



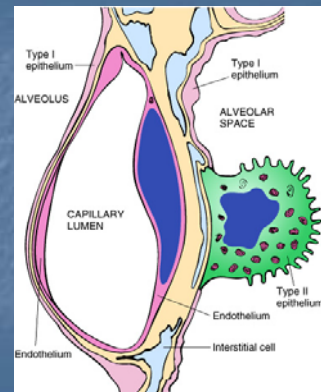
Pulmonary Diseases

We Move A Lot of Air

- Functions
 - Oxygenation
 - CO₂ & pH
- Basic defenses
 - Nose hairs
 - Cilia
 - Mucus
 - Cough reflex
 - Immune system



Alveolar Level

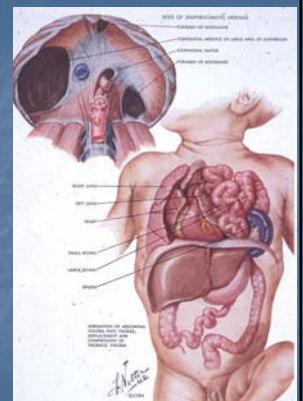


Basic Categories

- Congenital
- Infectious
- Neoplastic
- Nutritional
- Trauma
- Immunologic
- Vascular

Developmental

- Diaphragmatic defect
- Intestines in chest
- No room for lung to develop
- The newborn needs two.
- Depending on the degree of lung hypoplasia, may not be compatible with life.
- Today can surgical fix inutero.

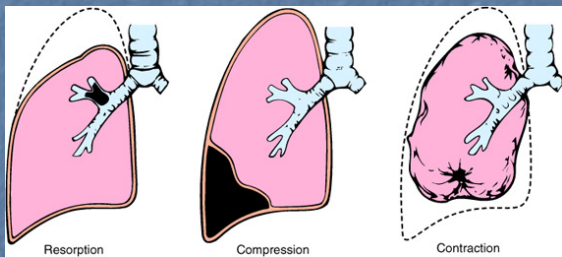


Gene Defect Related

- Cystic fibrosis
 - Bronchial infections
 - Pancreatic destruction
 - Thick mucus
- Alpha-1 antitrypsin deficiency
 - Emphysema
 - Cirrhosis
 - Can't neutralized activated proteases
- Immune system failure



Atelectasis (Collapse)



Obstructive vs. Restrictive

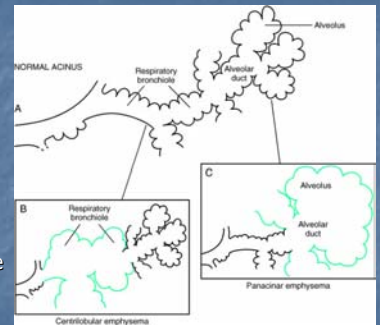
- Obstructive
 - Air passage patency
 - Increased resistance
 - Acute
 - asthma
 - Chronic
 - Chronic bronchitis
 - Emphysema
- Restrictive
 - Ability of lung to expand
 - Decreased total lung capacity

Chronic Obstructive Pulmonary Disease

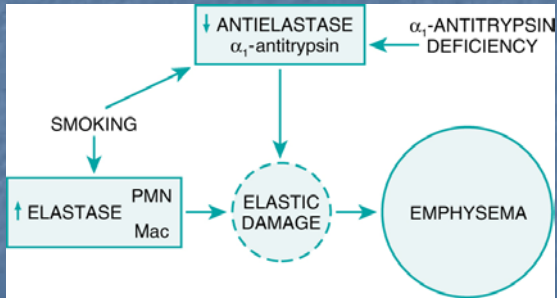
- COPD
- Lasting longer than 3 months
- Chronic cough with mucus production
- Restriction to air movement
- Two basic forms
 - Emphysema
 - Chronic bronchitis
- Actually most patients have a mix

