

Pneumonia

Community acquired pneumonia

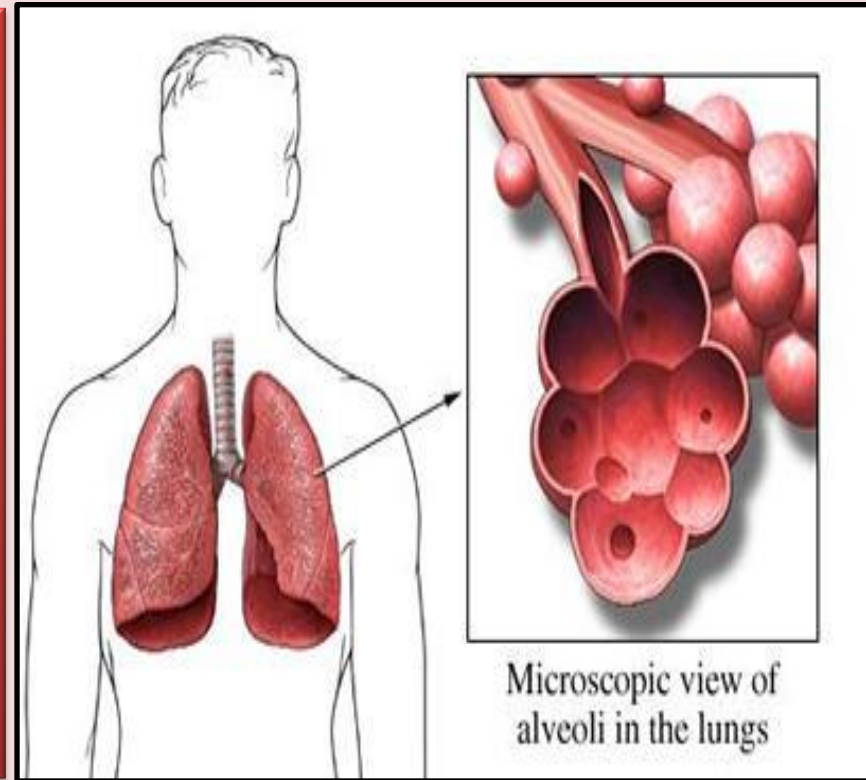
Dr fawzia Alotaibi

Introduction

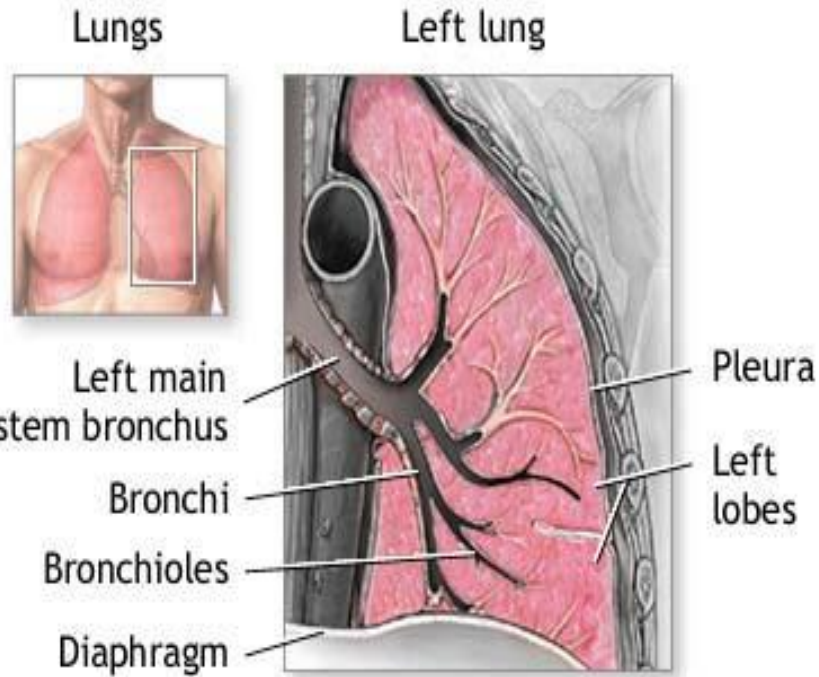
- inflammation of the parenchyma of the lung (the alveoli)
- Common in winter months
- It is the sixth leading cause of death in USA
- over 3 million people develop pneumonia each year and 600,000 hospitalized in United States
- Morbidity and mortality of pneumonia are high especially in old people
- Almost 1 million annual episodes of CAP in adults ≥ 65 yrs in the US
- Histologic spectrum vary
 - fibrinopurulent alveolar exudate (acute bacterial)
 - interstitial infiltrates (viral and other atypical pneumonias)
 - granulomas and cavitation (chronic pneumonias)

