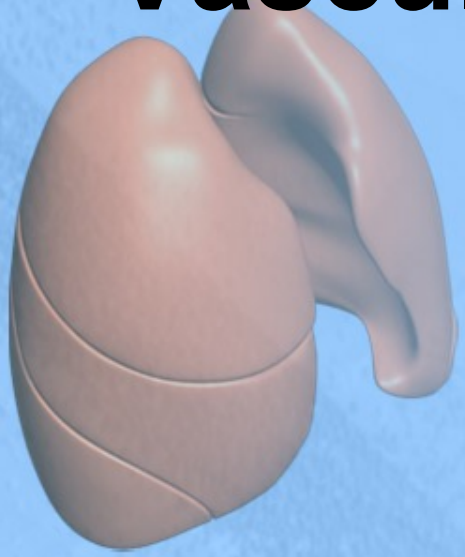
Pulmonary Disorders 3
Interstitial Lung Diseases
Vascular Pulmonary Diseases
Infections

Dr. Gary Mumaugh

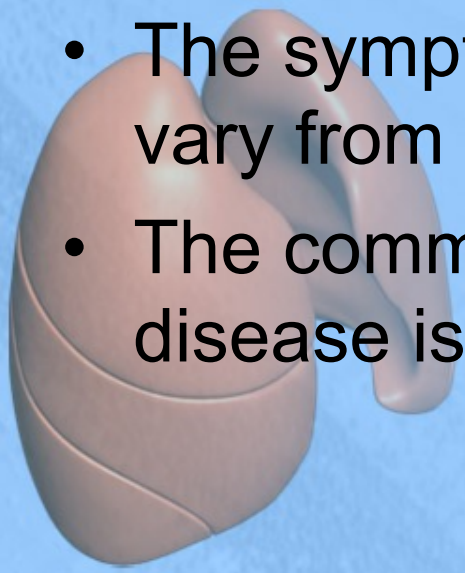


Major Pulmonary Topics

- Pleural Lesions
- Restrictive or Obstructive Lung Diseases
- Interstitial Lung Diseases
- Pulmonary Diseases of Vascular Origen
- Infections

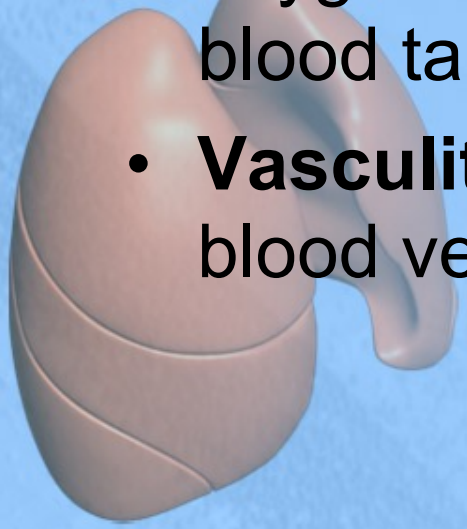
Interstitial Lung Diseases

- Refers to a group of about 100 chronic lung disorders characterized by inflammation and scarring that make it hard for the lungs to get enough oxygen.
- The scarring is called pulmonary fibrosis.
- The symptoms and course of these diseases may vary from person to person.
- The common link between the many forms of the disease is that they all begin with inflammation.



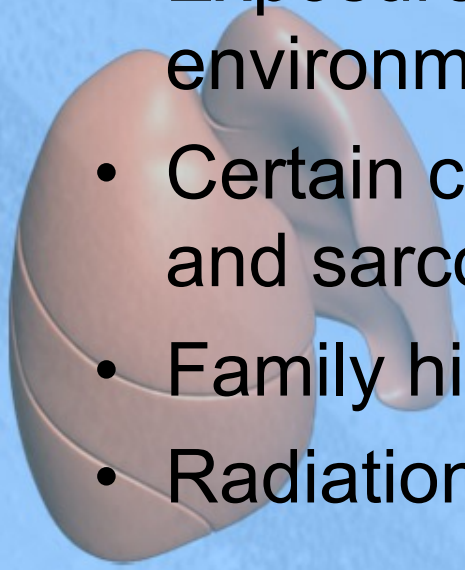
Inflammatory Signs of Interstitial Lung Diseases

- **Bronchiolitis:** inflammation of the small airways (bronchioles).
- **Alveolitis:** inflammation of the air sacs where oxygen and carbon dioxide exchange in the blood takes places (alveoli).
- **Vasculitis:** inflammation that involves the small blood vessels (capillaries).



Causes of interstitial lung disease

- The cause of interstitial lung disease is not known. Major contributing factors include:
- Smoking
- Certain drugs or medicines
- Exposure to substances at work or in the environment such as organic or inorganic dusts
- Certain connective tissue or collagen diseases and sarcoidosis
- Family history
- Radiation treatment

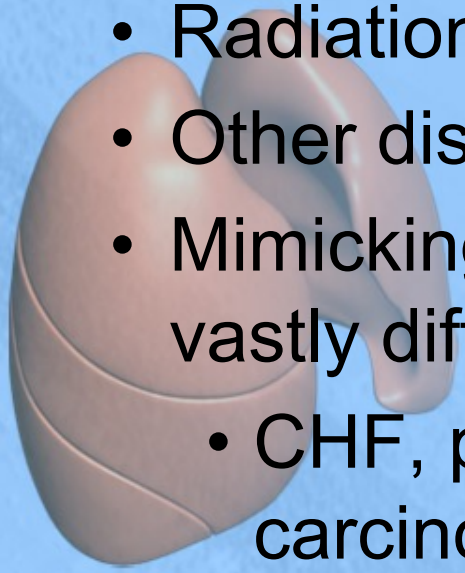


Symptoms of Interstitial Lung Diseases

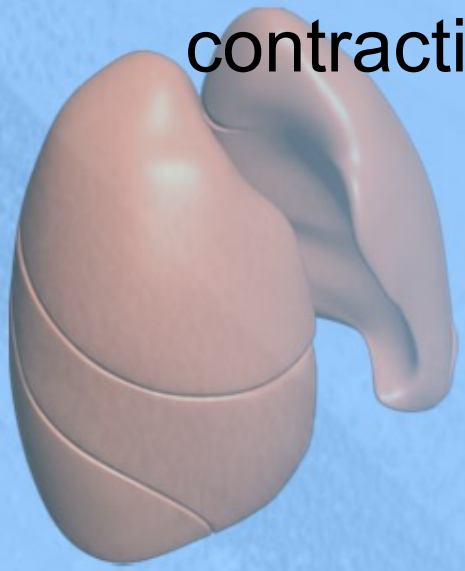
- Shortness of breath, especially with activity
- Dry, hacking cough that does not produce phlegm
- Extreme tiredness and weakness
- Loss of appetite
- Unexplained weight loss
- Discomfort in the chest
- Labored breathing, which may be fast and shallow
- Bleeding in the lungs

Pulmonary Fibrosis

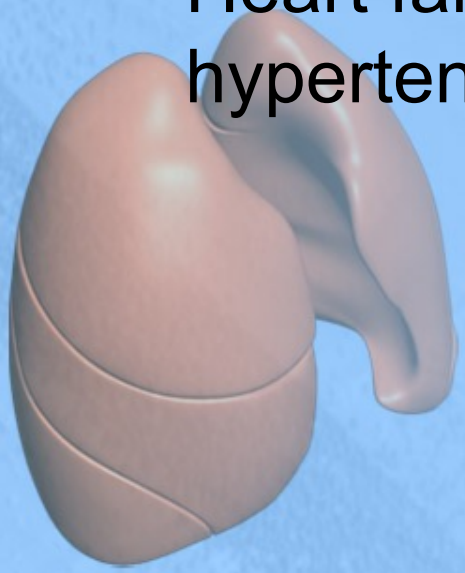
- Most common causes
  - Environmental causes – inhaled dusts, asbestosis, silicosis, glass makers, construction workers
  - Antigens – hypersensitivity pneumonitis
  - Drugs – Methotrexate
  - Radiation injury
  - Other diseases – sarcoidosis, RA
  - Mimicking disorders similar presentation but vastly different
    - CHF, pneumocystis or viral pneumonia, carcinomatosis



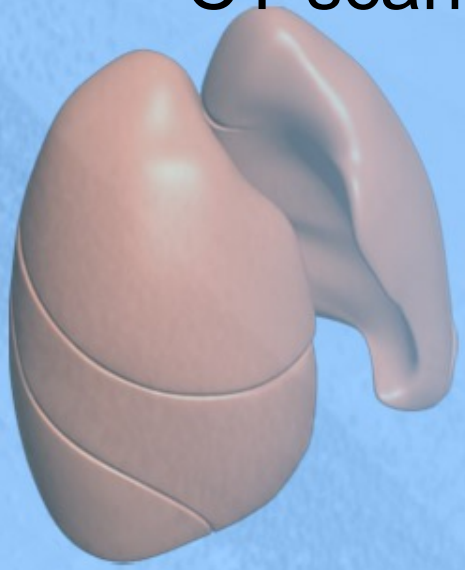
- Pathology of interstitial lung disease
  - Inflammation of the alveolar wall and inter-alveolar spaces
  - Fibrous scarring
  - Granuloma formation
  - End stage leads to a mass of scar tissue with contraction and the formation of cystic areas



- Impairment of pulmonary function
  - Decreased lung volume
  - Decreased compliance (stiff lungs)
  - Impairment of diffusion
  - Decreased gas exchange
  - Shunting and spasm of pulmonary arteries
  - Heart failure resulting from pulmonary hypertension



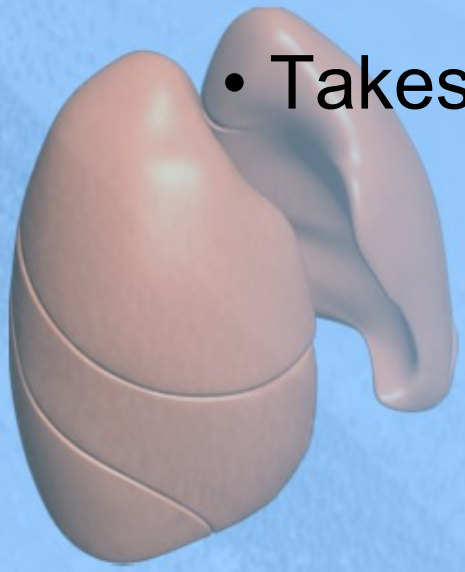
- S & S of pulmonary fibrosis
  - Obvious dyspnea
  - Chronic nonproductive cough
  - Clubbing
  - Mild cyanosis
- Diagnosis of pulmonary fibrosis
  - CT scan is confirmatory



