

# Bugs in Urology

## Infections of the lower urinary tract



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# Outline

- UTIs
- Recurrent cystitis/ UTIs
- Catheter Associated UTIs (CAUTIs)
- Epididymitis/ Orchitis
- Prostatitis – acute and chronic

# Clinical scenario #1

- 28 year old woman presents with 6 month history of intermittent dysuria, increased urinary frequency and suprapubic pain
- Nil past medical history
- Received 3 separate 3 day course of antibiotics
- Most recent course finished one week ago
- Currently asymptomatic



# #1 continued...

- Sexually active, no history of STDs, using condom with same partner
- Nil associated systemic features or vaginal symptoms

# #1 continued...

- O/E: Abdomen – unremarkable except mild suprapubic tenderness. PV – not done
- Ix: Urine dipstick – Leu 2+, Nit neg, Bld 1+



- Urine mc+s x2 (6 and 4 months ago) – *E Coli sp.*
- Rpt urine mc+s (1 month ago) – mixed growth

# UTI/ Recurrent Cystitis/UTIs

- Definition
- Incidence and Epidemiology
- Pathogenesis
- Diagnosis
- Treatment
- Prevention

# Definition

- *UTI is an inflammatory response of the urothelium to bacterial invasion that is usually associated with bacteriuria and pyuria* (Campbell's Urology)
- Bacteriuria is the presence of bacteria in the urine, which is normally free of bacteria
- Recurrent UTI/cystitis is caused either by bacterial persistence or reinfection with another organism

# Incidence

- UTIs are most common bacterial infection

INCIDENCE (%)			
AGE	FEMALE	MALE	Risk factors
0-1	0.7	2.7	Foreskin, anatomical GU abnormalities
1-5	4.5	0.5	anatomical GU abnormalities
6-15	4.5	0.5	Functional GU abnormalities
16-35	20	0.5	Sexual intercourse, diaphragm use
36-65	35	20	Surgery, prostate obstruct., catheter
>65	40	35	Incontinence, catheter, prostate obstruction



# Epidemiology

- Lifetime prevalence 14000 per 100000 men
- Lifetime prevalence 53000 per 100000 women
- Impact on NHS (PHLS study 2003)
  - 34.6% of hospital acquired infections
  - £1327 each
  - £177 million / year to treat 133,000 cases
  - 1 in 5 will develop secondary bacteraemia

(<http://www.publications.parliament.uk/pa/ld200203/ldselect/ldsctech/23/23w07.htm>)

# Pathogenesis - 1

- Bacterial entry
  - **1. Periurethral ascending bacteria**
  - 2. Haematogenous spread (immunocompromised and neonates)
  - 3. Lymphagatogenous spread – rectal, colonic and peri-uterine lymphatic's
  - 4. Direct extension of bacteria from adjacent organs e.g. Intraperitoneal abscess/ fistula

# Pathogenesis - 2

- Host defences
  - Unobstructed urinary flow - **prevents**
  - Urine characteristics e.g. Osmolality, pH, urea conc., organic acid conc. - **inhibits growth, colonisation** [and adherence (Tamm-Horsfall glycoprotein)]
  - Urinary retention/ reflux – **promotes**
  - Anatomic, functional abnormalities, foreign bodies – **susceptibility**
  - Epithelium - **barrier to prevent adherence**
  - Flora – **prevents colonisation**

# Pathogenesis - 3

- Bacterial pathogenic factors
  - Certain strains can adhere to epithelium due to composition to enable to resist host defences
- Causative pathogens
  - Most are caused by single bacterial species
  - > 80% *E. Coli sp (O serogroup)*
  - Gram +ve cocci, Gram –ve cocci, Gram –ve rods, Other organisms

# Diagnosis - 2

- Urine mc+s – gold standard
  - $> 10^5$  CFU / ml
  - Beware false negatives
  - And also false positives

# Treatment - 1

- Antibiotics
  - Infecting pathogen/s – susceptibility/ resistance
  - Patient e.g. allergies, co-morbidities
  - Site of infection
  - Renal/ liver disease
  
  - Consult local microbiology guidelines!!