Definition

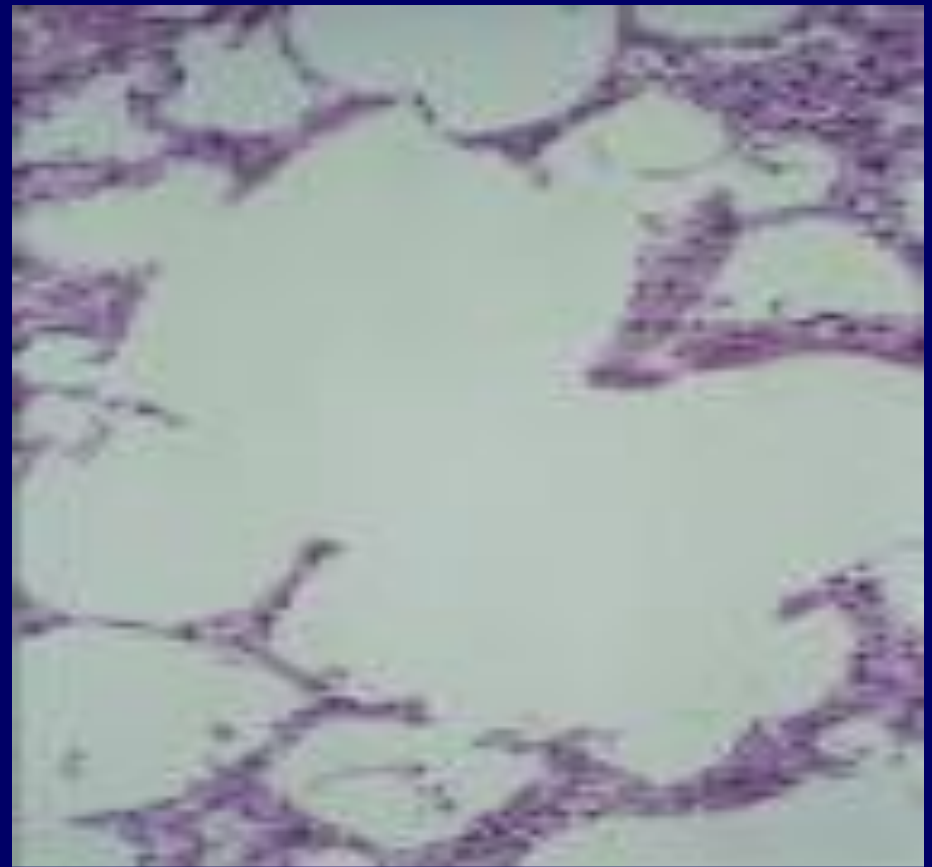
- Acute infection of the parenchyma of the lung alveoli (consolidation and exudation) caused by:
bacteria, fungi, virus, parasite.
 - Acute (Fulminant)
 - Chronic
- Other factors chemical, allergen



Lung Anatomy



ADAM.