Diseases that can cause pulmonary fibrosis

Silicosis

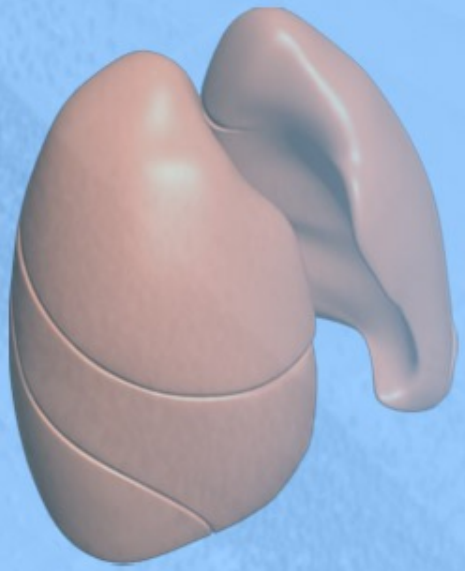
- Silicosis is currently the most prevalent chronic occupational disease in the world.
- It is caused by inhalation of crystalline silica, mostly in occupational settings.
- Disease of glass makers, sand blasters, rock miners and stone cutters
- Takes 20 years to develop



Diseases that can cause pulmonary fibrosis

Pneumoconiosis

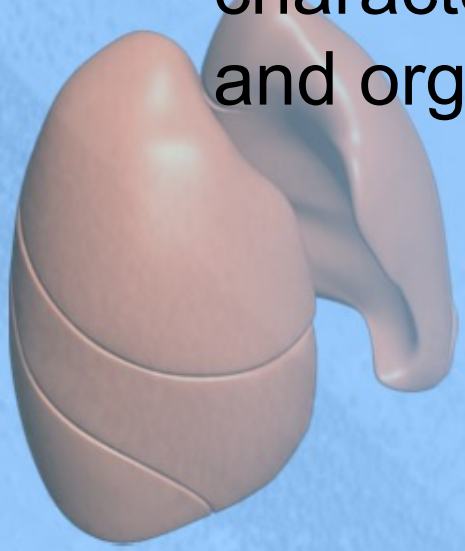
- Coal miner's disease
- Severe lung fibrosis with hypoxia
- Resulting from exposure to organic and inorganic particulates, most commonly mineral dust.



Diseases that can cause pulmonary fibrosis

Sarcoidosis

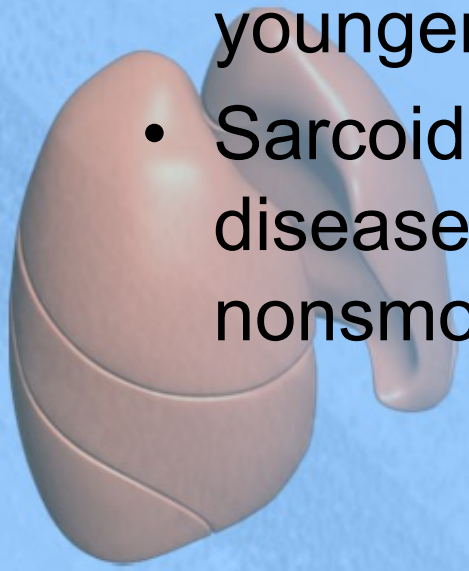
- Although sarcoidosis is considered here as an example of a restrictive lung disease, it is important to note that sarcoidosis is a multisystem disease of unknown etiology characterized by granulomas in many tissues and organs.



Diseases that can cause pulmonary fibrosis

Sarcoidosis

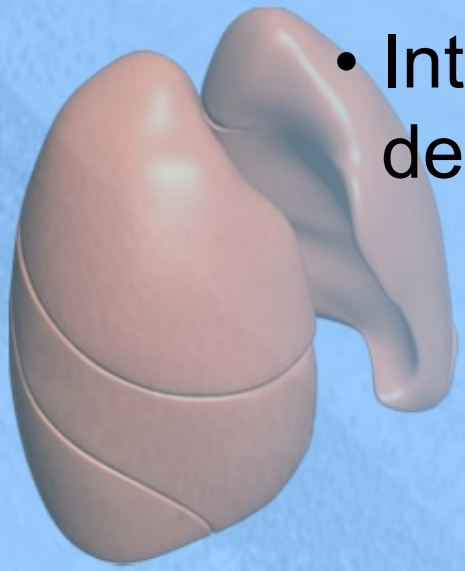
- Sarcoidosis occurs throughout the world, affecting both genders and all races and age groups.
- There is a consistent predilection for adults younger than 40 years of age.
- Sarcoidosis is one of the few pulmonary diseases with a higher prevalence among nonsmokers.



Diseases that can cause pulmonary fibrosis

Asbestosis

- Leads to 3 distinct diseases
  - Bronchiogenic carcinoma
  - Mesothelioma of lung (cancer of lung pleura)
  - Interstitial fibrosis – takes 20 years to develop

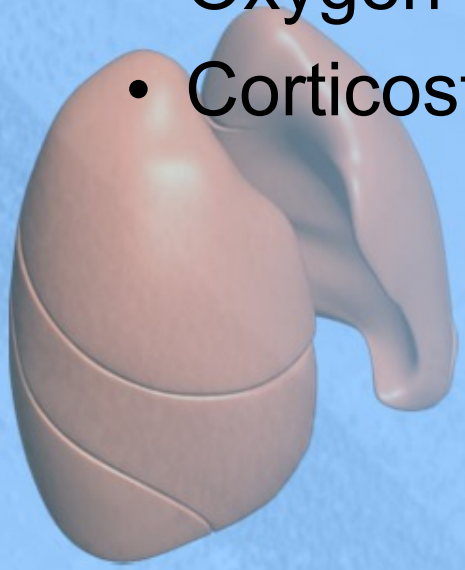


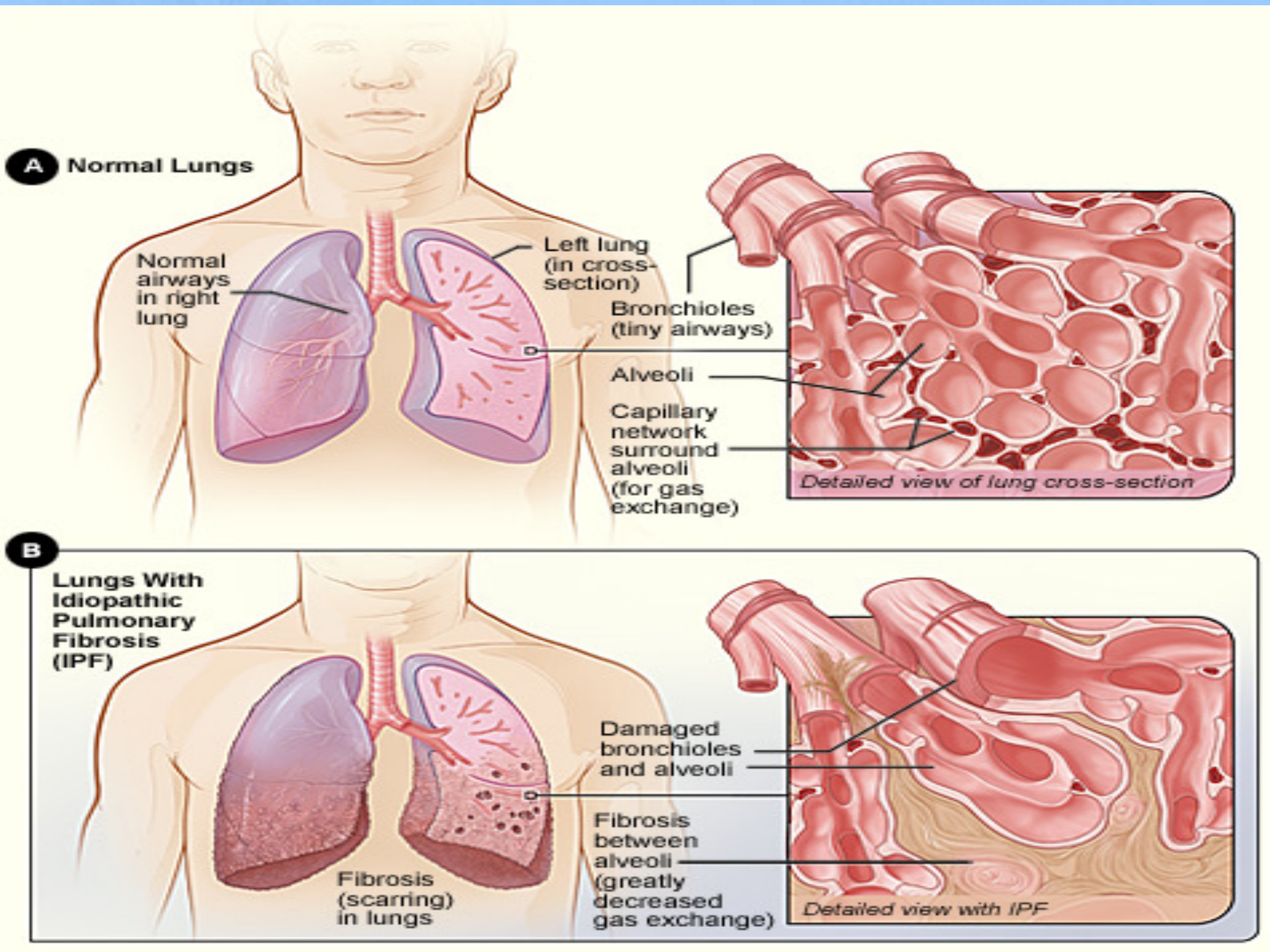
Diseases that can cause pulmonary fibrosis