# Diagnosis - 1

- Urinalysis - specificity
  - Nitrite – positive – 98%
  - Leu – positive – 87%
  - Leu or Nit – 79%
  - Leu and Nit – 98%
  
- No RBC, Leu, Nit, Protein >98% negative predictive value

# Treatment - 2

- 1<sup>st</sup> line
  - **Nitrofurantoin 50mg qds – 3-5 days**
  - Trimethoprim 200mg bd – 3-5 days
  - TMP – SMX (160/800) – 3 days
    - (Only if local *E. Coli* resistance < 20%)
- 2<sup>nd</sup> line
  - Fluoroquinolones e.g. Ciprofloxacin 250mg bd – 3 days



# Treatment - 3

- Complicated UTI
  - Aminoglycosides e.g. Gentamycin, Amikacin
  - Cephalosporins 1<sup>st</sup>/2<sup>nd</sup>/3<sup>rd</sup> generation
  - Penicillin – 1<sup>st</sup> gen, beta-lactamase inhibitors
  - Carbapenems e.g. Meropenem, ertapenem

# Antibiotic resistance

- *E Coli* resistance
  - Ampicillins – 18-54%
  - Trimethoprim – 9-27%
  - Sulfamethoxazole – 16-49%
  - Nitrofurantoin/ Fluoroquinolones - <3%

# Recurrent UTIs/ Cystitis

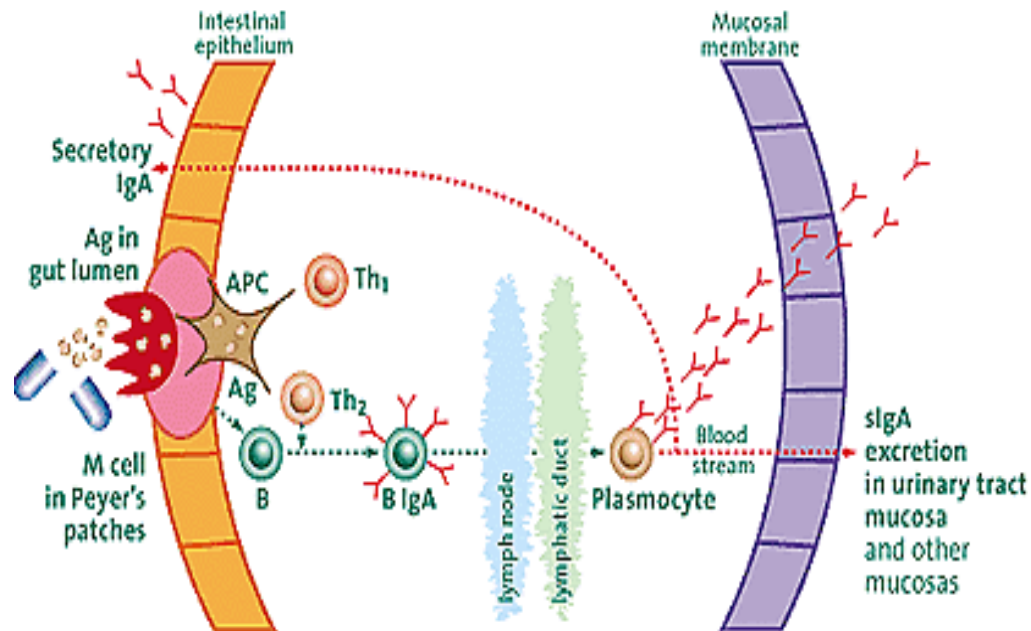
- An uncomplicated UTI is one that occurs in a healthy host in the absence of structural or functional abnormalities of the urinary tract. Recurrent uncomplicated UTI may be defined as 3 or more uncomplicated UTIs in 12 months (Level 4 evidence, Grade C recommendation)
- Recurrent UTIs occur due to bacterial reinfection or bacterial persistence. Persistence involves the same bacteria not being eradicated in the urine 2 weeks after sensitivity-adjusted treatment. A reinfection is a recurrence with a different organism, the same organism in more than 2 weeks, or a sterile intervening culture (Level 4 evidence, Grade C recommendation)