Epidemiology

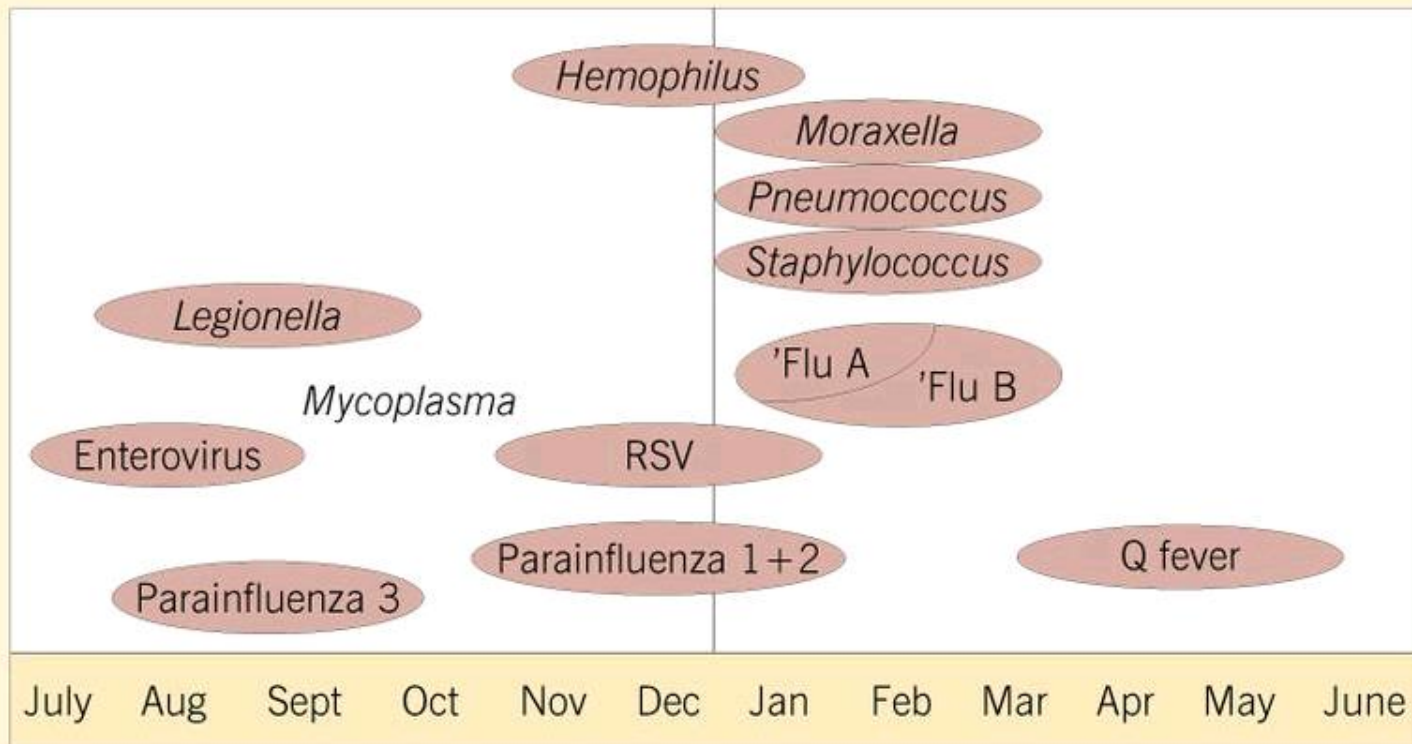
Risk factors

- Age < 2 yrs, > 65 yrs
- prior influenza
- HIV
- alcoholism
- smoking
- Asthma
- Immunosuppression
- Chronic lung and heart (*S. pneumoniae*)

Risk factors

- institutionalization
- Recent hotel : *Legionella*
- Travel,
- occupational exposures-
- birds (*C- psittaci*)
- Aspiration
- COPD
- dementia