Emphysema

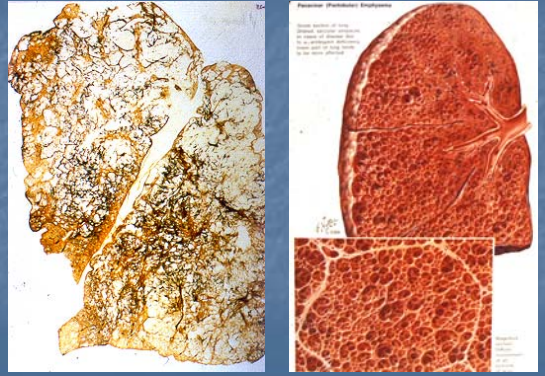
- Loss of pulmonary elastic tissue.
- Inflammatory
- Smoking
- Can't keep small airways open.
- Reduced surface area
- Reduced air volume exchange
- COPD



Emphysema



Emphysema



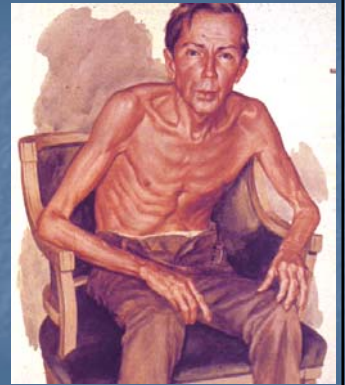
Emphysema

- Large airspaces
- Trapped in air the dilated alveoli
 - causes compression of smaller airways
 - Hyperinflation
- Changes are irreversible



Emphysema

- Pink puffer
- Barrel chest
 - Hyperinflation
 - Trapped air
- Thin
 - Lots of calories just to breath
- Rapid respirations
- Pursed lips
- COPD



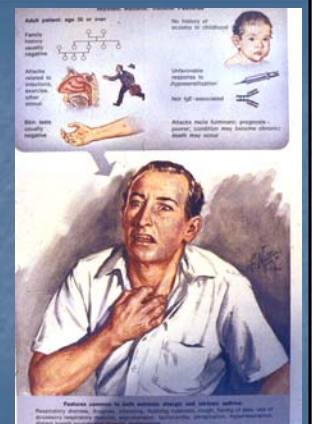
Chronic Bronchitis

- Also a chronic obstructive disease
- Chronic cough with mucus production for 3 months.
- May lead to emphysema (especially in smokers).
- COPD
- Larger airway narrowing
- Increased secretions
 - Goblet cell hyperplasia
- Blue bloater
 - Cyanotic



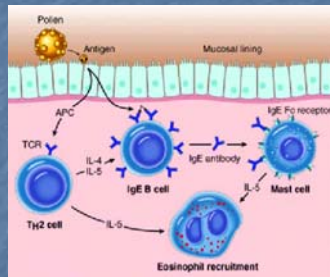
Asthma

- Bronchoconstriction
 - Episodic
 - Reversible
 - Various stimuli
- Extrinsic Asthma
 - Type I hypersensitivity
 - IgE
 - Atopic most frequent
 - Other manifestations
- Intrinsic
 - Triggers are nonimmune
 - Aspirin
 - Viral infections
 - Cold
 - Stress