# Treatment - 1

- Lifestyle modifications
- Low dose prophylactic antibiotics (LE 1A)
  - 95% reduction of recurrent UTI (Albert et al 2004)
- Intermittent self start antibiotics (LE 1A)(Pfau and Sacks 1993)
- Post coital voiding and antibiotic (LE 1A)(Pfau and Sacks 1993)
- Topical oestrogen in post menopausal women (LE 4A) (Raz and Stamm 1993)
- Lactobacillus oral RC1/ GR14 (LE 1C) (Anukam 2006)
- Lactobacillus vaginal suppository (LE 4C)(Reid and Burton 2002)
- Cranberry extract (LE 1C)(Lowe and Fagelman 2001)

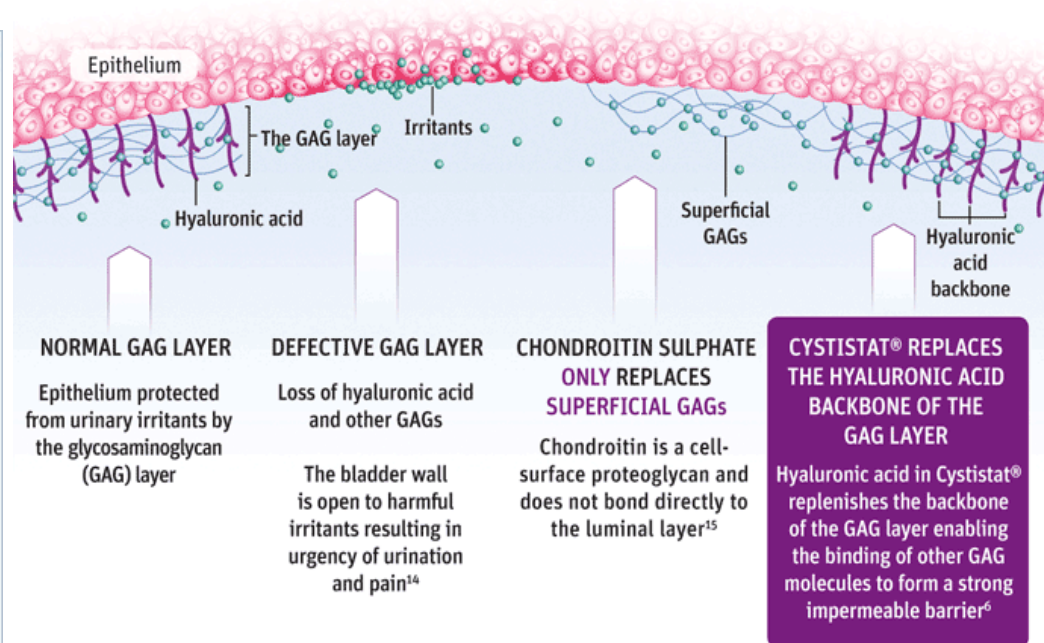
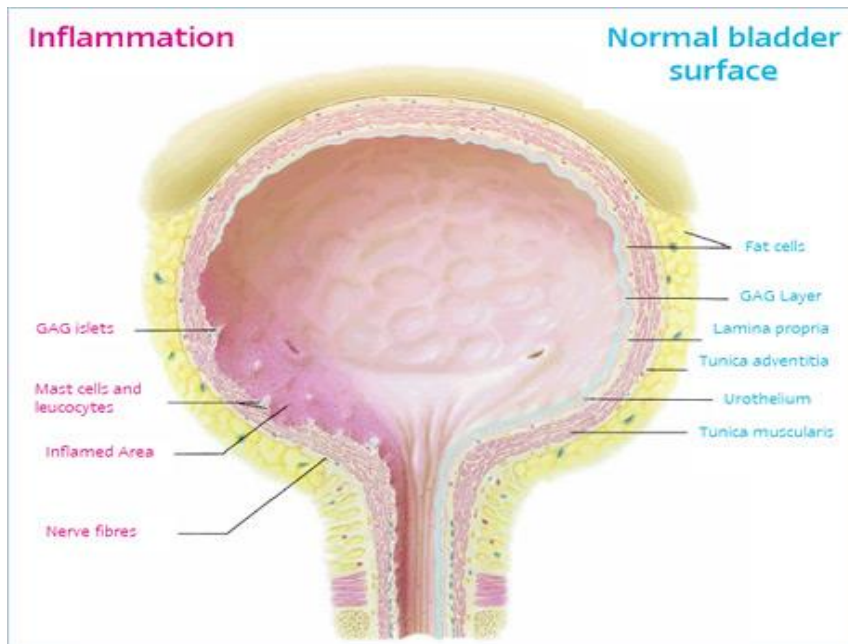
# Treatment - 2