Drug-induced pulmonary fibrosis – chemotherapy

Treatment of pulmonary fibrosis

- Very little effective care
- Oxygen 24 / 7
- Corticosteroids




A Normal Lungs
Normal airways in right lung
Left lung (in cross-section)
Bronchioles (tiny airways)
Alveoli
Capillary network surround alveoli (for gas exchange)
Detailed view of lung cross-section
B
Lungs With Idiopathic Pulmonary Fibrosis (IPF)
Fibrosis (scarring) in lungs
Damaged bronchioles and alveoli
Fibrosis between alveoli (greatly decreased gas exchange)
Detailed view with IPF

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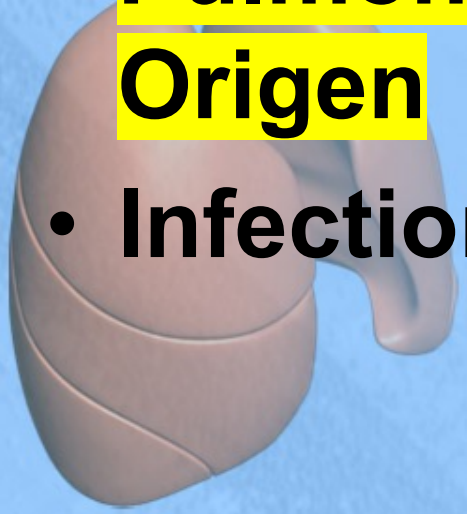
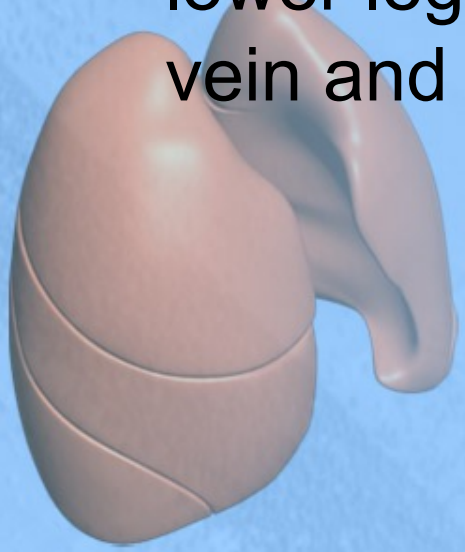


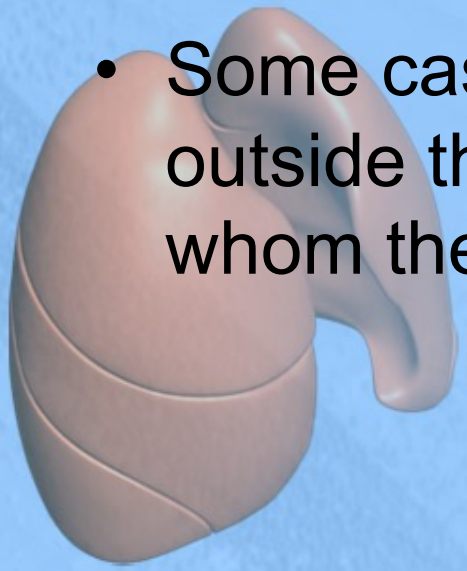
Pulmonary Embolism

- Blood clots that occlude the large pulmonary arteries are almost always embolic in origin.
- More than 95% of all pulmonary emboli arise from thrombi within the large deep veins of the lower legs, typically originating in the popliteal vein and larger veins above it.



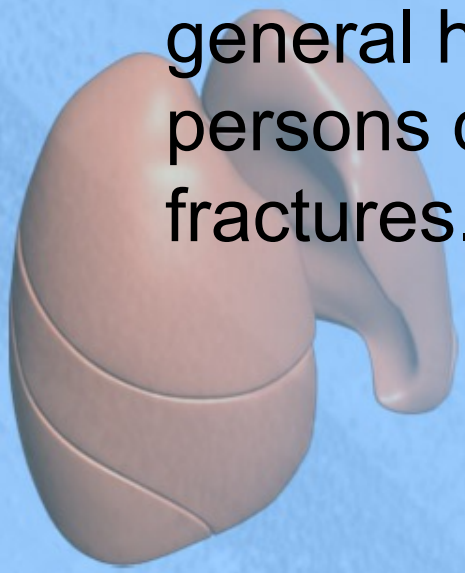
Pulmonary Embolism

- Thromboembolism causes approximately 50,000 deaths per year in the United States.
- Even when not directly fatal, it can complicate the course of other diseases.
- Some cases of embolism undoubtedly occur outside the hospital in ambulatory patients, in whom the emboli are small and clinically silent.



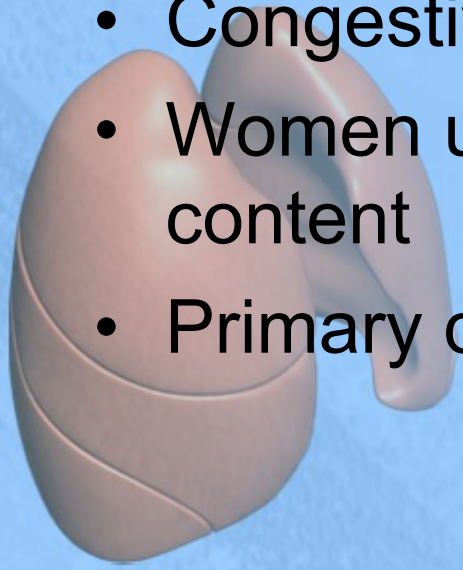
Pulmonary Embolism

- Even among hospitalized patients, no more than one third are diagnosed before death.
- Autopsy data on the incidence of pulmonary embolism vary widely, ranging from 1% in the general hospitalized population, to 30% in persons dying after severe burns, trauma, or fractures.



Pulmonary Embolism Risk Factors

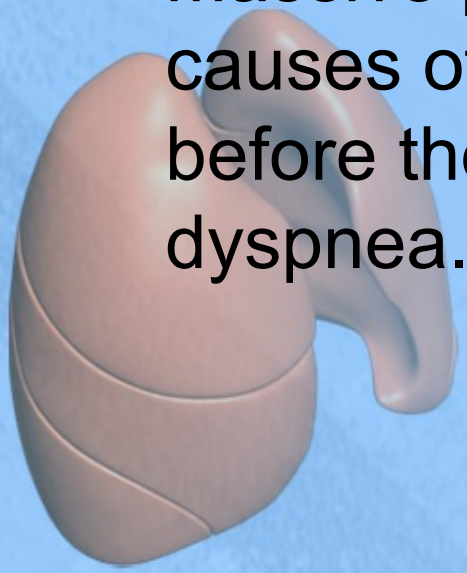
- Prolonged bedrest (particularly with immobilization of the legs)
- Surgery, especially orthopedic surgery, of knee and hip
- Severe trauma (including burns or multiple fractures)
- Congestive heart failure
- Women using birth control pills with high estrogen content
- Primary disorders of hypercoagulability



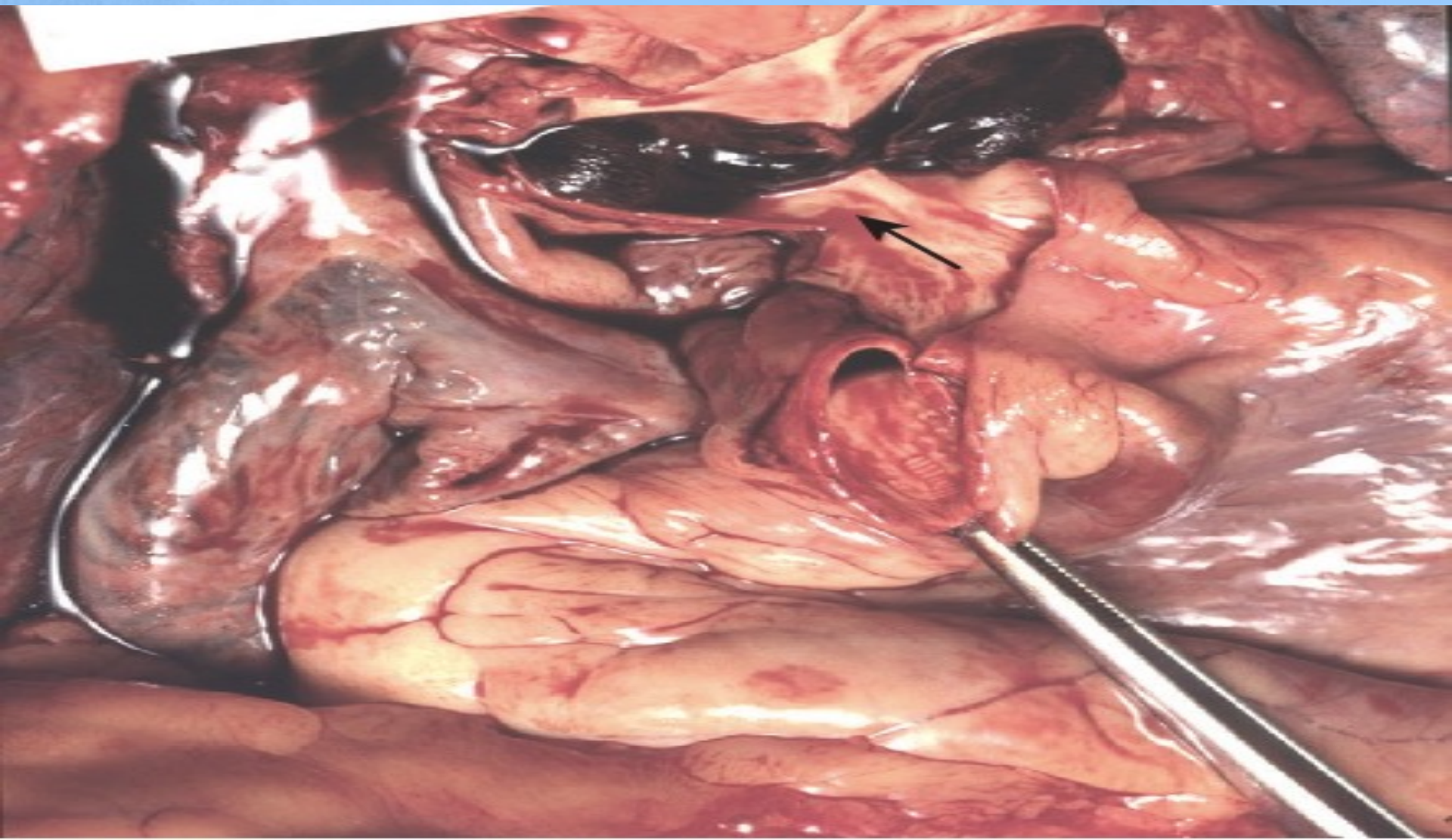
- Consequences of embolic pulmonary arterial occlusion
  - Sudden increase in pulmonary artery pressure
  - Diminished cardiac output
  - Right-sided heart failure or even death
  - Or even death

Clinical Features of Pulmonary Embolism

- Most pulmonary emboli (60% to 80%) are clinically silent because they are small
- In 5% of cases, sudden death, acute right-sided heart failure, or cardiovascular collapse (shock) may occur typically when more than 60% of the total pulmonary vasculature is obstructed
- Massive pulmonary embolism is one of the few causes of literally instantaneous death, even before the person experiences chest pain or dyspnea.