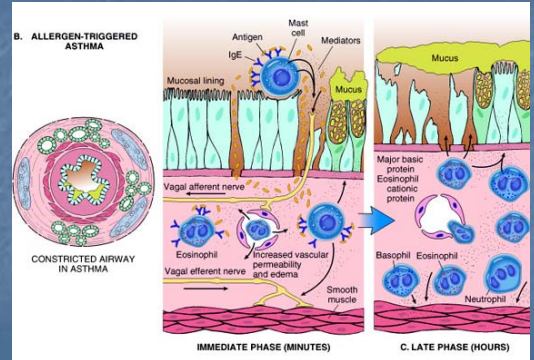


Asthma, Sensitization

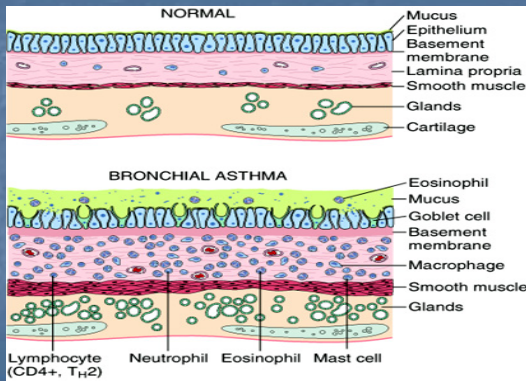
- Sensitization of CD4 cells
 - The T_H2 class
- T_H2 cells release cytokines
 - IL-4, IL-5 & IL-13
 - Cause production IgE
 - Growth of mast cells
 - Histamine producers
 - Activation of eosinophils
- Typically see 2 phases to an attack
 - Early, 30-60 minutes
 - Late, 4-8 hours



Asthma, Reaction



Asthma, Long-term



Bronchiectasis

- Dilated and inflamed bronchi
- Repeat infections
- Lots of mucus
- Foul smelling breath
- Unbelievable, productive morning cough



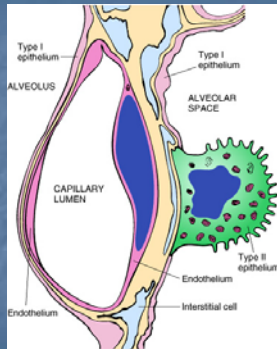
Restrictive Lung Disease

- Reduced compliance
 - Acute, surfactant problem
 - Chronic, fibrosis



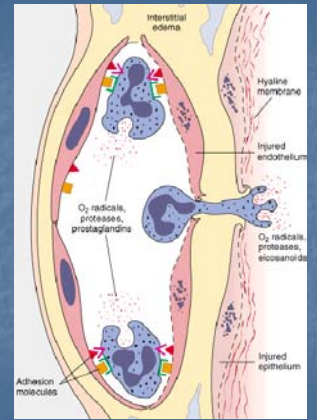
Acute Respiratory Distress

- Endothelial injury
 - Loss of fluid and proteins
- Injury to Type II epi
 - Lack of surfactant
- Accumulation of protein in the form of hyaline membranes within alveoli.

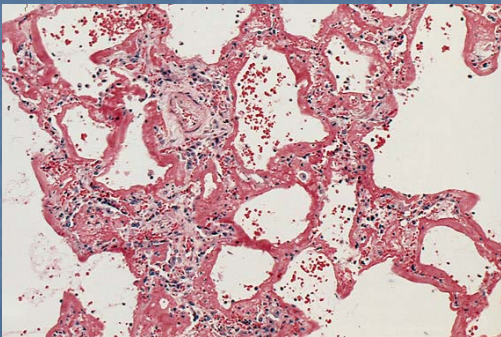


Hyaline Membrane Formation

- Initiation of inflammatory response
- Neutrophils play significant role
- Oxidant injury
- Leakage of proteins
- Formation of hyaline membrane
 - Reduces O₂ diffusion
- Reduced surfactant
- Alveolar wall becomes rigid.