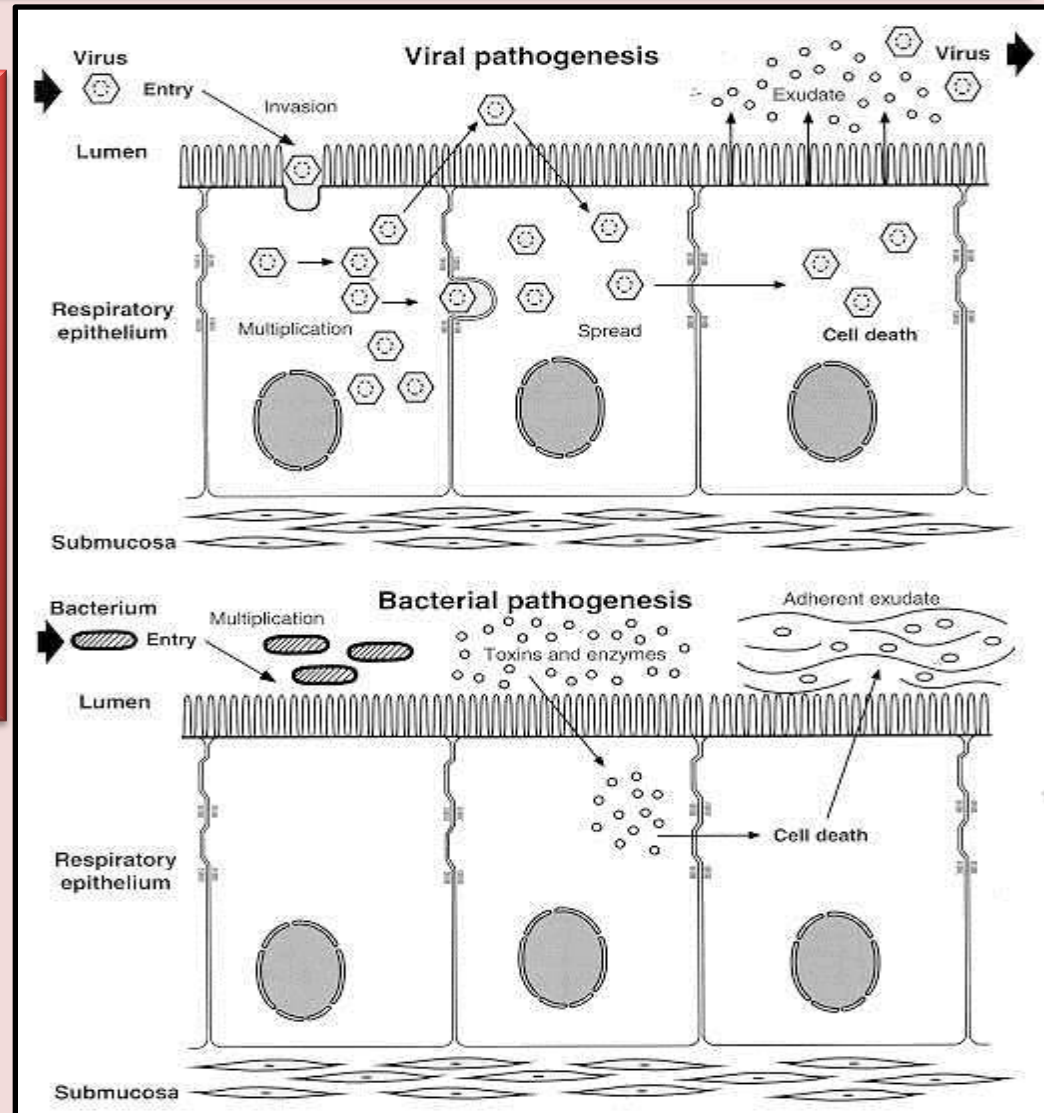
SEASONAL PATTERN OF RESPIRATORY PATHOGENS



Pathogenesis

Two factors involved
in the formation of
pneumonia

- pathogens
- host defenses.



Defense Mechanisms of the Respiratory Tract

- Filtration and deposition of environmental pathogens in the upper airways.
- Cough reflex.
- Mucociliary clearance.
- Alveolar macrophages.
- Humoral and cellular immunity.
- Oxidative metabolism of the neutrophils.

Pathophysiology :

- Inhalation or aspiration of pulmonary pathogenic organisms into a lung segment or lobe.
- Secondary bacteraemia from a distant source, Escherichia coli urinary tract infection and/or bacteraemia (Less common)

Classification

- **Anatomy**
 - Lobar: entire lobe
 - Bronchopneumonia
 - Interstitial
- **Pathogen**
 - Gram-positive : *Streptococcus pneumoniae* , *Staphylococcus aureus*, Group A hemolytic streptococci
 - Gram-negative : *Klebsiella pneumoniae*, *Hemophilus influenzae*, *Moraxella catarrhalis* and *Escherichia coli*
 - Atypical Bacteria : *Mycoplasma pneumoniae*, *Chlamydia pneumoniae* and *Legionella*. Anaerobic bacteria
 - Viral and fungal
- **Acquired environment:** community ,hospital ,nursing home acquired and immunocompromised host

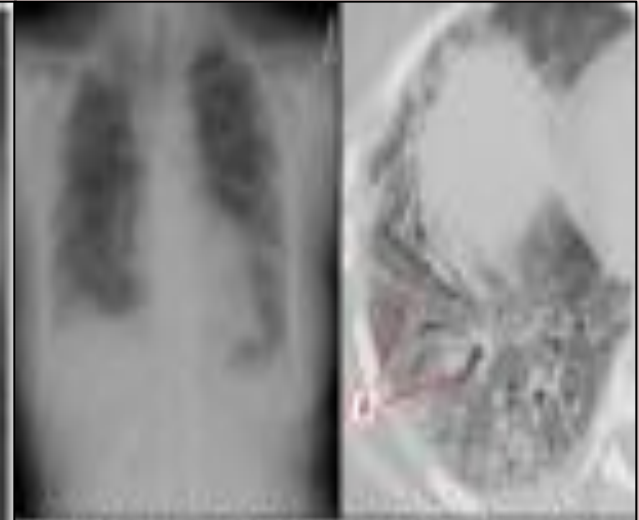


Lobar pneumonia



Figure 3. A chest radiograph of an 89-year-old patient with bacterial pneumonia typically shows a diffuse reticulonodular pattern

