

Community acquired pneumonia and treatment options

- 6 mechanisms in pathogenesis of pneumonia – (inhalation, aspiration, direct inoculation, reactivation, defects in pulmonary defenses, blunted cellular or humoral immune response)
- In general, clinical presentation: pleuritic chest pain, fever, cough, decreased breath sounds, dull to percussion, egophony

- Classified as “typical” or “atypical” or viral
- Typical = *S. pneumoniae*, *H. influenzae*, *S. aureus*, enteric gram negative bacteria. More segmental or lobar infiltrate.
- Atypical = *Mycoplasma*, *Legionella*, *Chlamydia pneumoniae*. More diffuse infiltrate. Sputum gram stain usually negative.

- Empiric treatment prior to susceptibility testing- cover *S. pneumoniae*, *S. aureus*, *H. influenzae*. Give amoxicillin-clavulanate, and 2nd or 3rd generation cephalosporin, or respiratory fluoroquinolone (3rd and 4th generation).

CAP patient characteristics

- Smokers: *S. pneumo*, *H. influenzae*, *Moraxella*
- Post viral bronchitis: *S. pneumo*
- No co-morbidity: atypicals, viral
- Alcoholic: *S. pneumo*, anaerobes
- IV drug user: *S. aureus*
- Epidemic: Legionnaire's
- Airway obstruction: anaerobes
- Animals: Psittacosis, Tularemia, *Coxiella burnetii*

Mechanisms of action of different antimicrobials

- **Penicillins-** Inhibits the transpeptidase enzyme step in peptidoglycan cell wall synthesis

1st generation:[ex Pen G] most streptococci, oral anaerobic coverage

2nd generation:[nafcillin] most streptococci, S. aureus (Penicillinase resistant)

3rd generation:[amoxicillin, ampicillin] most streptococci, basic G – coverage.

Amoxicillin is oral DOC for susceptible strains of S. pneumoniae

Amoxicillin with clavulanate treats beta lactamase producing bacteria like H. influenzae, Methicillin sensitive Staph aureus and anaerobes

4th generation:[piperacillin] extended spectrum, includes pseudomonas

- **Cephalosporins-**inhibits cell wall synthesis

Parenteral DOC for CAP caused by susceptible strains of S pneumoniae, H influenzae, Staph aureus.

1st generation: G+ (including Staph aureus), basic G-

2nd generation: G+, diminished Staph aureus, improved G- coverage, some anaerobic coverage

3rd generation: further diminished S. aureus, further improved G-, some Pseudomonal coverage and diminished G+ coverage

4th generation: same as 3rd plus coverage against Pseudomonas

**note that neither group is effective against “atypicals”

- **Macrolides**-inhibits 50s subunit of ribosome in protein synthesis
Treats mycoplasma, legionnaire's, chlamydial infections
Active against most common pathogens and atypical agents. Macrolide resistance is emerging to Strep pneumoniae
- **Fluoroquinolones**-inhibits DNA gyrase
Broad spectrum against likely agents of CAP. Active against penicillin resistant Strep pneumoniae. Resistance developing.
1st generation: G- NOT pseudomonas, UTI only, NO atypicals
2nd generation: G- including pseudomonas, S. aureus, some atypicals NOT pneumococcus
3rd generation: G-, G+, expanded atypicals
4th generation: same as 3rd plus enhanced coverage of pneumococcus, decreased activity vs pseudomonas.
- **Tetracyclines**- inhibits 30s subunit of ribosome in protein synthesis
G+ and G-, aerobic & anaerobic bacteria, "atypicals"- mycoplasma, chlamydia and category A bioterrorism agents

Streptococcus pneumoniae

(2/3 of CAP cases)

- **Properties:** G + diplococci “lancet shaped”, α hemolytic. #1 cause CAP: “rusty sputum”, single rigor, fever.

- **Tx and dose:**

sensitive strains treat with penicillin G 250,000-400,000 units/kg/day IV divided q 4-6 or amoxicillin (oral) 1g PO tid.

intermediate resistance strains are susceptible to 2nd/3rd generation parenteral cephalosporins and respiratory fluoroquinolones

Cefotaxime 1-2g IM/IV q6-8 or ceftriaxone 1-2 g IM/IV q24h.

Levofloxacin 500mg IV/po qd (others: alatrofox-, gati-, moxi-)

- **Prevention:** capsular vaccines (prevnar, pneumovax)

- **H. influenzae**

trimethoprim-sulfamethoxazole, Ampicillin IV, Amoxicillin po, azithro/clarithromycin, doxycycline

If severe, 3rd gen cephalosporin

- **Enteric gram negatives**

Anaerobes: clindamycin or beta lactam/beta lactamase inhibitor

- **Staph aureus**

Sensitive strains: Nafcillin or oxacillin (penicillinase resistant abx)

MRSA- Vancomycin

- **Atypicals**

Legionella- fluoroquinolone or azithromycin

Mycoplasma- erythro, azithro, clarithromycin, or fluoroquinolone

Chlamydia pneumoniae- doxycycline, erythrocyclin or fluoroquinolones

Duration of therapy

- *S pneumoniae*: until afebrile for 3-5d
- *C pneumoniae*: 7-14 d
- *M pneumoniae*: not well established.
- *Legionella*: 10-21 d
- *S aureus*, *P aeruginosa*, *Klebsiella*, anaerobes >3weeks