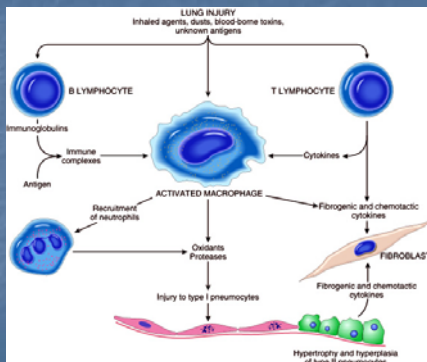
Hyaline Membranes



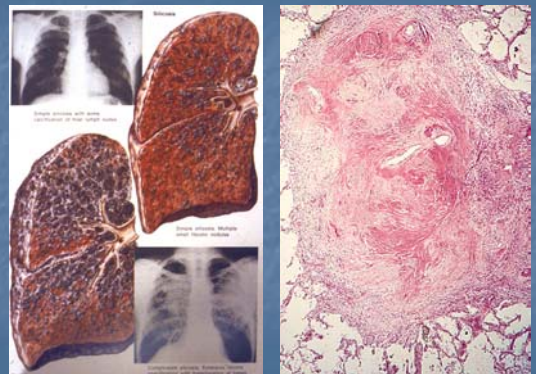
Chronic Restrictive Lung Disease

- Occupational
 - Asbestos
 - Silicosis
 - Coal miner's lung
- Chemotherapy
 - Busulfan
- Immunological
 - Rheumatoid arthritis
 - Sarcoid
 - Scleroderma and other collagen vascular diseases
- Idiopathic

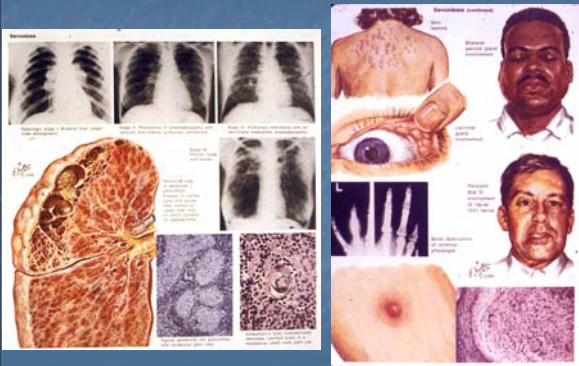
Pulmonary Fibrosis



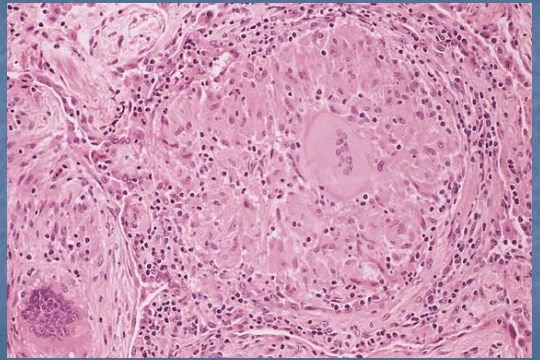
Silicosis



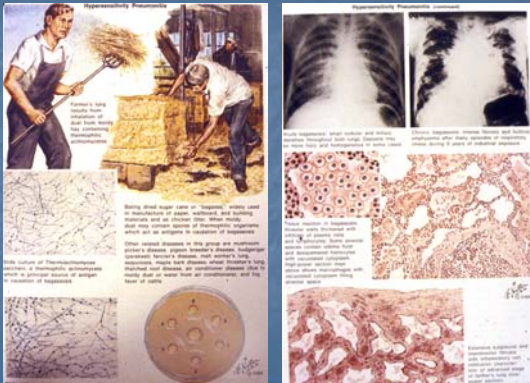
Sarcoidosis



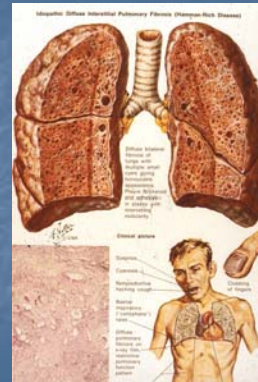
Sarcoidosis



Hypersensitivity Pneumonitis



Idiopathic Pulmonary Fibrosis



Vascular Related Pulmonary Disease

- Acute alterations in blood flow.
 - Congestion and edema
 - PE
- Chronic congestion
 - Eisenminger reaction
- Primary Pulmonary hypertension
- Inflammatory
 - Autoimmune vasculitis

