

**Institute for Microbiology, Medical Faculty of Masaryk University  
and St. Anna Faculty Hospital in Brno**

# **Agents of urinary tract infections**

# Urinary tract infections (UTIs)

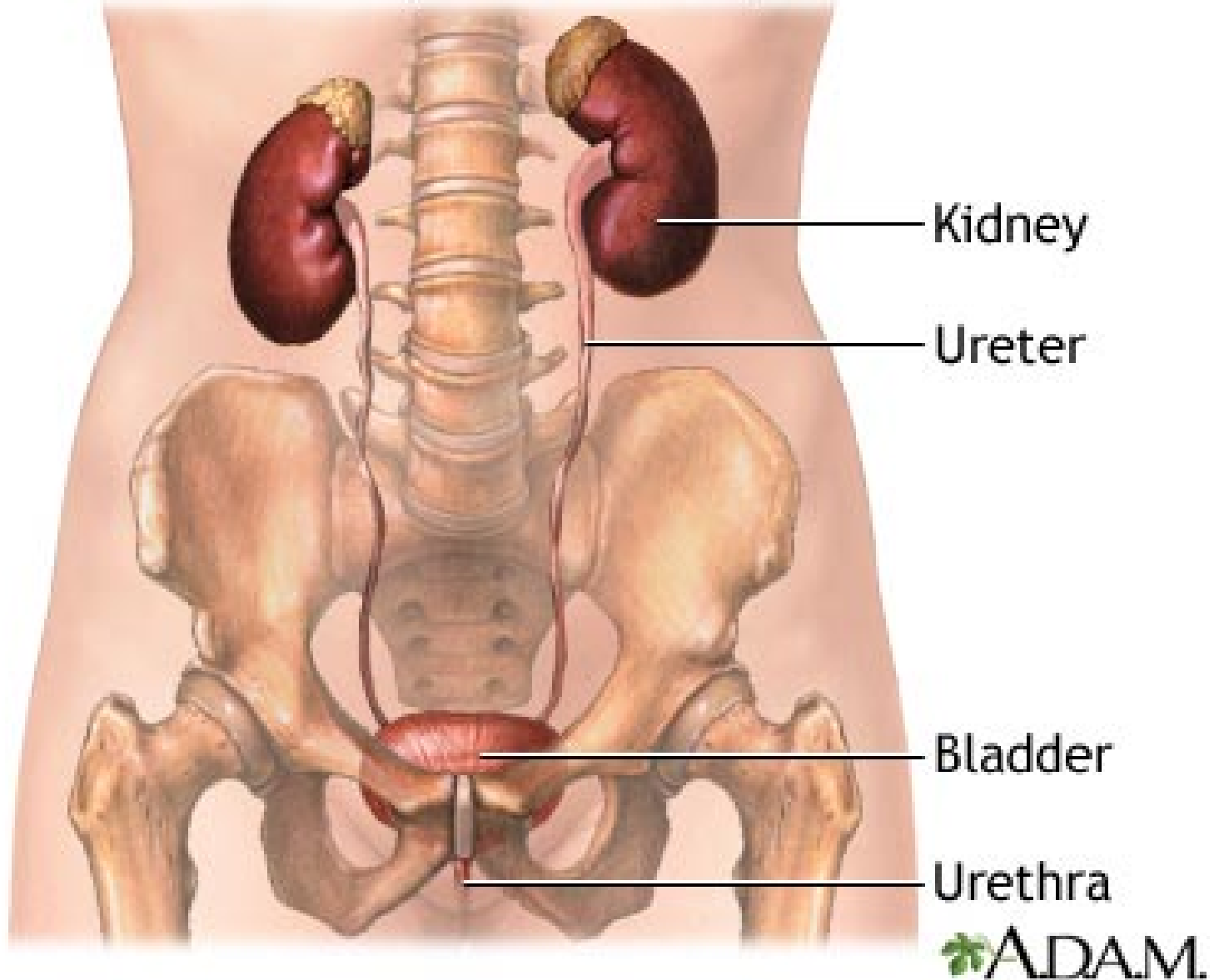
**Frequency of UTIs:**

**2nd most common infections**

**In adults: the most common infections**

**Afflicting mainly females (shorter urethra)**

# Normal anatomy of the urinary tract



# Cystitis

- **the most common UTI:**
- **develops ascendently caused by intestinal microflora**
- **symptoms:**
  - dysuria** (difficult urination with sharp burning pain)
  - pollakisuria** (urgent need to urinate accompanied by urination of a small amount of urine only)

# Pyelonephritis

- more serious
  - origin: ascendent or hematogenous
  - symptoms:  
fever, chills, flank pain, or costovertebral tenderness, urinary frequency, dysuria, hematuria
- ...urethritis – will be dealt with STD