Bronchopneumonia



89-year-old woman with rapidly progressive BIP. PA radiograph (left) shows diffuse (predominant with bronchovascular) and ground glass density (right) areas (right bronchovascular bundle shows peribronchovascular thickening and bronchovascular dilatation with secondary dilatation and enlargement of the airways).¹⁴

Interstitial pneumonia

Pathogens

- **Bacterial pneumonia**

- Typical

- (1) **Gram-positive bacteria as**

- *Streptococcus pneumoniae*
 - Staphylococcus aureus
 - Group A hemolytic streptococci

- (2) **Gram-negative bacteria**

- Klebsiella pneumoniae
 - Hemophilus influenzae
 - Moraxella catarrhal
 - Escherichia coli

- (3) **Anaerobic bacteria**

- **Atypical pneumonia**
 - Legionnaires pneumonia
 - Mycoplasmal pneumonia
 - Chlamydia pneumonia
 - Rickettsias
- **Fungal pneumonia**
 - Candida
 - Aspergilosis
 - Pneumocystis carinii

Viral pneumonia

the most common cause of pneumonia in children < than 5 years

- Adenoviruses
- Respiratory syncytial virus
- Influenza virus
- Cytomegalovirus
- Herpes simplex virus

Pneumonia caused by other pathogen

- Parasites
- protozoa

CAP

- CAP : pneumonia acquired outside of hospitals or extended-care facilities for > 14 days before onset of symptoms.
 - *Streptococcus pneumoniae* (most common)
- Drug resistance streptococcus pneumoniae(DRSP) is a major concern.

What is the most common cause of community-acquired pneumonia?

Children

• Viral

- Respiratory syncytial virus
- Parainfluenza virus
- Human metapneumovirus

• Bacterial

- *S.pneumoniae*
- *H.influenza* type B
- Group B streptococci in neonate

Adult

- *S.pneumoniae*
- *Mycoplasma pneumoniae*,
chlamydophila pneumoniae
- respiratory viruses depending on the season

