



# Antibiotics- a summary

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# Antibiotic Summaries-

## Penicillin

- Cheap and effective
- Indications
  - *S. pneumoniae*
  - Human bites
  - Gp A streptococcal infections
    - Necrotizing fasciitis, Strep throat.
  - Oral anaerobic infections
  - Syphilis
  - Pasteurella (Cat bites)
- Contra-indications
  - *S. aureus*, Serious Gram negatives
  - Penicillinase resistance

# Amoxicillin

- Cheap. Ampicillin is IV form
- PCN spectrum + enterobacteriaceae
  - E. coli, proteus
  - Better E. faecalis activity
- Rash with EBV and some lymphomas
- Increased Gram negative resistance
- Beta-lactamase resistance
  - H. influenza, Klebs, Gonococcus
- Clavulinate/sulbactam
  - Broaden spectrum, overcome b-lactamase
  - Gets more anaerobes (Bacteroides)

# Anti-Staph PCN's- Nafcillin

- Best agent against MSSA
- No need to Renal Dose – hepatically cleared
- NO Gram negative or anaerobe activity
- NO Enterococcus activity
- Frequent dosing required
- Interstitial nephritis

# Anti-pseudomonal PCN

Piperacillin/Tazobactam and  
Ticarcillin/clavulinate – Zosyn and Timentin

- Broad spectrum
- Cover ALL anaerobes
  - DO not add flagyl or clinda
- Treats all enterobacteraciae
  - Timentin misses morganelia
- Weak MSSA and enterococcus
  - Timentin has no enterococcal coverage
- Frequent dosing

# Carbapenems

## ■ Imipenem/cilastatin

- Very broad and powerful
  - All gram+ve, -ve and anaerobes and enterococcus
- Treats nocardia
- Ill nursing home patient, intra-abdominal abscess
- Pancreatitis?
- Seizure risk, dosing in renal failure

## ■ Meropenem

- CNS gram negative coverage
- Less seizures, easier renal dosing
- Misses enterococcus

## ■ Ertapenem

- No pseudomonal coverage, no acinetobacter, enterococcus
- Once daily
- ESBL E. coli and Klebsiella infections

# Monolactams

- Aztreonam
- Renally dose
- ONLY Gram Negatives
- Marked resistance here – ESBL and AMP-C inducer
- Avoid use unless true PCN allergy

# Cephalosporins

- 1st Generation – Cephalexin
  - Pre-op, MSSA, OP therapy
- 2<sup>nd</sup> Generation – Cefotetan/Cefoxitin
  - Mixed infections
- 3<sup>rd</sup> Generation – Ceftriaxone
  - *S. pneumoniae* – 1gm q24 enough, higher doses for meningitis and endocarditis only
  - Beware Enterobacter and Amp-C induction
- 4<sup>th</sup> Generation – Cefepime
  - Higher doses in BMT and CC only 2g q8
  - Zwitterion – less resistance and VRE

# Aminoglycosides

## ■ Amikacin

- Expensive, marked resistance,
- Often used with imipenem in SICU
- Not interchangeable with gentamicin.

## ■ Gentamicin

- Workhorse especially Ob/gyne
- Cheap, effective for NH UTI's I/A sepsis
- Synergy in enterococcal endocarditis

## ■ Tobramycin

- no good versus enterococcus
- Gentamicin resistance = Tobramycin resistance

# Aminoglycosides-Dosing

- aminoglycosides can be dosed once daily in patients with normal renal function
- optimal dose not defined but 4-7 mg/kg/day used in studies
- appears that 10x MIC for organism may be optimal
- only measurement of trough necessary
- renal insufficiency is NOT a reason not to use an aminoglycoside
- Q8h dosing in endocarditis

# AG – Side-effects

- aminoglycoside toxicity is usually cumulative over time, not with a single dose
- ototoxicity far more important relative contraindication as it is irreversible (although also cumulative)
- Ototoxicity can occur weeks after therapy finished
- aminoglycoside loading dose does not change with renal function
- Inactivated in acid environments
  - Pulmonary processes or large abscesses