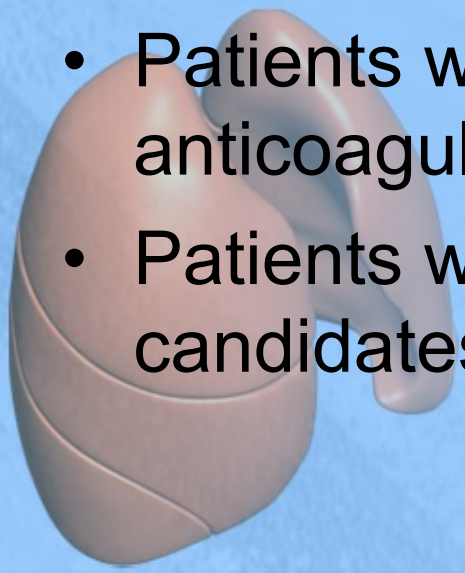


Large saddle embolus from the femoral vein lying astride the main left and right pulmonary arteries



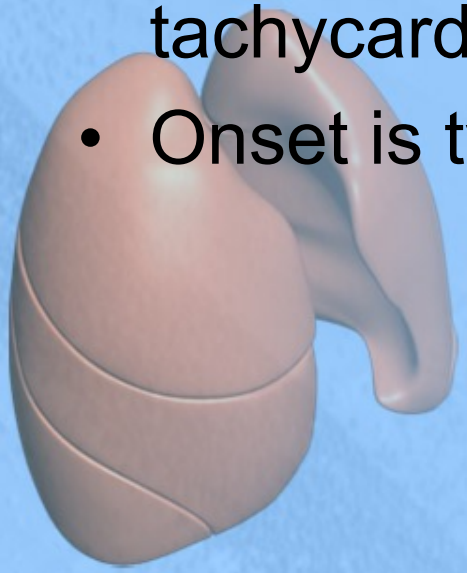
Prophylactic Therapy

- Anticoagulation
- Early ambulation for postoperative and post parturient patients
- Application of elastic stockings
- Intermittent pneumatic calf compression
- Isometric leg exercises for bedridden patients
- Patients with pulmonary embolism are given anticoagulation therapy
- Patients with massive pulmonary embolism are candidates for thrombolytic therapy.

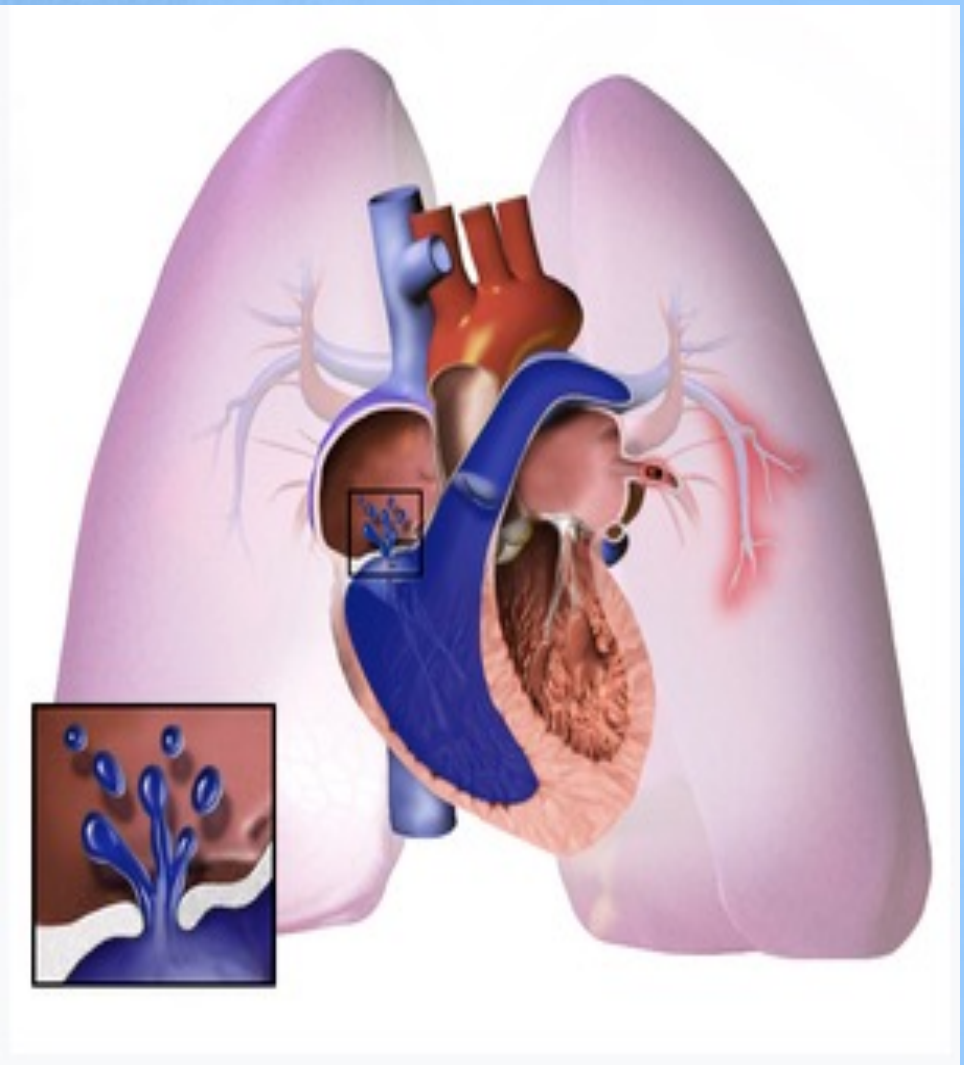


Pulmonary Hypertension

- Pulmonary hypertension (PH or PHTN) is a condition of increased blood pressure in the arteries of the lungs.
- Symptoms include shortness of breath, fainting, tiredness, chest pain, swelling of the legs, and tachycardia
- Onset is typically gradual.

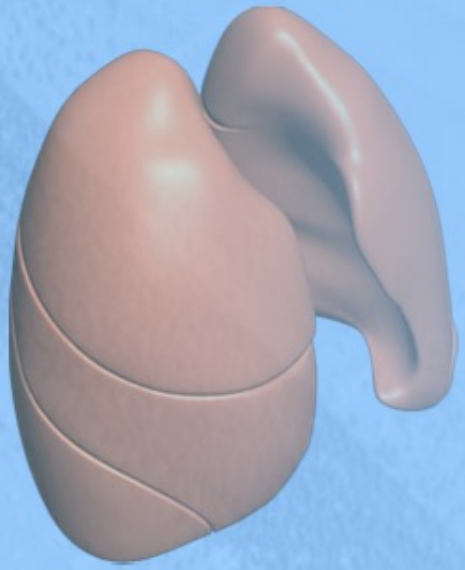


Risk Factors



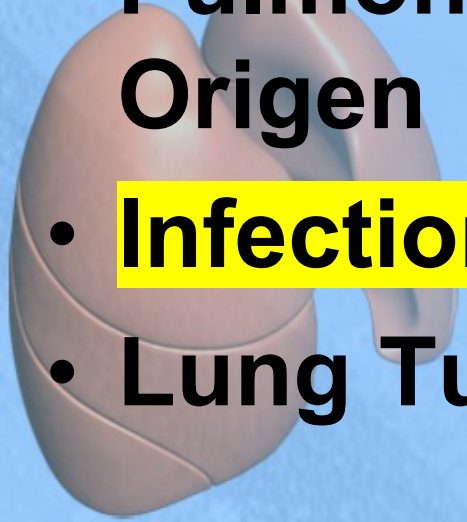
- Family history
- Pulmonary embolism
- HIV /AIDS
- Sickle Cell
- Cocaine use
- COPD
- Sleep apnea
- High altitudes

- Primary pulmonary hypertension (PPH) is a severe and progressive disease
- Without treatment, the median survival is 2.8 years, with survival rates of 68%, 48%, and 34% at 1, 3, and 5 years,



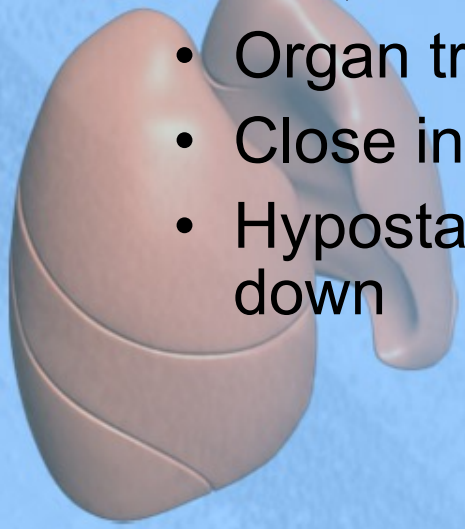
Major Pulmonary Topics

- Pleural Lesions
- Restrictive or Obstructive Lung Diseases
- Interstitial Lung Diseases
- Pulmonary Diseases of Vascular Origen
- Infections
- Lung Tumors