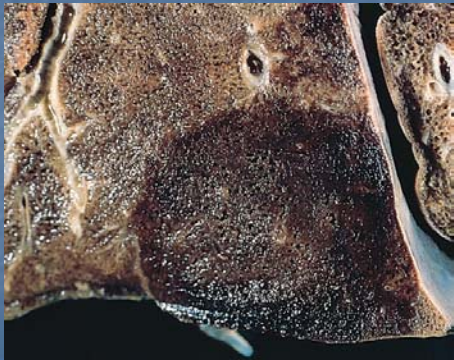
Pulmonary Edema



Pulmonary Embolus

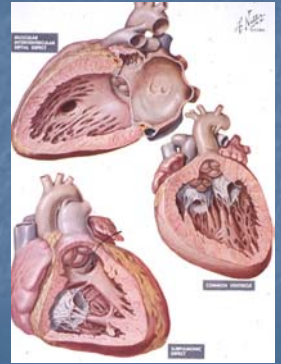


Pulmonary Infarct

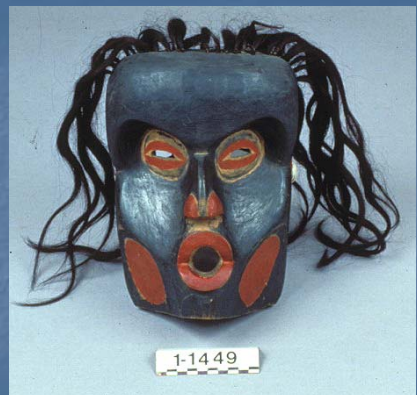
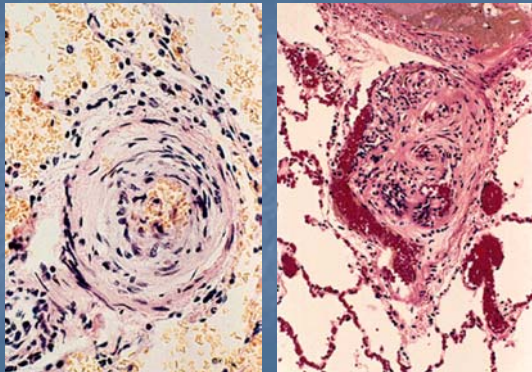


Ventricular Septal Defect

- Left to right shunt
- Depending on size will lead to Eisenmenger reaction.
- Later becomes right to left shunt.
- Possible infections.



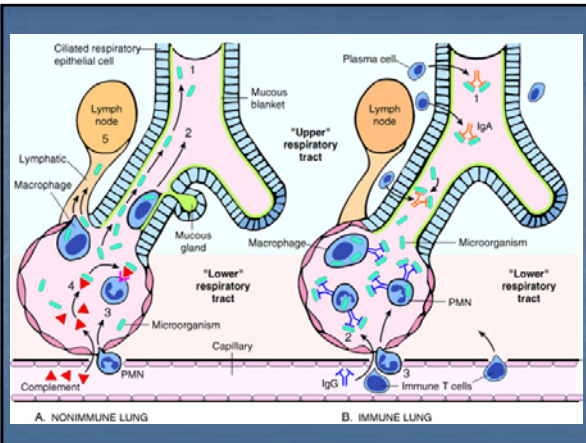
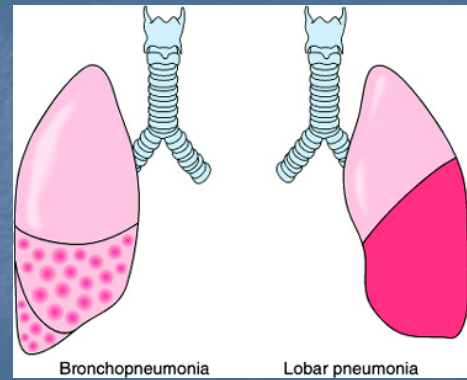
Pulmonary Hypertension