# Macrolides and Clindamycin

- Similar action on 50S Ribosome
- Resistant same with MLS gene (macrolide/lincosamide/streptogramin)
- Strep/MSSA – Cidal
- Static otherwise
- NB: Dissociative resistance ie: MSSA erythromycin resistant but clinda sensitive will become clinda resistant on therapy

# Macrolides

- Erythromycin
  - Cyto P450 inducer +++++
  - Legionella 4g/day
  - Increasing resistance
- Azithromycin
  - **Not P450 inducer**
  - MAC, S. pneumo, legionella, STD's
- Clarithromycin
  - Marked P450 inducer +++++
  - Beware in organ transplantation – acute rejection
  - H. pylori, MAI

# Clindamycin

- Gram Positives
  - MSSA, Gp A strep, S. pneumo
- Gp A strep theoretical anti-toxin effect
  - Nec. Fasc and animal models with PCN
- B. fragilis and oral anaerobic resistance
  - 25% resistance in I/A infections
- Potent C. difficile inducer
  - 25-50% develop on therapy after 1 week
- Do not use in Hospital aspiration
  - rarely anaerobes after 5 days
  - No teeth = no anaerobes
  - Covered by unasyn and zosyn

# VRE and MRSA therapies

## ■ Daptomycin

- Expensive, needs renal adjustment
- Most Cidal antibiotic MRSA and MRSE
- Treats VRE and *E. faecalis*
- IV only, bacteremia and SSI
- Myalgias, CPK weekly

## ■ Oxazolidinone

### □ Linezolid

- Expensive
- Static MRSA and VRE species
- VRE and MRSA resistance reported
- Oral formulation 100 %, no renal/ hepatic dosing issues
- Thrombocytopenia and aplastic anemia, neuropathy

# Tetracyclines

## ■ Doxycycline

- Atypical infections
- Outpatient pneumonia therapy – AST guidelines
- Mycoplasma, chlamydia, Ehrlichia
- Spirochaetes – leptospirosis, Lyme,

## ■ Minocycline

- Intracerebral anaerobes
- Listeria
- nocardia

# Quinolones

## Ciprofloxacin

- Restricted resistant pseudomonas only – 1/2 dilution better, but does it make any difference?
- Avoid UTI
- Poor gram positive – MSSA and Strep

## ■ Gatifloxacin

- Effective against Bacteroides
- Need renal dosing
- May cause hypo/hyperglycemia

## ■ Otherfloxacin

- Gemi, moxi , levo etc

# Quinolone Side-effects

- QT prologation
  - Numerous reports ALL quinolones
  - Torsades – ICU, numerous QT agents
- Neurological
  - Confusion and fugue states
- Thrombocytopenia
- Resistance!
  - Increasing gram neg due to empiric use
  - Likely pediatric indication- S. pneumo resist+++
  - Possible meningitis indication with newer quinolones
  - Increasing community MRSA due to overuse

# Bactrim (Sulpha-trimethoprim)

- Still Useful & very cheap
- UTI's – think short course
  - *S. saprophiticus* in UTI
- PCP –treatment and prophylaxis
- Nocardia therapy
- MRSA skin lesions
- Toxicity
  - Nausea, vomiting
  - Steven's Johnson rash
  - G-6PD anemia

# Others

## ■ Rifampin

- Static agent
- Only FDA indicated for Tb, Not *S. aureus*
- Reddens bodily fluids – saliva, urine and sweat
- Combination therapies only – Tb, Prosthetic infections
- Early resistance in MSSA endocarditis
- Hepatotoxicity common

## ■ Metronidazole

- Gram negative anaerobes and *C. difficile*
- Acetaldehyde reaction (Alcohol containing meds)
- Metallic Taste
- Do not need to add to Zosyn, imipenem or unasyn!