

# BUGS AND DRUGS

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## Principles of Antibiotic Use (see attached grid)

1. **Efficacy first then safety and cost.**
2. **Potency is not the same as activity.**
3. **Cidal v. static.**
  - Cidal preferred for:
    - SBE, Neutropenic fever, Meningitis, Osteomyelitis
4. **Community v. hospital-acquired.**
5. **Compartmentalization of infection**
6. **Pharmacokinetics.**
  - Large doses for large people and high volumes of distributions.
    - Large, fresh burns and early postoperative patients have large volumes of distribution.
  - Utility of post-antibiotic effect.
    - Aminoglycoside (single daily dosing)
      - Aminoglycoside does not distribute to fat
  - Predictors of efficacy
    - Peak/MIC: aminoglycosides
      - (maximize concentrations)
    - AUC/MIC: fluoroquinolones, glycopeptides, azithromycin
      - (maximize amount of drug)
    - Time>MIC: beta-lactams, carbapenems, monobactams, clindamycin, oxazolidinones
      - (maximize duration of exposure)
7. **Seriously ill does not necessarily mean broad-spectrum antibiotics.**
8. **Sepsis: “Cluster bomb” approach to the treatment.**
9. **Compliance.**

# Microbiologic Exceptions to the Rule

## 1. Group A *Streptococcus*

- Toxic shock syndrome
  - Clindamycin (obviates toxin production) plus third generation cephalosporin (overcomes Eagle effect)

## 2. *Strep. pneumoniae*

- High level penicillin resistance: MIC 2 or greater microgram/ml
- Moderate level penicillin resistance: MIC =0.5--<2 microgram/ml
- Penicillin resistance relates to treatment of meningitis
- Ceftriaxone resistance:

	Sensitive	Intermediate	Resistant
• Meningeal	0.5	1	>1
• Non meningeal	1 or less	2	>2

## 3. *Staph. aureus*

- MSSA = Beta lactam
- MRSA = Vancomycin
- VISA = Linezolid, Daptomycin, Tigecycline (or Synercid)

## 4. *Enterococcus*

- Sensitive = Beta lactam like ampicillin or vancomycin plus aminoglycoside for cidal activity
- VRE= Linezolid, Daptomycin, Tigecycline (or Synercid for *E. faecium* but not *E. faecalis*)

## 5. *Haemophilus influenzae*

- Assume beta-lactamase producer

## 6. *Enterobacteriaceae*

- Enterobacter spp. and induced beta-lactamase production
  - Exception is cefepime, a fourth generation cephalosporin

## 7. *Pseudomonas aeruginosa*

- Synergy:
  - Anti-pseudomonal penicillin or cephalosporin, carbapenem or monobactam plus aminoglycoside or fluoroquinolone
    - NOT any two of anti-pseudomonal penicillin, cephalosporin, carbapenem or monobactam;
    - NOT fluoroquinolone plus aminoglycoside

## 8. Anaerobes including *B. fragilis*

- Above the belt v. below the belt is passé
  - *Prevotella* spp. above the belt are beta-lactamase producers

## Selected Syndromes and Empiric Antibiotic Choices

Syndrome	Flora	Antibiotics <sup>@</sup>
<b>Pneumonia</b>		
• Community acquired:	Mixed: <i>S. pneumoniae</i> , Atypicals, <i>Haemophilus</i>	Azithromycin plus Ceftriaxone, OR Moxifloxacin
• Nosocomial:	GNR (incl. <i>Pseud.</i> ), <i>Staph</i> , Anaerobes	Cefepime + Vancomycin + Metronidazole +/- Amikacin
<b>Meningitis:</b>	<i>S. pneumoniae</i> , <i>N. meningitidis</i>	Ceftriaxone + Vancomycin <sup>^</sup>
<b>Cellulitis *:</b>	<i>Staph</i> , <i>Strep</i>	Vancomycin
<b>Cellulitis with water exposure</b>		
--Salt:	<i>Vibrio</i>	Add Ciprofloxacin
--Fresh:	<i>Aeromonas</i>	Add Ciprofloxacin
<b>Infected diabetic foot ulcer (PO therapy)</b>	Polymicrobial: Mixed Aerobes and Anaerobes	Ciprofloxacin + Amox./CA (OR + Clindamycin, OR + Metronidazole)
<b>Fasciitis (community acquired)</b>	<i>Strep</i> , <i>Staph</i> , Anaerobes, GNR	Cefepime + Metronidazole + Vancomycin
<b>Osteomyelitis**</b>	Usually <i>Staph</i>	Vancomycin
<b>Invasive diarrhea:</b>	<i>Shigella</i> , <i>Salmonella</i> , <i>Campylobacter</i>	Ciprofloxacin
<b>Simple cystitis</b>	<i>E. coli</i>	Ciprofloxacin or Nitrofurantoin
<b>Pyelonephritis</b>	<i>E. coli</i> , <i>Enterococcus</i>	Ampicillin + Gentamicin
<b>Prostatitis</b>	GNR	Ciprofloxacin
<b>Sepsis</b>		
• Community acquired: #	<i>Strep</i> , <i>Staph</i> , GNR, Anaerobes, <i>Enterococcus</i>	Ceftriaxone + Metronidazole + Vancomycin OR Ertapenem + vancomycin <sup>\$</sup>
• Hospital acquired: #	<i>Strep</i> , <i>Staph</i> , GNR, <i>Pseudomonas</i> , Anaerobes, <i>Enterococcus</i>	Cefepime + Metronidazole + Vancomycin OR Meropenem + vancomycin <sup>\$</sup>

\* The combination of TMP/SMX + rifampin is a predictably active oral regimen for treating MRSA infection, but this regimen is not reliably active against Streptococci, especially Group B Streptococci. Oral linezolid is not ideal. An oral step down regimen for cellulitis when MRSA cannot be excluded remains controversial, but clindamycin plus TMP/SMX is one choice.

\*\* Once culture results prove that the *Staphylococcus aureus* is MSSA and not MRSA, switch to nafcillin or cefazolin.

# A carbapenem might be indicated if ESBL is a consideration (Nursing Home, etc)

@ Cefepime might be used preferentially instead of ceftriaxone in some community acquired infections involving GNR in order to forestall the emergence of ESBL

<sup>^</sup> Add ampicillin in adults older than 50-60 years to cover possible Listeria.

<sup>\$</sup> Regimen of choice if ESBL is a concern.