Special conditions

Chronic lung diseases

- *S.pneumoniae*
- *H.influenza*

Recently hospitalized

- Gram negative, *legionella*

Recent influenza

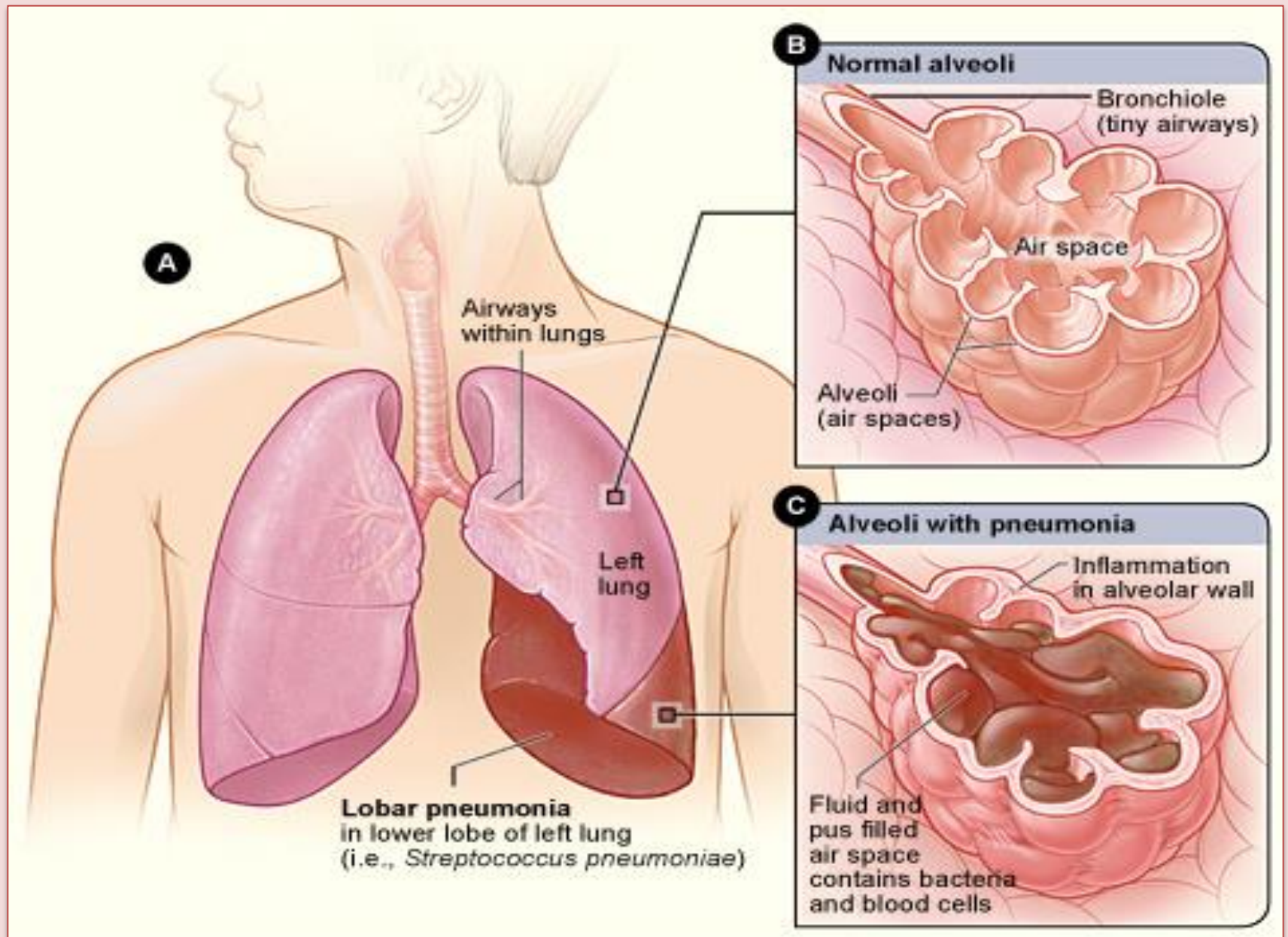
- *S.pneumoniae*
- *S.aureus*

What is the difference between typical and atypical community-acquired pneumonia?

Variable	Typical	Atypical
Etiology	S.pneumoniae, H.influenza	Mycoplasma pneumoniae, chlamydophila pneumoniae , legionella, TB, viral or fungal
Clinical presentation	Sudden onset of fever, chill, productive cough, shortness of breath and chest pain	Gradual onset headache, sore throat and body ache
Diagnosis Gram Stain	Useful	Useless (no cell wall)
Radiography	Lobar infiltrate	Dramatic changes: patchy or interstitial
Treatment with penicillin	Sensitive	Resistant

Clinical manifestation lobar pneumonia

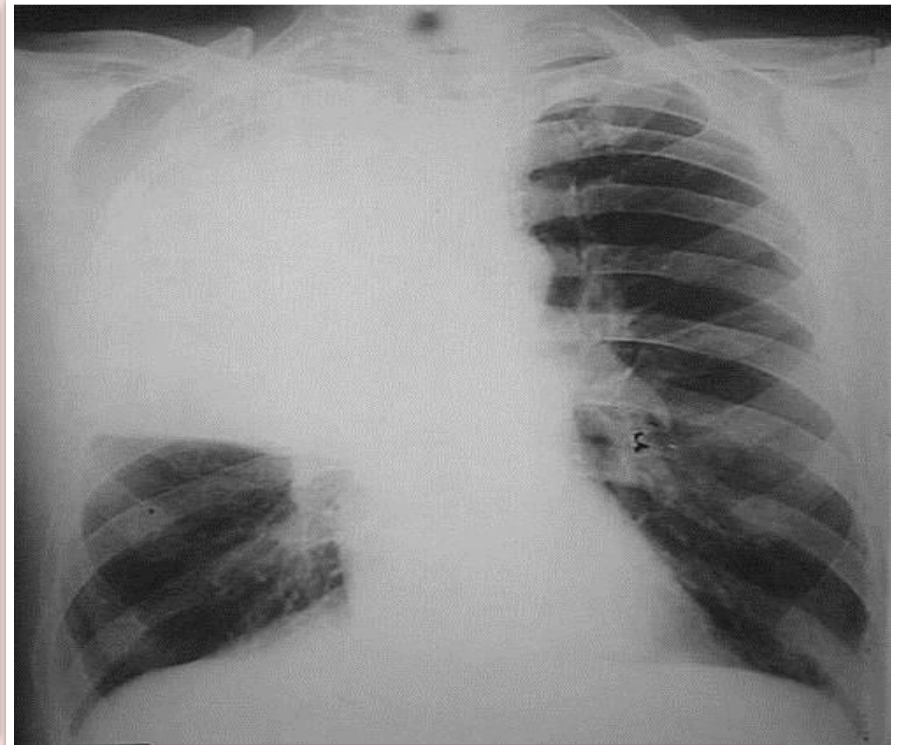
- The onset is acute
- Prior viral upper respiratory infection
- Respiratory symptoms
 - Fever
 - shaking chills
 - cough with sputum production (rusty-sputum)
 - Chest pain- or pleurisy
 - Shortness of breath