# Etiology of UTIs

**Differs in:**

- **non-complicated UTIs**
- **structural abnormalities** (prostatic hypertrophy, urinary stones, strictures, pregnancy, congenital defects, permanent catheters)
- **functional disorders** (vesicoureteral reflux, neurological disorders, diabetes mellitus)

# Etiology of non-complicated UTIs

1. 80 % *Escherichia coli*

2. 10 % enterococci (*Enterococcus faecalis*)

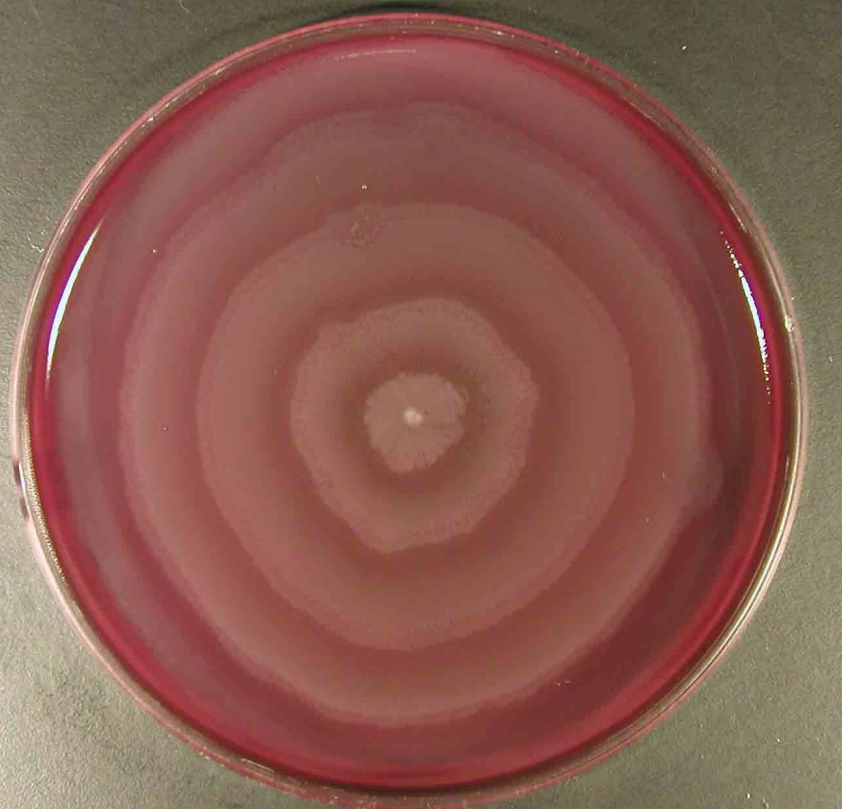
3. 5 % *Proteus mirabilis*

- other enterobacteria (*Klebsiella pneumoniae*,  
*Kl. oxytoca*, *Ent. cloacae*, *C. freundii* etc.)
- *Streptococcus agalactiae*
- coagulase neg. staphylococci
- yeasts (mainly *Candida albicans*)









[www.medmicro.info](http://www.medmicro.info)



<http://biology.clc.uc.edu>

# Etiology of complicated UTIs

**80 %**

***Escherichia coli***

***Klebsiella pneumoniae***

***Proteus mirabilis***

***Pseudomonas aeruginosa***

**enterococci**

**other enterobacteria**

**acinetobacters**

**other G-neg. non-fermenting rods**

**candidae**

# ***Lege artis* taking a urine sample**

- **after a thorough cleaning incl. external orificium of urethra by soap and water**
- **middle stream of urine**
- **sterile vessel**
- **sterile tube & stopper promptly**
- **process it within 2 hours, or place into 4 °C for 18 hours at most**

# COUNTERTHINK

## EXPENSIVE URINE

PROZAC : \$143  
LIPITOR : \$129  
BLOCADREN : \$83  
VASOTEC : \$64  
PLENDIL : \$85  
CHEMOTHERAPY : \$1,350  
-----  
\$1,854 PER MONTH



QUALITY MULTIVITAMIN : \$28  
SUPERFOOD SUPPLEMENT : \$45  
MEDICINAL HERBS : \$75  
FRESH PRODUCE DAILY : \$225  
AGED GARLIC EXTRACT : \$13  
POMEGRANATE JUICE : \$60  
-----  
\$446 PER MONTH

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CONCEPT - MIKE ADAMS

ART - DAN BERGER

WWW.NEWSTARGET.COM

# Semi-quantitative examination – I

- **the kind of microbe in the urine sample**
- **the amount of the microbe**

## Because

- **high numbers only stand for the UTI**
- **low numbers mean usually contamination acquired during urination**

# Semi-quantitative examination – II

The urine is inoculated on culture media by a calibrated loop taking 1  $\mu$ l of urine