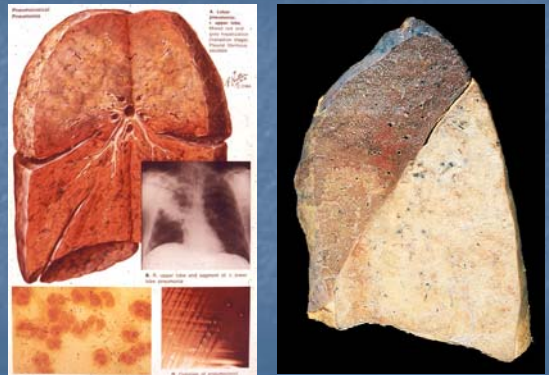
Pulmonary Infections

- Pneumonia
 - Infection in the alveolar spaces
 - Bacteria
 - TB
 - Interstitial tissue
 - Virus
 - Mycoplasma
- Abscess
- Bronchitis
- Bronchiolitis
- Pleuritis

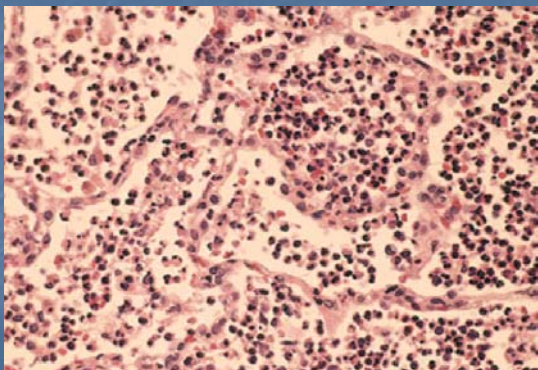
Bacterial Pneumonia



Streptococcal pneumoniae



Acute Bacterial Pneumonia

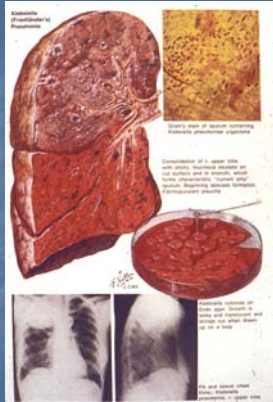


Gram Negative Bugs

- Typically from body flora
 - 'Opportunistic' infections
- Compromised host
 - Alcoholic
 - Aspiration
 - Chemotherapy
 - Tracheostomy
 - Broad spectrum antibiotics that change host flora

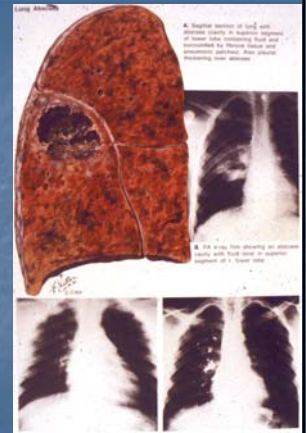
Klebsiella Pneumonia

- Gram negative rod
 - Very mucoid capsule
- Aspiration
 - Head down in the gutter
- Rusty sputum
- High fever



Pulmonary Abscess

- Staphylococcus
- Aspiration of gastric material
- Hole with
- Air-fluid level

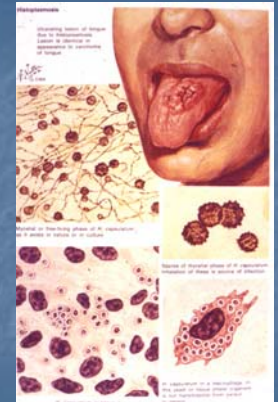


Fungal Pneumonias

- Typically means something wrong with immune system
- Histoplasmosis is very common
 - Ohio River valley
 - Virtually all of us beat the bug
- HIV has changed things a lot

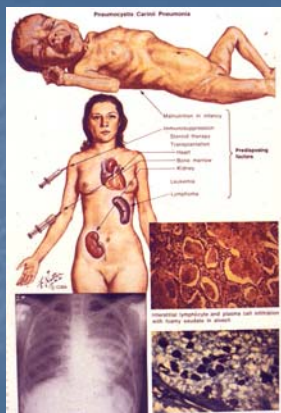
Histoplasmosis

- Dimorphic yeast
- Fungal growth phase
- Oral or pulmonary infection
- Granulomas
- Most people lock it down.
- Forms of the disease
 - Pulmonary
 - Systemic