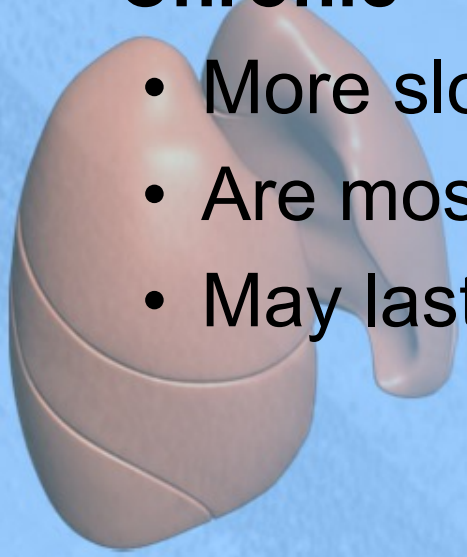
Pneumonia

- 2-3 million cases in USA yearly causing 45,000 deaths
  - Mortality is 4 times higher over 65
- Predisposing factors
  - Preceded by viral URI causing cilia damage and the production of serous exudates
  - Smoking impairs mucociliary escalation
  - Elderly and compromised immune systems
  - HIV, AIDS, sickle cell disease, diabetes
  - Organ transplant patients
  - Close indoor quarters in the winter
  - Hypostatic pneumonia can occur from constant laying down



Acute vs. Chronic pneumonia

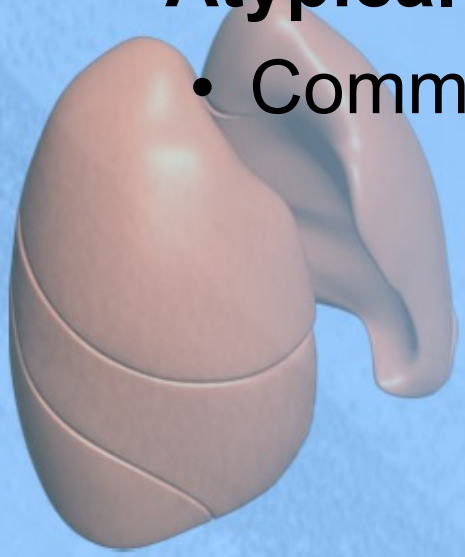
- **Acute**
  - Symptoms within 1-2 days after exposure
  - Shaking, fever, chills, prostration, dyspnea
  - Common cause of death before antibiotics
- **Chronic**
  - More slow progressive form
  - Are most viral and fungal pneumonias
  - May last several weeks to months



Diagnosis based on symptoms

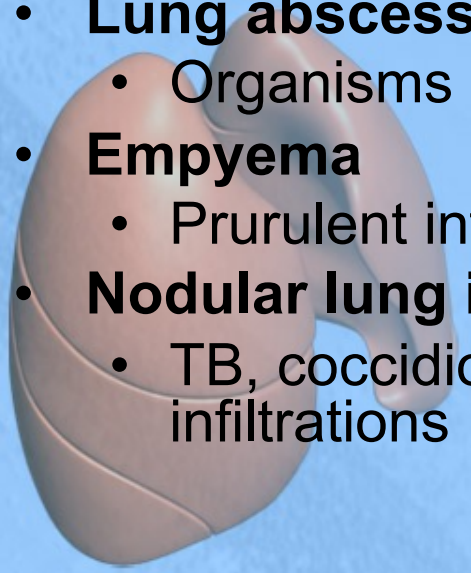
- **Typical pneumonia**
  - Rapid onset, productive cough, fever
  - X-ray changes

- **Atypical pneumonia**
  - Common with most viral pneumonias



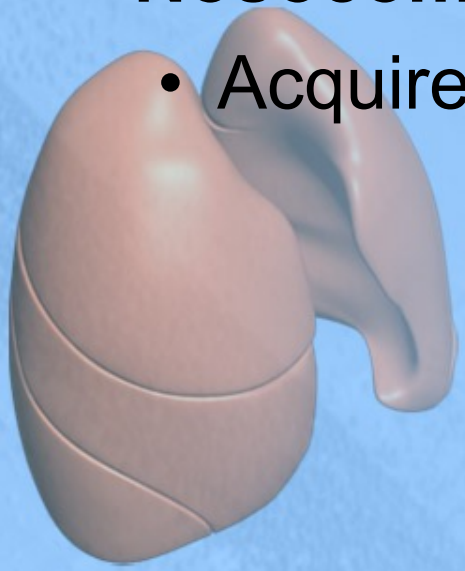
Dx based on part of the lungs affected

- **Lobar pneumonia**
  - "Classic" pneumonia in which all the alveoli sacs in the lobe are pus filled or fluid filled
- **Bronchopneumonia**
  - Patchy infiltration throughout the bronchi and bronchioles
- **Interstitial pneumonia**
  - In the connective tissue between the alveoli with granular infiltration
- **Lung abscess**
  - Organisms destroy tissue and form pus abscess
- **Empyema**
  - Prurulent infection in the pleural space
- **Nodular lung infections**
  - TB, coccidiomycosis and histoplasmosis cause nodular infiltrations



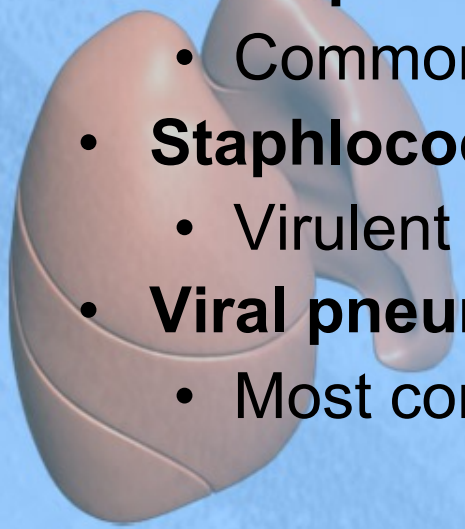
Dx according to where the pneumonia was acquired

- **Community acquired**
  - Acquired anywhere in the community, but not in a hospital
- **Nosocomial**
  - Acquired in a hospitalized setting

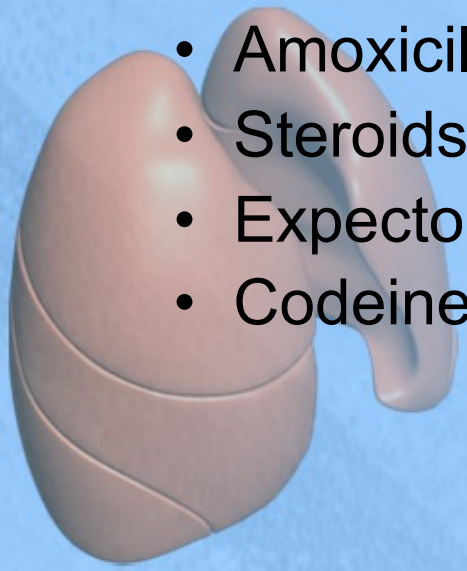


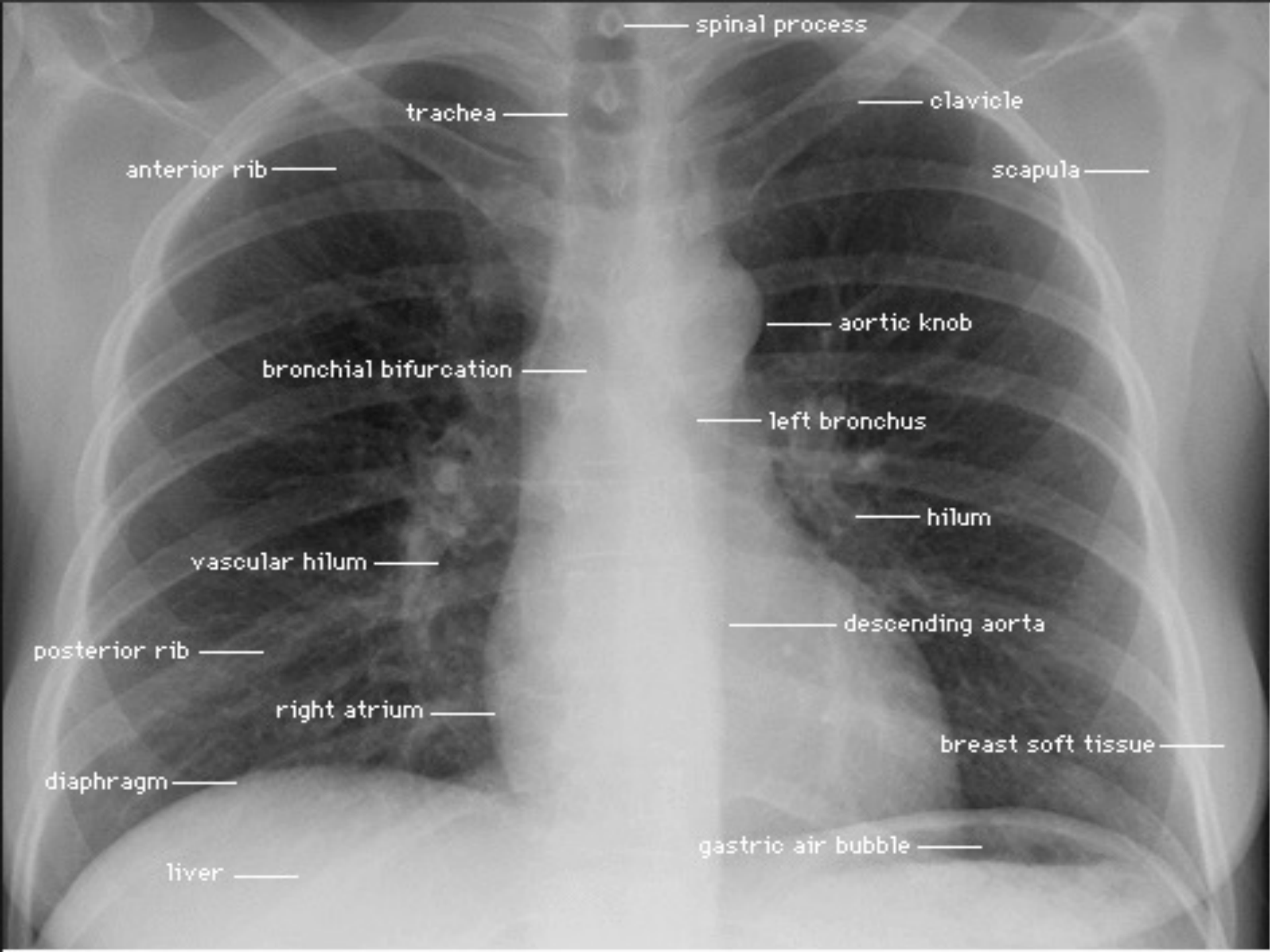
Dx according to etiologic agent

- **Pneumococcal pneumonia**
  - Classic bacterial pneumonia
  - AKA streptococcal pneumonia
- **Aspiration pneumonia**
  - Common in elderly from swallowing gastric or food contents in the trachea
  - Often vomiting with loss on consciousness
- **Hemophilus pneumonia**
  - Common on smokers with COPD
- **Staphlococci pneumonia**
  - Virulent infection often after influenza
- **Viral pneumonia**
  - Most common form