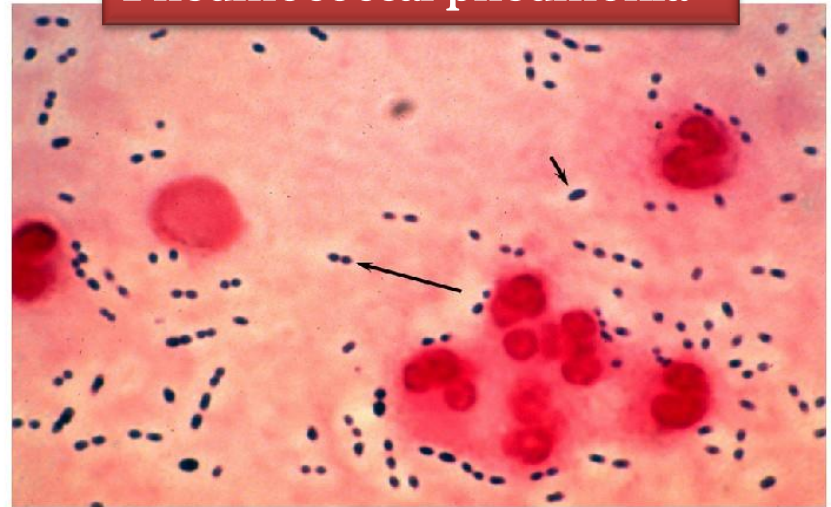
Lobar pneumonia

Diagnosis

- Clinical
 - History & physical
- X-ray examination
- Laboratory
 - CBC- leukocytosis
 - Sputum Gram stain- 15%
 - Blood culture- 5-14%
 - Pleural effusion culture



Pneumococcal pneumonia



Drug Resistant Strep Pneumoniae

- 40% of U.S. *Strep pneumo* CAP has some antibiotic resistance:
 - PCN, cephalosporins, macrolides, tetracyclines, clinda, bactrim, quinolones
- All MDR strains are sensitive to vancomycin or linezolid; most are sensitive to respiratory quinolones
- β -lactam resistance – Not for meningitis (CSF drug levels)
- PCN is effective against pneumococcal Pneumonia at concentrations that would fail for meningitis or otitis media
- For Pneumonia, pneumococcal resistance to β -lactams is relative and can usually be overcome by increasing β -lactam doses (not for meningitis!)

	PCN Minimum Inhibitory Concentration (MIC) mcg/mL to <i>Streptococcus Pneumonmoniae</i> :		
	Susceptible	Intermediate	Resistant
2008	MIC \leq 2	MIC = 4	MIC \geq 8
<i>2007 CAP Guidelines</i>	<i>MIC <2</i>	---	<i>MIC \geq 2</i>
Meningitis	MIC <0.06	---	MIC \geq0.12

- Pneumococcal CAP: Be cautious if using PCN if MIC >4. Avoid using PCN if MIC \geq 8.
- Remember that if MIC <1, pneumococcus is PCN-sensitive in sputum or blood (but need MIC <0.06 for PCN-sensitivity in CSF).

Mycoplasma pneumonia

- Eaton agent (1944)
- No cell wall
- Mortality rate 1.4%
- Rare in children and in > 65
- Associated with M.I. in some literature
- Myocarditis
- *Mycoplasma pneumonia*.
- common
- people younger than 40.
- crowded places like schools, homeless shelters, prisons.
- usually mild and responds well to antibiotics.
- can be very serious
- may be associated with a skin rash and hemolysis

• Symptoms

- Insidious onset
- Mild URTI to severe pneumonia
- Headache
- Malaise
- Fever
- dry cough
- Arthralgia / myalgia

• Signs

- Minimal
 - Few crackles
 - Rhonchi
 - Exhaustion
 - Low grade fever



Legionella pneumophila

- Legionnaire's disease.
- has caused serious outbreaks.
- Outbreaks have been linked to exposure to cooling towers
- ICU admissions.