- Immunoactive prophylaxis
  - OM-89 (LE 1B)(Uro-Vaxom) – recurrent uncomplicated UTI (Naber et al 2009)
  - StoVac / Solco-Urovac (LE 1C)



# Treatment - 3

- Intravesical therapy
  - Chondroitin sulphate (0.2%) – Gepan
  - Sodium hyaluronate - Cystistat



# Clinical scenario #2

- 83 year old gentleman with long term urethral catheter in situ for > 2 years
- Inserted for “probable BPH” and outflow obstruction, however never been seen by a urologist
- Repeated episodes of catheter blockages and multiple admissions to hospital requiring antibiotics to treat suspected UTI

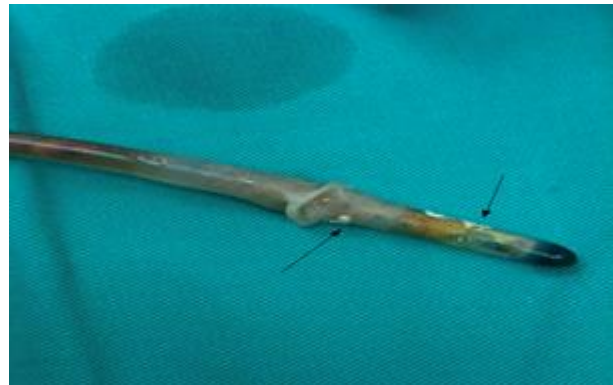
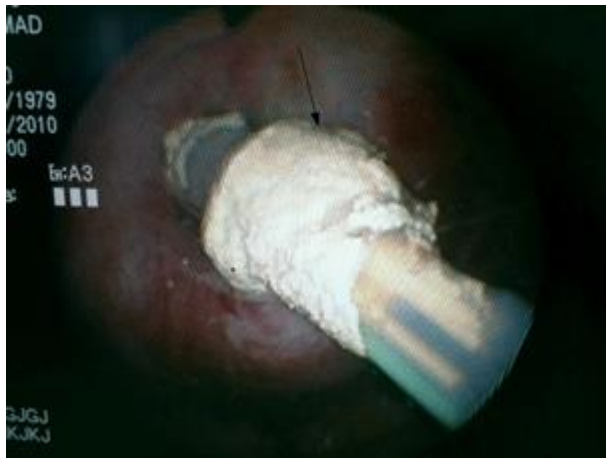
## #2 continued...

- O/E – Pt comfortable, no clinical evidence of sepsis
- Catheter – urine appears cloudy with lots of debris in bag. Bed sheet appears to be wet.
- Ix: Renal function normal, inflammatory markers improving
- Tx: 48hrs of iv antibiotics, now on day 5 of oral antibiotics



# Catheter associated UTI (CAUTI)

- Definition + Clinical diagnosis
- Pathogenesis
- Microbiology
- Management



# CAUTI

- Catheter associated bacteriuria most common hospital acquired infection > 30% of infections (House of Lords Motion – May 12)
- Development of bacteriuria incidence of 10% per day
- Most CAUTI are asymptomatic
- Short-term catheter – only 10-30% symptomatic
- Long-term catheter – pyrexia in 1 per 100 days

# Pathogenesis

- Bacterial entry via periurethral or intraluminal route
- Catheter bag provides unique environment for biofilms – i.e. within urine + catheter surface
- > 30 days – often multiple organisms
- *E Coli* still most common
- *Pseudomonas*, *Proteus*, *Enterococcus*