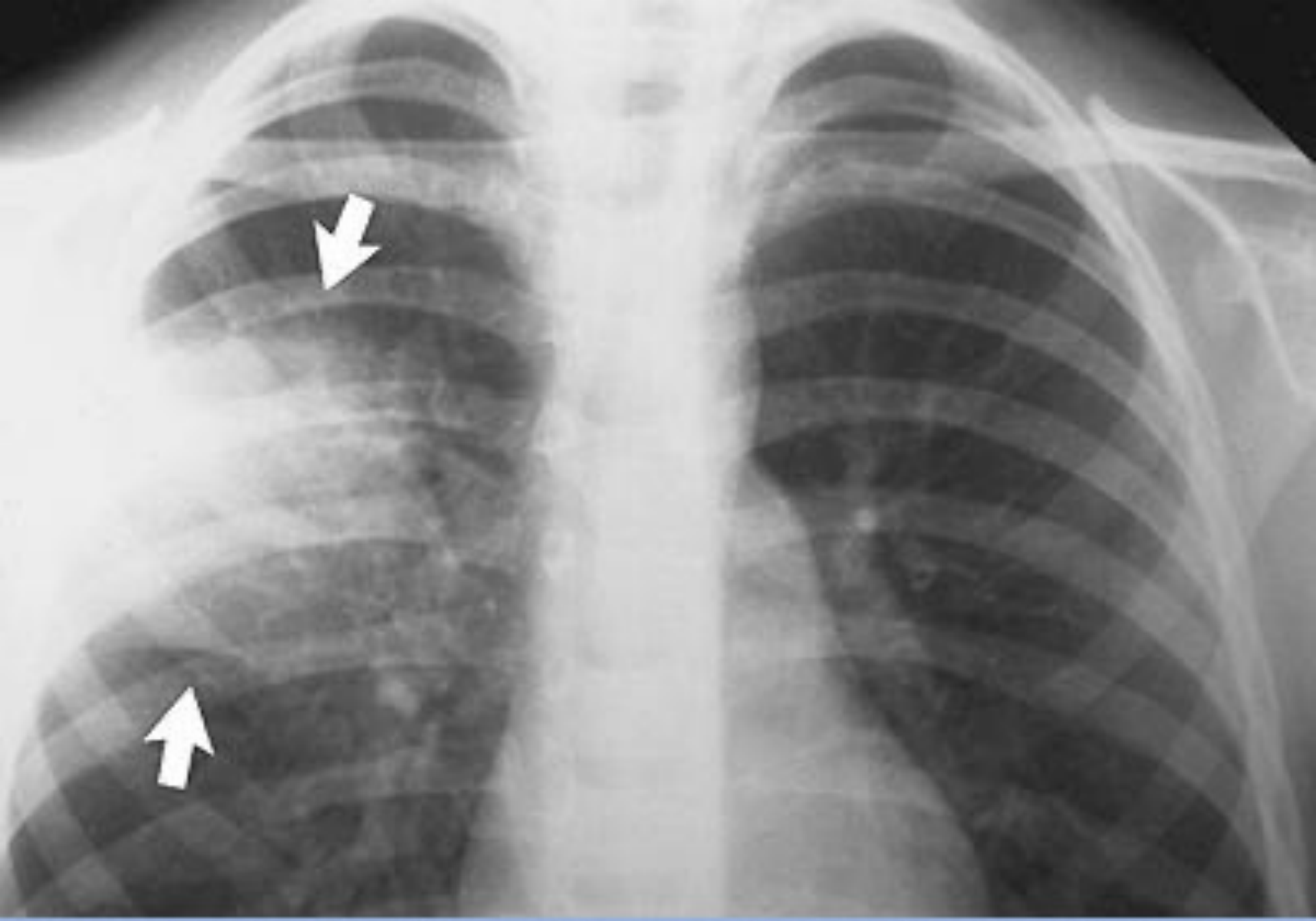


- **S & S of pneumonia**
  - Cough, sore throat, fever, chills, rapid breathing, wheezing, dyspnea, chest or abdominal pain, exhaustion, vomiting
- **DX of pneumonia**
  - Medical history, physical examination, x-ray
- **TX of pneumonia**
  - Antibiotics, respiratory therapy with oxygen
  - Amoxicillin is first-line therapy
  - Steroids for wheezing
  - Expectorates and lots of fluids
  - Codeine for severe pain




spinal process
trachea
clavicle
anterior rib
scapula
aortic knob
bronchial bifurcation
left bronchus
hilum
vascular hilum
descending aorta
posterior rib
right atrium
breast soft tissue
diaphragm
gastric air bubble
liver

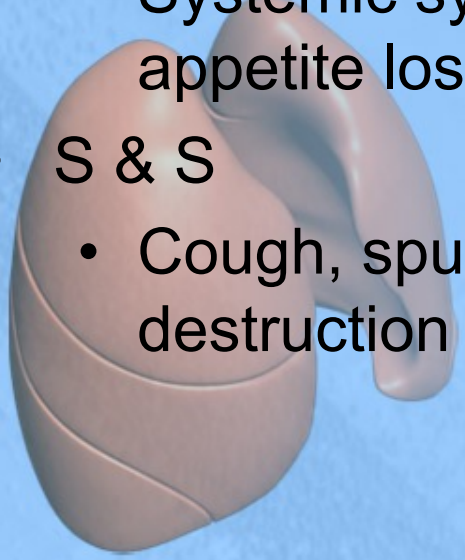
Pnuemonia



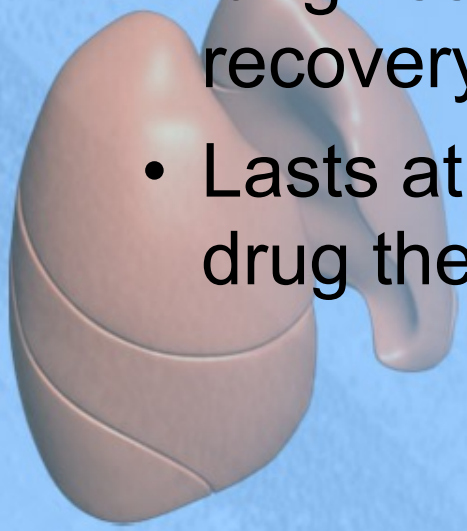

TUBERCULOSIS

Tuberculosis - TB

- One third of world population have active or latent infection resulting in 3 million deaths per year
- Pathology and course of TB
  - A chronic destruction of the lung with scarring
  - Slow progressive lung damage and possible death
  - Systemic symptoms of wasting, fatigue, night sweats, appetite loss – used to be called consumption
- S & S
  - Cough, sputum, hemoptysis, TB spread to organs leads to destruction of organs and organ systems

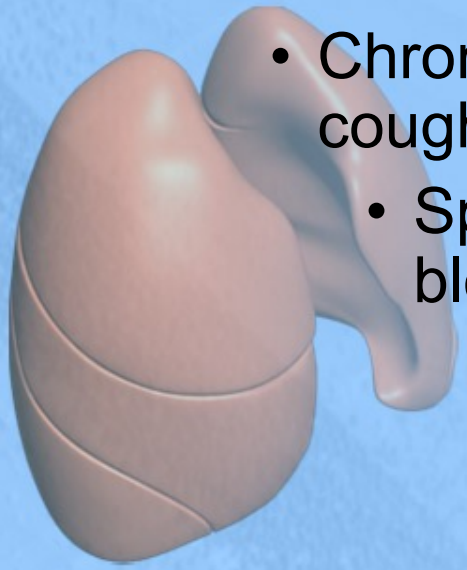


- **DX of classic triad**
  - Lung infiltrate, calcified node enlargement, pleural effusion
- **TX of TB**
  - When it comes to treatment of TB, think slow
  - Slow growth of organisms, slow destruction of lung tissue, prolonged treatment and slow recovery
  - Lasts at least year and is treated with extensive drug therapy with isoniazid and rifampin