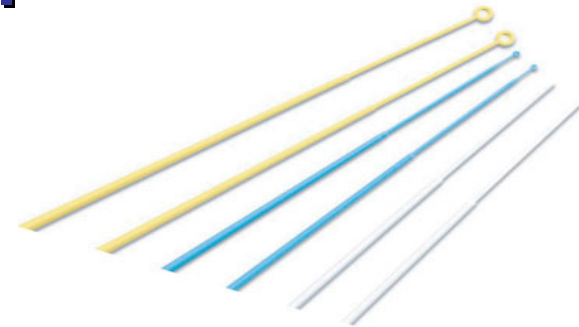
In this case

1 colony means  $10^3$  CFU/ml

10 colonies mean  $10^4$  CFU/ml

100 colonies mean  $10^5$  CFU/ml

(CFU = colony-forming unit = 1 cell)





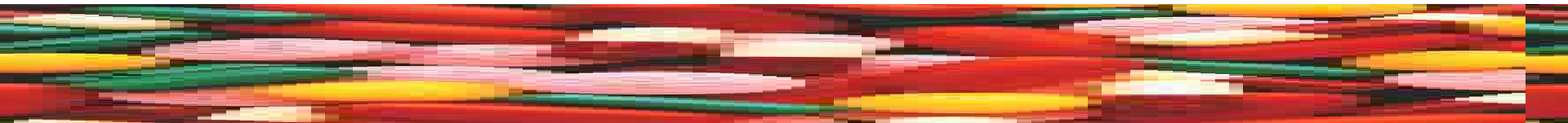


# Significant concentrations of bacteria in urine

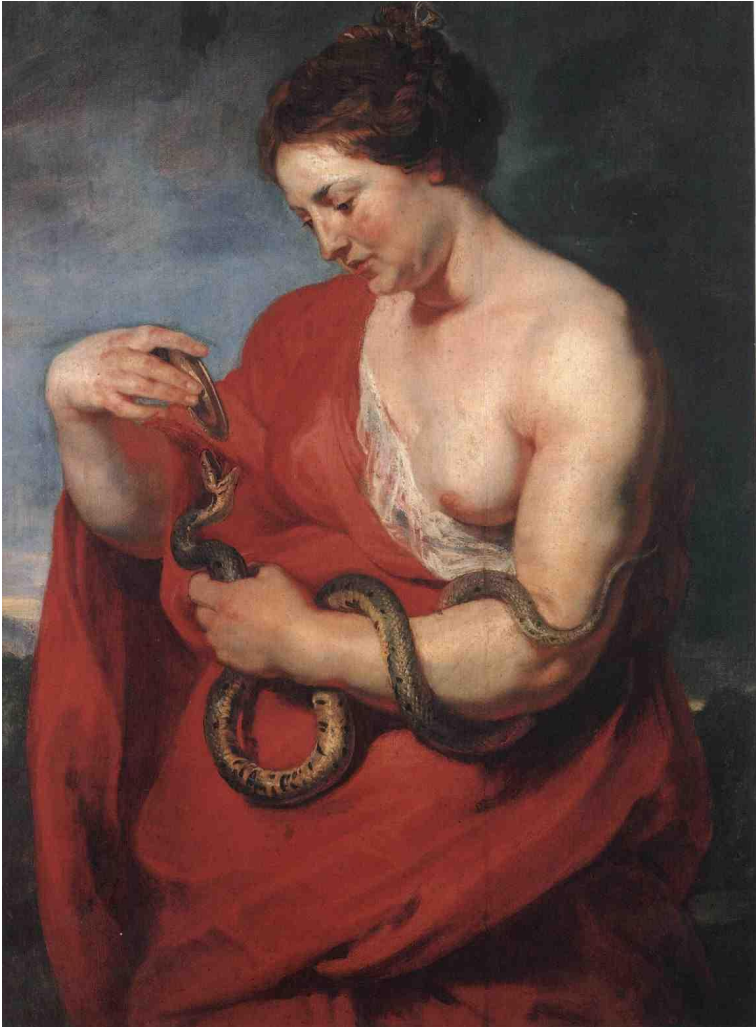
Type of specimen, symptoms	Type of microbe	Significant number (CFU/ml)
Middle stream, symptoms present	Primary urine pathogen	$10^3$
	Dubious urine pathogen	$10^5$
Middle stream, no symptoms	Any	$10^5$
Suprapubic puncture	Any	$10^1$

# Therapy

- **Trimethoprim**
- **Nitrofurantoin**
- **Cephalexin**
- **Amoxicillin**
  
- **in complicated UTIs ATB sensitivity assessment**
- **ESBL strains**



**Paulus Peeter Rubens (1577-1640): Goddess of health Hygiene (1615)**



# Detail

**Paulus Peeter Rubens (1577-1640): Goddess of health Hygiene (1615)**

