

MICROBIOLOGY



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Community acquired pneumonia

Histological appearance:

1. **Fibrinopurulent:** alveolar exudate seen in acute bacterial pneumonias. (Seen with *S.pneumonia*)
2. **Mononuclear interstitial infiltrates:** in viral and other atypical pneumonias (Seen with atypical mycoplasm)
3. **Granulomas** and **cavitation:** seen in chronic pneumonias (Seen in T.B)

Epidemiology:

Overall the rate of CAP 5.16 to 6.11 cases per 1000 persons per year
Mortality 23%

Risk factors:

pneumonia is high especially in old people (Why ? because immunity is low) and children less than 2
prior influenz /asthma/ COPD
smoking alcoholism, traveling (hotels)
immuocompression (DM, HIV)
chronic lung and heart disease
occupational exposures : birds (C-psittaci)

Factors involved in the formation of pneumonia:

1. host defenses(e.g. Mucociliary clearance-Alveolar macrophages-Cough reflux)
2. pathogens(e.g. bacteria-viral-fungal)

Pathophysiology:

- *Inhalation of pathogenic organism into a lung segment or lobe
- *secondary bacteraemia from another source
- *aspiration of oropharyngeal content

Classification:

- 1-Pathogen-(most useful-choose antimicrobial agents)
- 2-Anatomy (lobar – bronchopneumonia – interstitial)
- 3-Acquired environment (community – hospital)

Bacterial pneumonia (Classification by Pathogen):

Streptococcus pneumoniae is the most frequently isolated pathogen

- **Typical:** Typical pneumonia usually is caused by bacteria

(1)**Gram-positive bacteria** (**Streptococcus pneumoniae**- Staphylococcus aureus- Group A hemolytic streptococci)

(2) **Gram-negative bacteria** (*Hemophilus influenzae*- *Moraxella catarrhalis*- *Escherichia coli*- *Klebsiella pneumoniae*)

(3) **Anaerobic bacteria**

– **Atypical pneumonia:** not detectable on gram stain; won't grow on standard media (Because it doesn't have a cell wall)

- *Mycoplasma pneumoniae* *(most common atypical)
- *Chlamydia pneumoniae*
- *C. burnetii* (Q fever)
- *Legionella*
- *Rickettsias*

(viral pneumonia in children less than 5: adenovirus, syncytial virus, influenza virus, cytomegalovirus, herpes simplex virus)

Community acquired pneumonia

MOST COMMON: STREP PNEUMONIAE
 DRSP: drug resistant streptococcus pneumoniae (dangerous)

Type	Typical	Atypical
	lobar pneumonia	Bilateral interstitial
organism	- <i>S. pneumoniae</i> - <i>H. influenzae</i> - <i>M. catarrhalis</i> - <i>staph aureus</i> Can gram stain	- <i>Chlamydia pneumoniae</i> - <i>Mycoplasma pneumoniae</i> - Q fever(<i>Coxiella burnetii</i>) - <i>Legionella</i> – <i>Psittacosis</i> – TB – viruses Cant gram stain (most don't have cell wall) Wont grow on standard media
Clinical presentation	-cough -shortness of breath - fever -chest pain -shaking -sputum (SUDDEN) Prior viral infection	(flu like symptoms) -headache -sore throat - mild cough -mild fever - myalgia (GRADUAL)
treatment	β -lactam (if resistant we use -penicillin -second gen cephalosporin - third gen cephalosporin	macrolides, tetracyclines, fluoroquinolone , doxycycline <i>levofloxacin</i> Resistant to penicillin
X-ray finding	One lobe consolidation	Bad bilateral interstitial infiltrate

Drug resistant strep pneumoniae are resistant to: cephalosporins, macrolides, tetracycline,
Clindamycin, bactrim, quinolones, Penicillin
But all MDR are sensitive to VANCOMYCIN OR LINEZOLID and most are still sensitive to quinolone
For meningitis: Penicillin is not effective

Classification by anatomy:

1. Lobar: entire lobe -
2. Lobular: (bronchopneumonia)-
3. Interstitial

Classification by acquired environment:

- A. Community acquired pneumonia (CAP)
- B. Hospital acquired pneumonia (HAP)
- C. Nursing home acquired pneumonia (NHAP)
- D. Immunocompromised host pneumonia (ICAP)

Atypical pneumonia:

Approximately 15% of all CAP.

Often extra pulmonary manifestations:

-**Mycoplasma:** causes GIT problems (extrapulmonary manifestations) +
associated with skin rash and hemolysis + myocarditis + pancreatitis
common (but rare in children)
no cell wall.

in people younger than 40

usually mild and respond well to antibiotics (but may be serious)

-**Chlamydia:** laryngitis (obligate intracellular)

Q fever usually found in sheep caused by *Coxiella burnetii*

Francisella tularensis usually found in Rabbits

C. psittaci usually found in birds/ Parrots

Treatment: 1st: tetracycline 2nd: macrolide

Legionella:

Causes very severe pneumonia. Caused by *Legionella pneumophila*: (atypical organism). Outbreaks have been linked to exposure to **cooling towers** (e.g. air-condition, water sprays, waterfalls, water tanks). Patient admitted to the ICU will have high fever and low sodium (hyponatremia)

WBC count < 15,000 (mildly elevated) + acute renal failure (urinary antigens will be found)

Dry cough + mild URTI (upper urinary tract infection) + rhonchi + malaise
 abnormal LFT (liver function test)

Treatment of legionella infection is with ciprofloxacin (quinolones) for 10-14 days
 (21 days if the patient is immuno-compromised)

Macrolides
 tetracycline
 rifampicin

Out Patient management:

condition	organism	treatment
Outpatient, healthy, with no exposure to antibiotics	S pneumoniae, Viral M pneumoniae,	Macrolides or Doxycycline
Outpatient, with comorbidity or exposure to antibiotics	S pneumoniae, M pneumoniae, C. pneumoniae, H influenzae S aureus, anaerobes	Macrolides +Beta lactam Or Respiratory Flouroquinolones
Inpatient : Not ICU	Same as above +legionella	Antipneumococcal Beta lactam+ Macrolides Or Respiratory Flouroquinolones
Inpatient : ICU	Same as above + <i>Pseudomonas</i>	Antipneumococcal Beta lactam+ Macrolides Or Antipneumococcal Beta lactam+ Respiratory Flouroquinolones

Anti-pneumococcal B-lactam: cefotaxime

Anti-pseudomonas B-lactam: cetazidime

Respiratory flouroquinolone: gatifloxacin/moxifloxacin/Levofloxacin

B lactam: amoxicillin+clavulnic acid /Cefuroxime

Macrolides: azithromycin/clarithromycin

Questions:

1-patient 25 years old presented with cough fever lobular pneumonia, culture Gram positive diplococci what is the most likely organism?

- a- Chlamydia
- b- Legionella
- c- S. pneumoniae
- d- Mycoplasma

2- which one of the following is the most common Atypical bacteria?

- a- Mycoplasma
- b- H influenzae
- c- S. pneumoniae
- d- S. aureus

3- C. psittaci usually found in which animal?

- a- Sheep
- b- Rabbits
- c- Pigs
- d- birds

4- which one of the following is seen in ICU patients with Legionella?

- a- Low fever high sodium
- b- high fever high sodium
- c- High fever low sodium
- d- Low fever low sodium

Answers 1- C 2-A 3-D 4-C