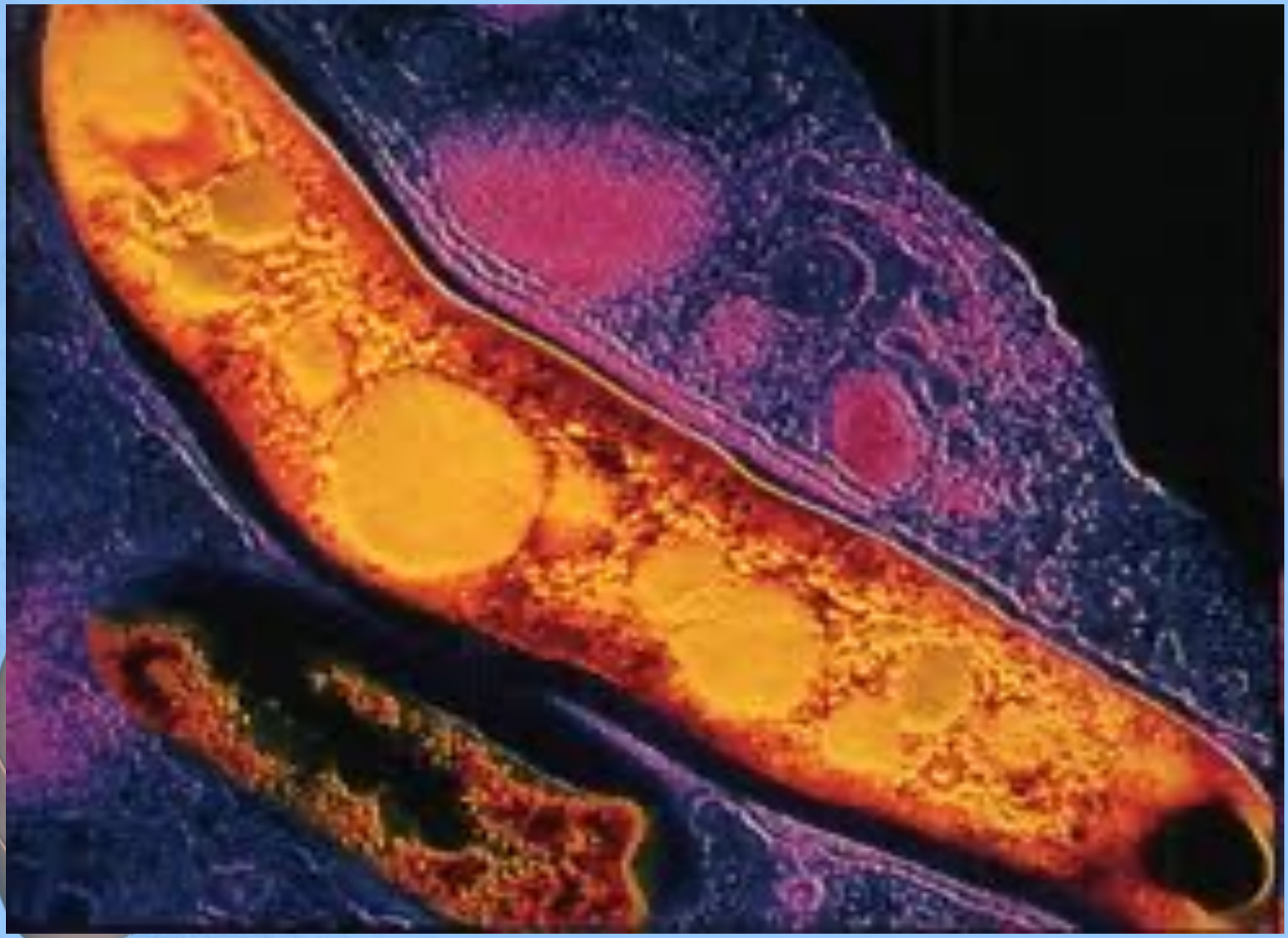


Tuberculosis

- **Symptoms**
  - Chronic illness
  - Symptoms include
    - Slight fever with night sweats
    - Progressive weight loss
    - Chronic productive cough
      - Sputum often blood streaked

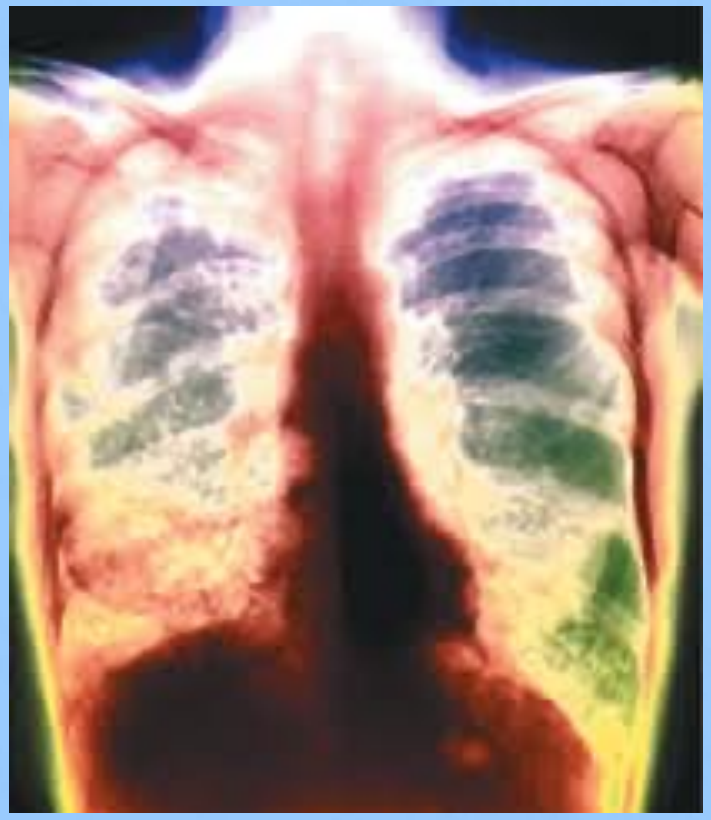


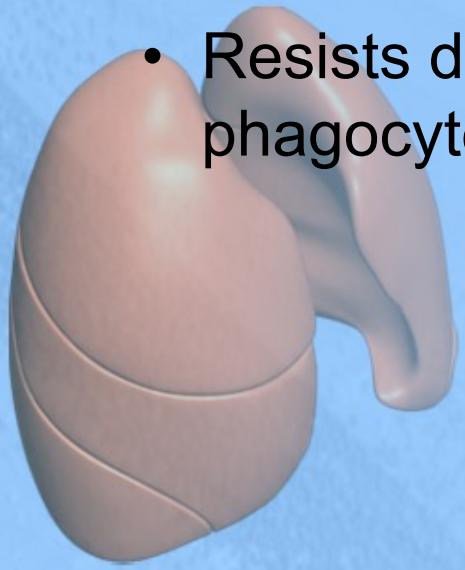
- **Causative Agent**
  - *Mycobacterium tuberculosis*
    - Gram-positive cell wall type
    - Slender bacillus
    - Slow growing
      - Generation time 12 hours or more
    - Resists most prevention methods of control



Tuberculosis

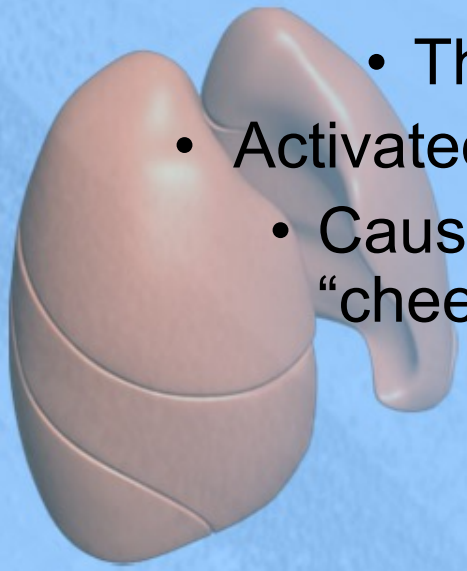
- **Pathogenesis**
  - Usually contracted by inhalation of airborne organisms
  - Bacteria are taken up by pulmonary macrophages in the lungs
  - Resists destruction within phagocyte





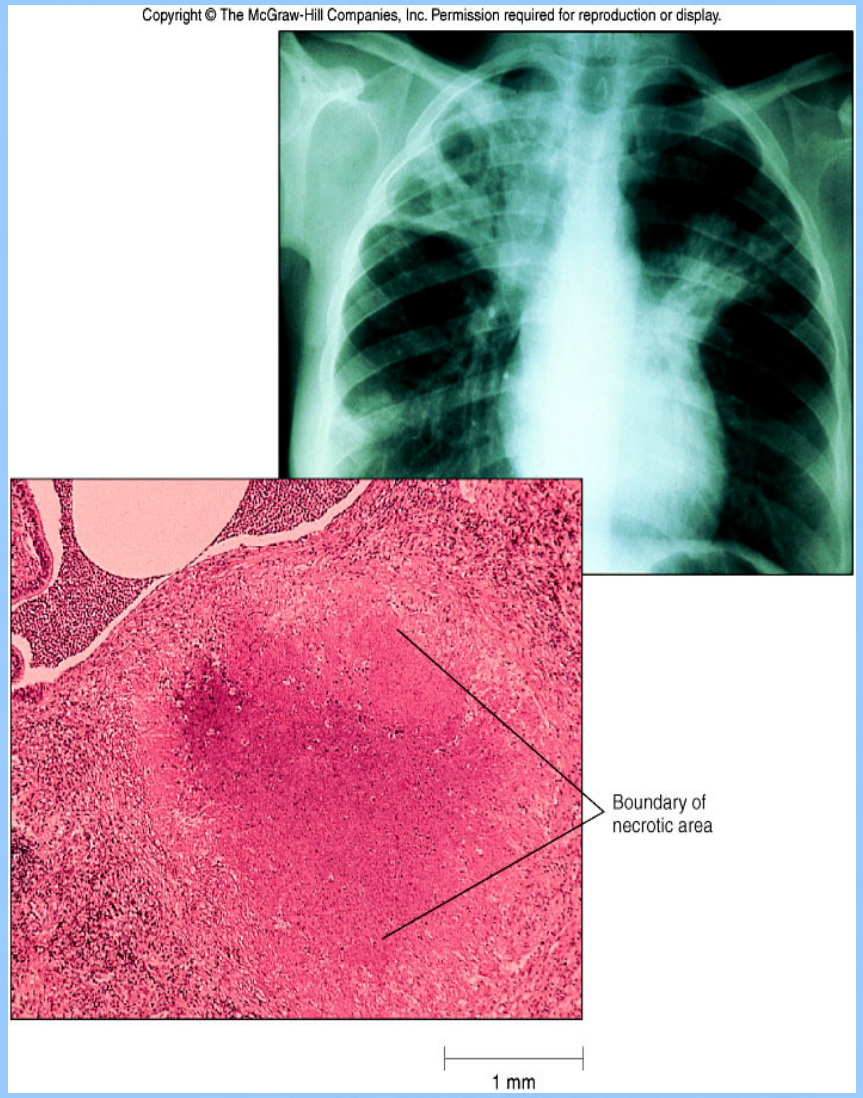
Tuberculosis

- **Pathogenesis**
  - Organisms are carried to lymph nodes
  - About 2 weeks post infection intense immune reaction occurs
    - Macrophages fuse together to make large multinucleated cell
    - Macrophages and lymphocytes surround large cell
      - This is an effort to wall off infected tissue
  - Activated macrophages release into infected tissue
    - Causes death of tissue resulting in formation of “cheesy” material