Diagnosis & Treatment of atypical pneumonia

- Mild elevation WBC
 - U&Es
 - Low serum Na (Legionella)
 - Deranged LFTS
 - ↑ ALT
 - ↑ Alk Phos
 - Cold agglutinins (*Mycoplasma*)
 - Serology
 - DNA detection
- Macrolide
 - Rifampicin
 - Quinolones
 - Treat for 10-14 days

Importance of history taking in patient with community-Acquired pneumonia

History	
Solid organ transplant	Any pathogen Bacterial , viral, fungal,or parasitic
HIV	Pneumocystis jirovecii
Travel to some area in USA	Endemic Mycosis
Exposure to air-conditioning, cooling towers, hot tub, hotel stay, grocery store mist machine	Legionella pneumophilla
Exposure to Turkeys, chickens, ducks or parrots	Chlamydia psittaci
Exposure to contaminated bat caves	Histoplasma capsulatum
Exposure to sheep, goat or cattle	Coxiella burnetii
Exposure to rabbits	Francisella tularensis
Occupation	Mycobacterium tuberculosis, HIV

Evaluate the severity & degree of pneumonia

Is the patient will require hospital admission?

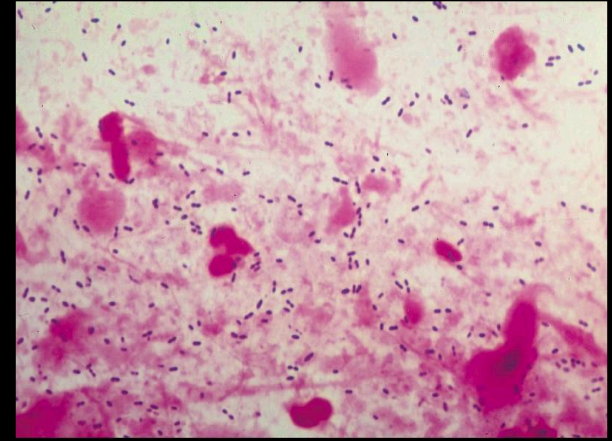
- patient characteristics
- comorbid illness
- physical examinations
- basic laboratory findings

Diagnosis

- Physical examination
 - Respiratory signs on consolidation
 - Other systems
- Chest x-ray examination
- Laboratory
 - CBC~ leukocytosis
 - Electrolytes (↓Na in legionella)
 - Urea, creatinine, LFT

Diagnosis

- Sputum Gram stain~ 15%
- Sputum culture
- Bronchoscopic specimens
- Blood culture 6~10%
- NP swab for respiratory viruses
- *Legionella* urine antigen
- **Serology** for *M.pneumoniae*, *C.pneumoniae*
- *Cold agglutination M.pneumoniae*
- More Invasive procedure in sick patient



Management

- Outpatient or inpatient (hypotension, confusion and oxygenation) and age
- Previous treatment in the past 3 months
- Resistance patterns in the community

Antibiotics selection

	Macrolide (Azithromycin or clathromycin)	Fluoroquinolone(F Q)	Ceftriaxone (β lactam)
Outpatient	√		
Outpatient with comorbidity and or macrolides treatnet		√	√ + macrolide
Inpatient Non ICU		√	√+ macrolide
Inpatient ICU			√ +macrolide or FQ

Other Concerns

Organisms	Antibiotics
<i>Pseudomonas</i>	Macrolide + ceftazime or FQs
MRSA	Vancomycin or linezolid
<i>Chlamydia psittaci</i>	Macrolide or tetracycline
<i>Coxiella burnetii</i>	Macrolide or tetracycline
<i>Legionella</i>	Erythromycin

The diagnostic standard of severe pneumonia

- Altered mental status
- $PaO_2 < 60 \text{ mmHg}$. $PaO_2/FiO_2 < 300$, needing MV
- Respiratory rate $> 30/\text{min}$
- Blood pressure $< 90/60 \text{ mmHg}$
- Chest X-ray shows that bilateral infiltration, multilobar infiltration and the infiltrations enlarge more than 50% within 48h.
- Renal function: $U < 20 \text{ ml/h}$, and $< 80 \text{ ml/4h}$

Complications

- Death 10% , 40% (ICU) within 5 days
- Mainly old age with sever pneumonia
- Respiratory and cardiac failure
- Empyema 10%

Prevention

- Vaccination
 - Influenza
 - *S.pneumoniae*
- Prevention of Aspiration
 - Head Position
 - Teeth cleaning