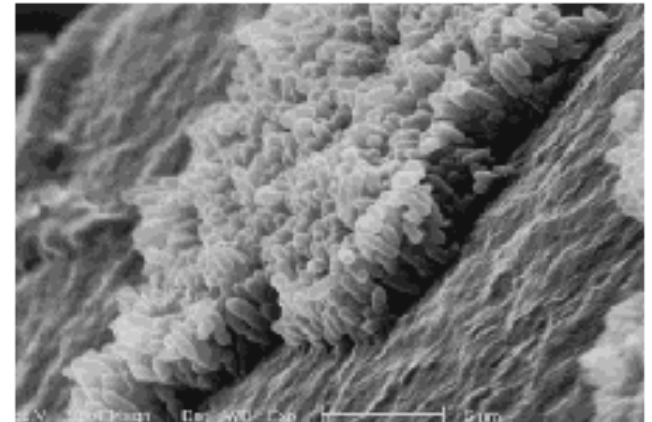


Figure 1. A biofilm on a urinary catheter (Adapted from Stickler and Morgan, J Med Microbiol 55 (2006), 489-494)

# CSU - Microbiology

- Significant bacteriuria - 100 CFU / ml
  - (much less than for UTI  $10^5$  CFU/ ml)
- Pyuria is not discriminate indicator of infection

# Management - 1

- Aseptic technique and closed system
- Reduce period of catheterisation
- Short-term catheter – anti-microbial reduce incidence of bacterial colonisation
  - After 3-4 days – bacteria equal to those with no antibiotics +/- side effects +/- resistance
- Only treat if symptomatic, then review daily
- Change catheter if indwelling > 7days
- Silver alloy catheters

# Management - 2

- Little evidence for antibiotic prophylaxis long term
- *Candida sp* – no treatment required, change of catheter
- Consider SPC insertion/ CISC/ condom drainage system
- > 10 years then screen for bladder Ca

# Clinical scenario # 3

- 28 year fit and healthy, sexually active male presents with severe left testicular pain radiating up to left groin
- Started 3 days ago, getting progressively worse
- Noticed left testicle increasing in size
- Feeling feverish and nauseated over last 24 hrs

## #3 continued...

- O/E – T 37.9. P - 92. Pt appears uncomfortable, swollen, erythematous scrotum. Tender to palpation bilaterally.
- No evidence of abscess
- No urethral discharge
- No skin necrosis



**Red, Swollen Testes**



# Epididymitis / Orchitis

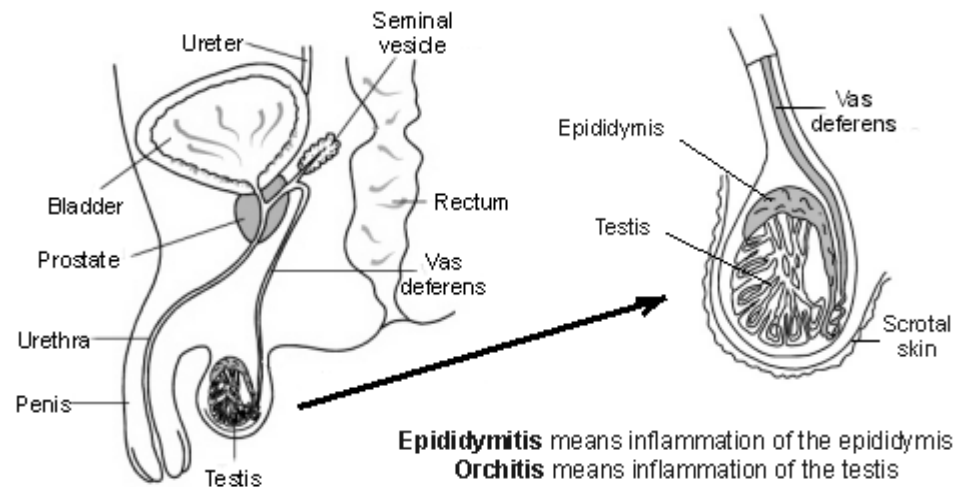
- Definition and causes
- Pathogenesis
- Microbiology
- Management

# Definition

- Inflammation of epididymis / testicle / both
  - Acute - sudden onset of pain and swelling
  - Chronic - > 6 weeks, induration, little swelling
  - Most common orchitis – mumps orchitis
- Caused from ascending infection of urinary tract
  - < 35 yrs - sexually transmitted (*N. Gonorrhoea*, *C. Trachomatis*)
  - Children/ older men – *E. Coli*

