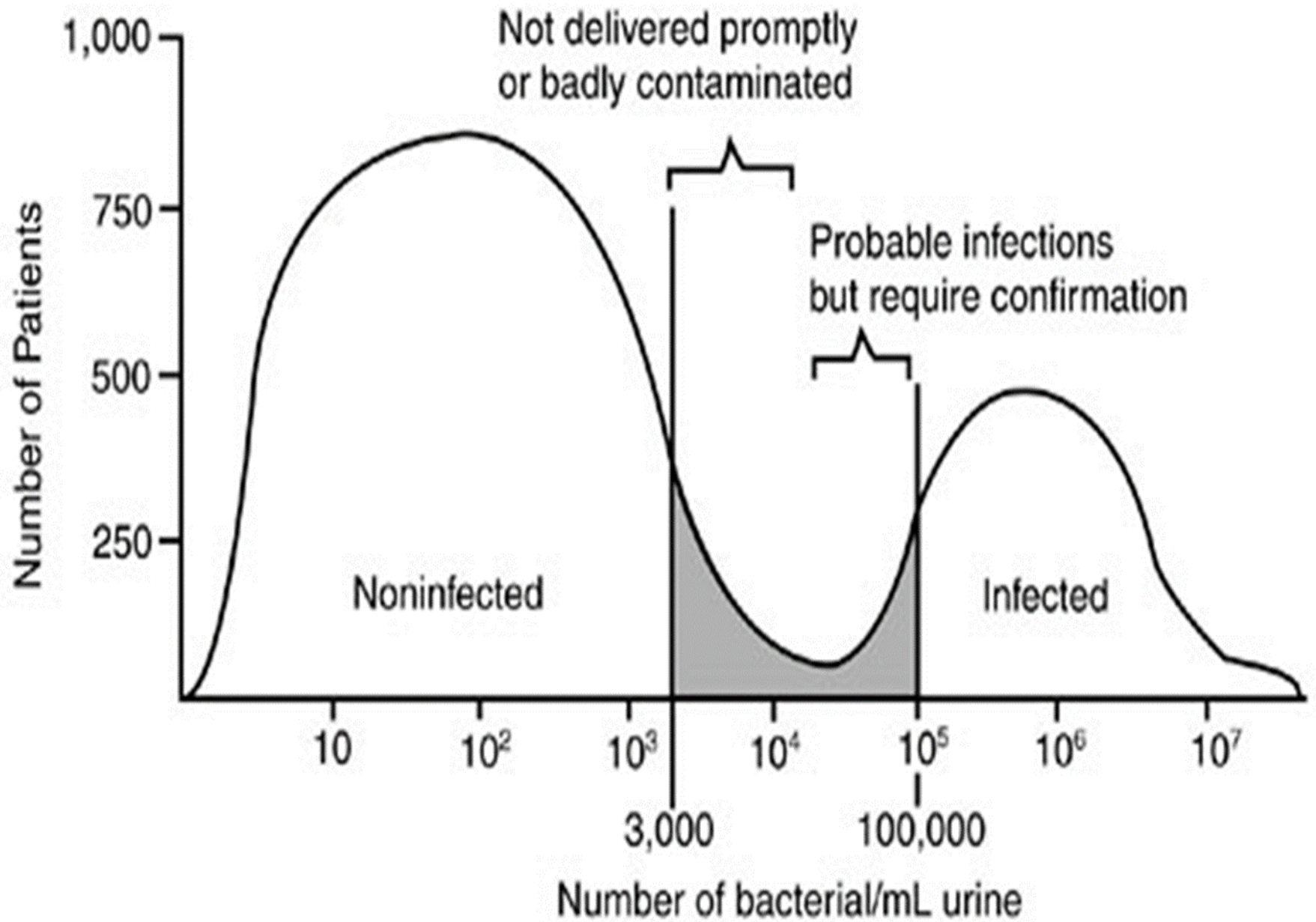
URINE PLATE TECHNIQUE

CALIBRATED LOOP: 0.001 μL vs. 0.01 μL



Inoculation: dip calibrated loop in urine, streak down middle of agar plate, then with the same loop go back and streak across the center inoculum to dilute

- Using 0.001/ml loop
 - 1 colony = 1000 CFU/ml
 - 100 colonies = 100,000 CFU/ml





Recurrent cystitis

- ▶ Three or more episodes of cystitis /year
- ▶ Requires further investigations such as Intra-Venous Urogram (**IVU**) or Ultrasound to detect obstruction or congenital deformity.
- ▶ Cystoscopy required in some cases.



Treatment of cystitis

- **Empiric treatment** commonly used depending on the knowledge of common organism and sensitivity pattern.
- **Treatment best guided by susceptibility pattern of the causative bacteria.**
- Common agents: Ampicillin or Amoxicillin, Amoxicillin-Clavulanic acid , Cephradine, Ciprofloxacin, Norfloxacin, Gentamicin or TRM-SMX.



Treatment of cystitis

- **Duration** of treatment: three days for uncomplicated cystitis
- 10-14 days for complicated and recurrent cystitis.
- **Prophylaxis** required for recurrent cases by Nitrofurantoin or TRM-SMX.
- **Prevention** : drinking plenty of water and prophylactic antibiotic.



Reference

- ▶ Ryan, Kenneth J. Sherris Medical Microbiology. Latest edition. McGraw – Hill Education