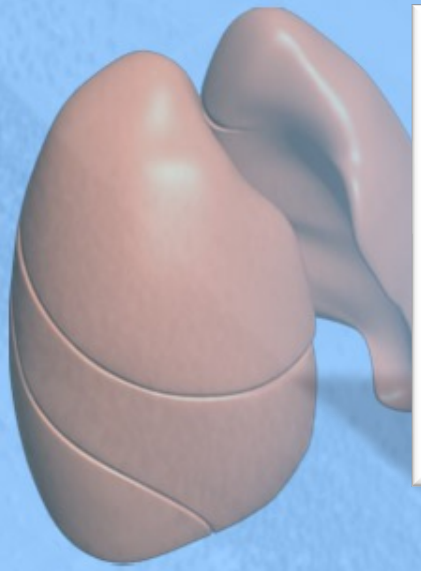
Tuberculosis

- **Epidemiology**
  - Estimated 10 million Americans infected
    - Rate highest among non-white, elderly poor people
  - Small infecting dose
    - As little as ten inhaled organisms
  - Factors important in transmission
    - Frequency of coughing, adequacy of ventilation, degree of crowding

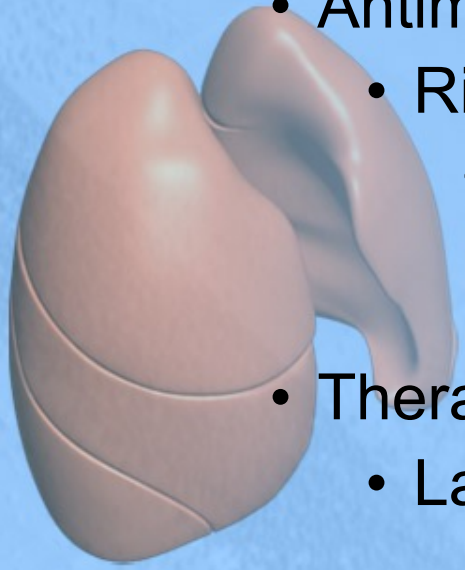


Tuberculosis

- **Epidemiology**
  - Tuberculin test used to detect those infected
    - Small amount of tuberculosis antigen is injected under the skin
    - Injection site becomes red and firm if infected
    - Positive test does not indicate active disease



- **Prevention**
  - Vaccination for tuberculosis widely used in many parts of the world
    - Vaccine not given in United States because it eliminates use of tuberculin test as diagnostic tool
- **Treatment**
  - Antibiotic treatment is given in cases of active TB
    - Two or more medications are given together to reduce potential antimicrobial resistance
    - Antimicrobials include
      - Rifampin and Isoniazid (INH)
        - Both target actively growing organisms and metabolically inactive intracellular organisms
    - Therapy is pronged
      - Lasting at least 6 months

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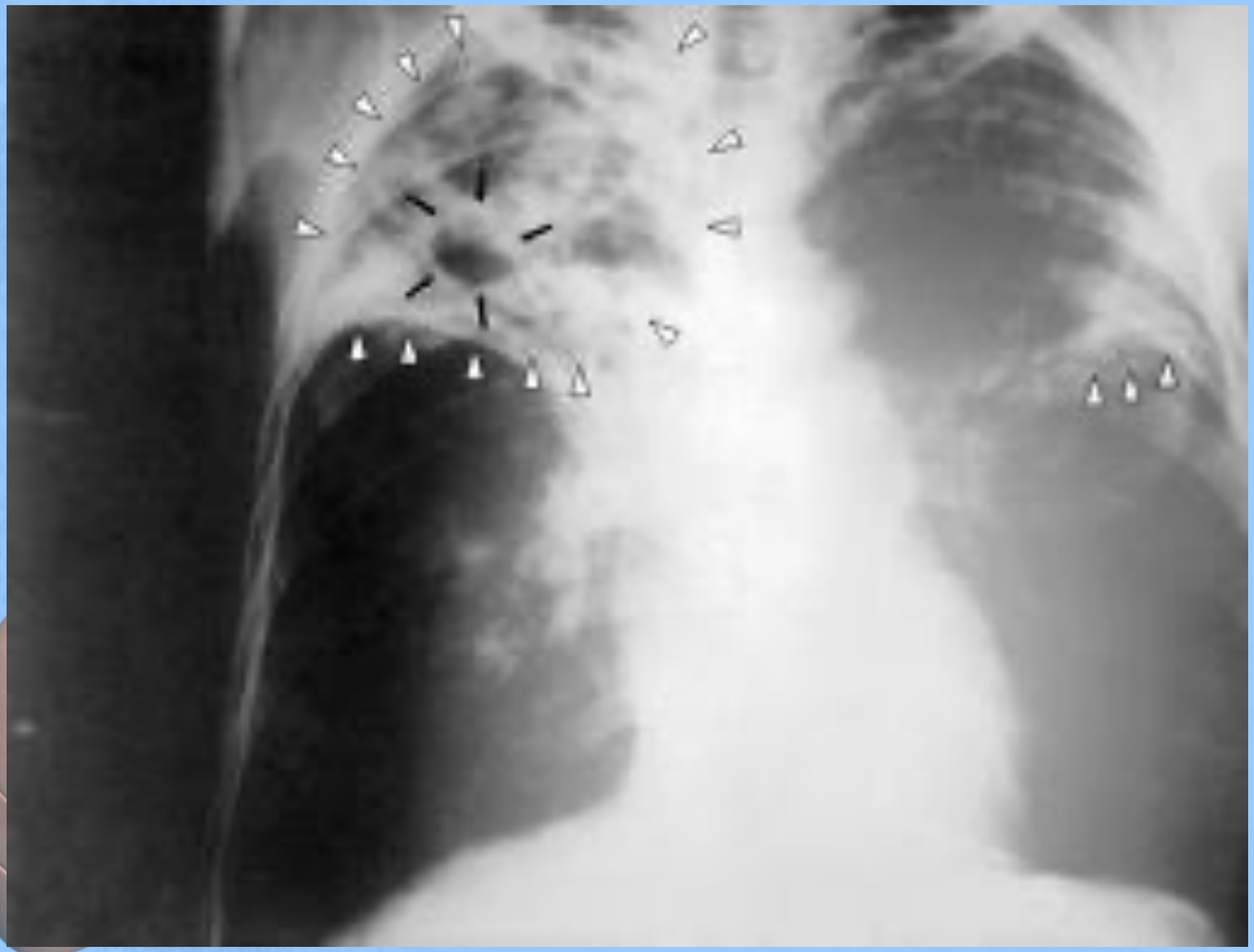


TABLE 22.9 Tuberculosis

① Airborne *Mycobacterium tuberculosis* bacteria are inhaled and lodge in the lungs.

② The bacteria are phagocytized by lung macrophages and multiply within them, protected by lipid-containing cell walls and other mechanisms.

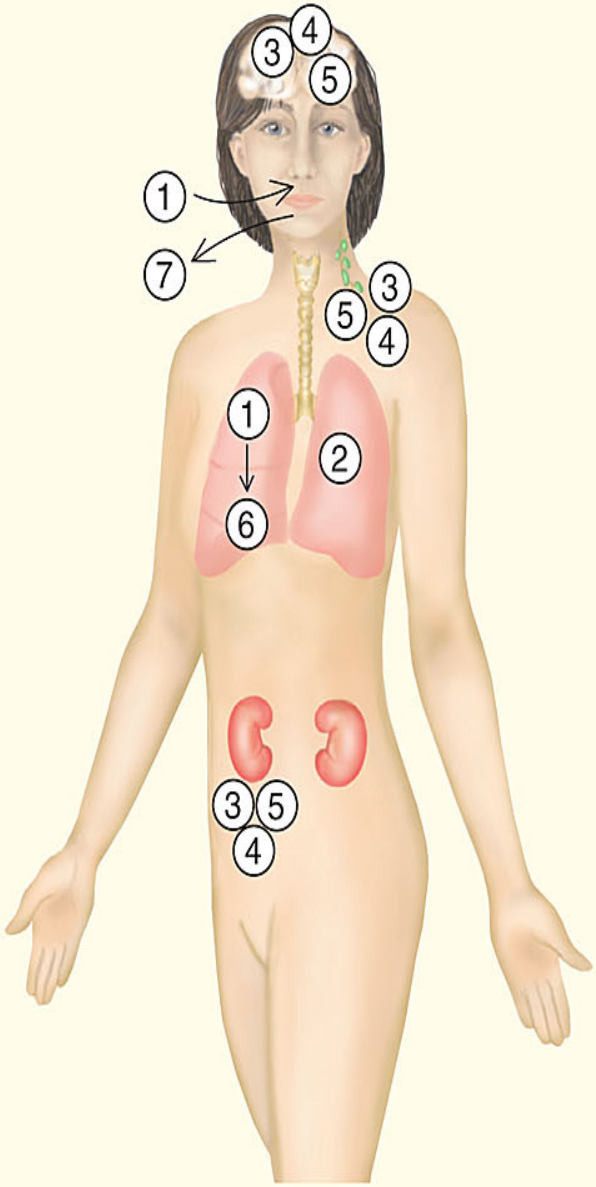
③ Infected macrophages are carried to various parts of the body such as the kidneys, brain, lungs, and lymph nodes; release of *M. tuberculosis* occurs.

④ Delayed hypersensitivity develops; wherever infected *M. tuberculosis* has lodged, an intense inflammatory reaction develops.

⑤ The bacteria are surrounded by macrophages and lymphocytes; growth of the bacteria ceases.

⑥ Intense inflammatory reaction and release of enzymes can cause caseation necrosis and cavity formation.

⑦ With uncontrolled or reactive infection, *M. tuberculosis* exits the body through the mouth with coughing or singing.



Symptoms	Chronic fever, weight loss, cough, sputum production
Incubation period	2 to 10 weeks
Causative agent	*Mycobacterium tuberculosis;* unusual cell wall with high lipid content
Pathogenesis	Colonization of the alveoli incites inflammatory response; ingestion by macrophages follows; organisms survive ingestion and are carried to lymph nodes, lungs, and other body tissues; tubercle bacilli multiply; granulomas form.
Epidemiology	Inhalation of airborne organisms; latent infections can reactivate.
Prevention and treatment	BCG vaccination, not used in the United States; tuberculin (Mantoux) test for detection of infection, allows early therapy of cases; treatment of all high-risk cases including young people with positive tests and individuals whose skin test converts from negative to positive. Treatment: two or more antitubercular medications given simultaneously long term, such as isoniazid (INH) and rifampin; DOTS.

YOU MAKE ME FORGO PULMONARY VENTILATION

(YOU TAKE MY BREATH AWAY)