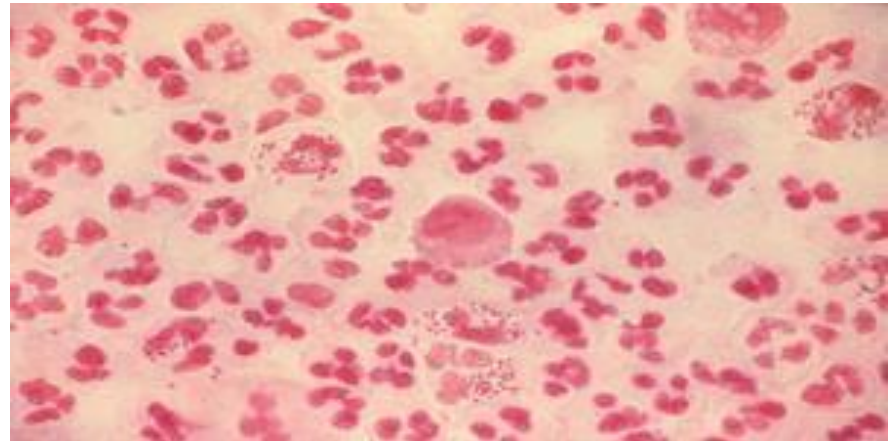
# Pathogenesis

- Ascending infection from bladder, urethra, prostate via ejac. Ducts and vas deferens into epididymis
- Starts in tail then body to head
- Children – GU abnormality e.g. Foreskin
- Elderly – BPH/ UTI/ catheter
- Sexually active - STD



# Microbiology

- Gram staining of urethral smear/ MSU
  - Gram neg diplococci – *N. gonorrhoeae*
  - WBC – non gonococcal urethritis
  - *C. trachomatis* – isolated in 2/3 patients

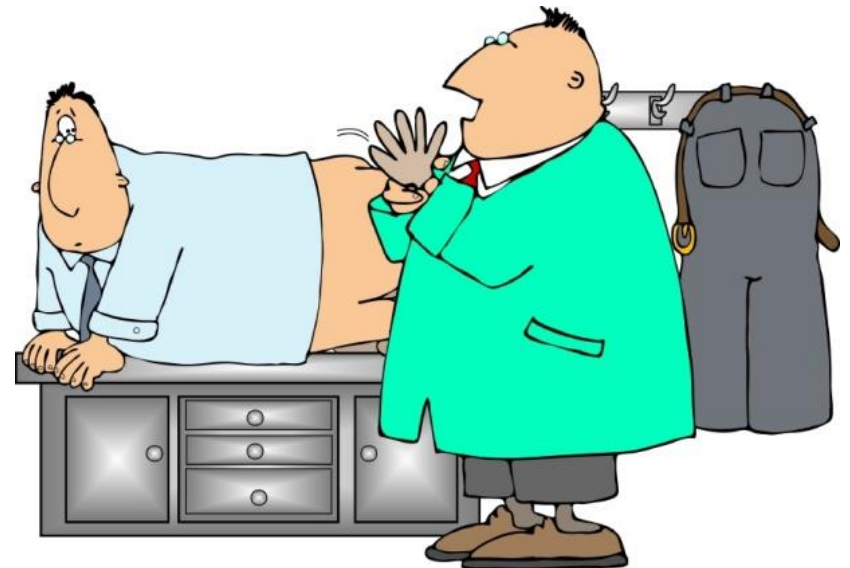


# Management

- Clinically exclude torsion
- Fluoroquinolones – best penetration
- Samples – urethral swab and MSU prior to antibiotics
- Need good activity against *C. Trachomatis*
- Supportive therapy
- Treatment of STD and sexual partner
- If abscess – needs surgical I+D
- If uro-pathogens – investigate for LUTS

# Scenario #4

- 38 year old gentleman presenting with 3 day history of fevers, rigors, urethral discharge, dysuria, scrotal and perineal pain
- Nil PMHx
- DRE – exquisitely tender boggy prostate, no discharge per rectum
- Urine – Nit +ve
- CRP – 250, WBC 24



# Prostatitis – Acute and Chronic

- **Acute bacterial prostatitis (NIH Type I)**
  - Ascending urethral or reflux
  - Bacteria as well as leucocytes seen with acini
  - Leads to oedema of prostate
  - Variable degrees of necrosis +/- abscess

# Presentation

- Younger men <50
- Abrupt onset, fever, malaise + LUTS
- Possible AUR
- DRE – exquisitely tender, boggy +/- discharge
- Raised Inflammatory markers
- Positive urine analysis
- Raised PSA (if done)
- Usually *E. Coli*; other gram –ves. Rarely anaerobes



# Microbiology

- **Aetiologically recognised pathogens\***

- *E. coli*
- *Klebsiella* sp.
- *Prot. mirabilis*
- *Enterococcus faecalis*
- *P. aeruginosa*

- **Organisms of debatable significance**

- Staphylococci
- Streptococci
- *Corynebacterium* sp.
- *C. trachomatis*
- *U. urealyticum*
- *Myc. Hominis*

(Adapted from Weidner et al. and Schneider et al.)

# Management

- Antibiotics (po / iv)
  - To cover gram –ve and enterococci
    - TMP / Fluoroquinolones – good penetration 4-6 weeks
    - Aminoglycoside/ ampicillin
- If AUR – urethral catheter (SPC recommended)
- Intraprostatic antibiotics – not recommended
- Drainage of abscess – if greater than >1cm

# Prostatitis – Acute and Chronic

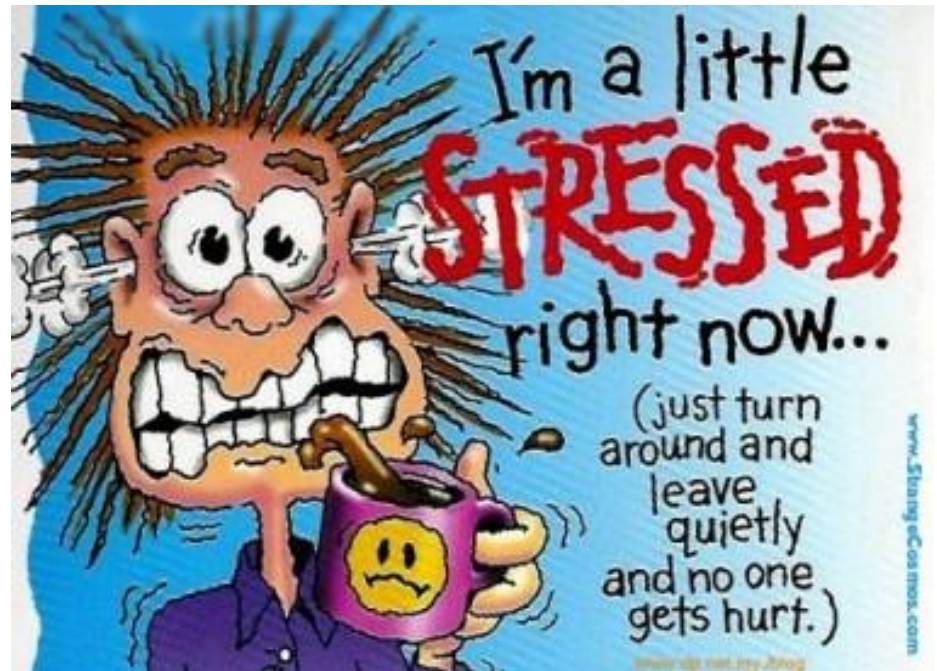
- **Chronic bacterial prostatitis (NIH Type II)**
  - Normally insidious onset
  - Generally symptoms > 3 months
  - Recurrent, relapsing symptoms caused by persistent uropathogen
  - History of acute bacterial prostatitis
- Urinalysis – variable WBC/ bacteria
- Organisms – similar to acute bacterial prostatitis +/- gram +ves

# Management

- Similar to acute bacterial prostatitis
  - Fluoroquinolones e.g. Ciprofloxacin/ Levofloxacin/ Ofloxacin – 4 weeks
  - If fluoroquinolone resistant – TMP – 4-12 weeks

# Prostatitis – Acute and Chronic

- **Chronic abacterial prostatitis/ CPPS (NIH Types IIIA and IIIB)**
  - Difficult to treat!
- Antibiotics
- Lifestyle
- Prostatic massage
- Pain control
- Counselling



ANY  
QUESTIONS  
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