Pneumocystis carinii

- Immune failure
- Organism is very common
- Immunosuppression
 - Starvation
 - HIV
 - Chemotherapy
- Can't culture
- [Bronchial wash](#)
- Stain for the bug

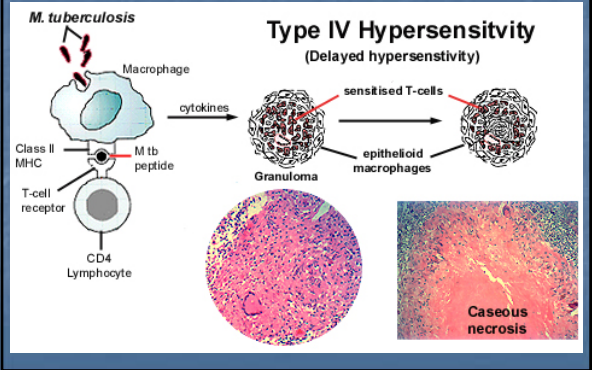


Tuberculosis

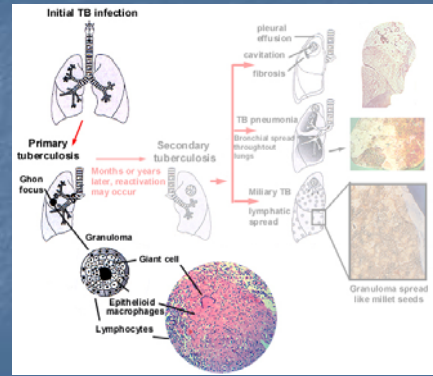
- Mycobacterium tuberculosis (most cases)
 - Type IV hypersensitivity
 - Granuloma
- Primary infection
 - Pulmonary
 - Perhaps goes lymphatics
 - Hopefully it stops here.
- Secondary TB
 - Internal reactivation
 - Perhaps years later
 - Not all patients



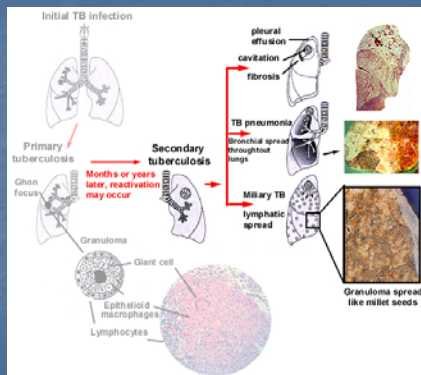
Granuloma Formation



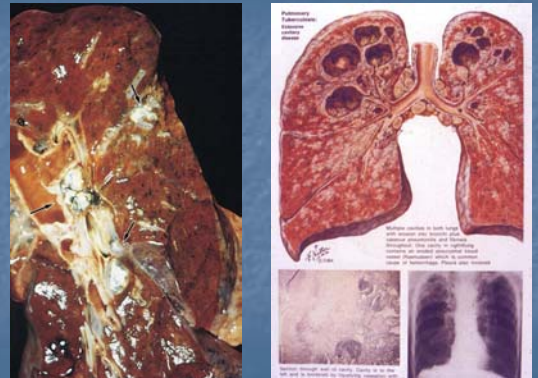
Primary TB



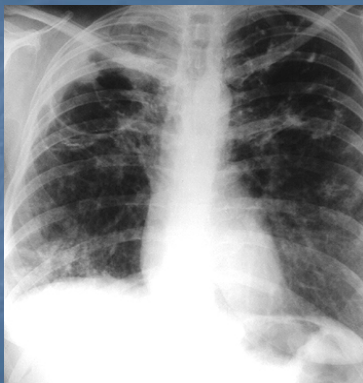
Secondary or Reactivation TB



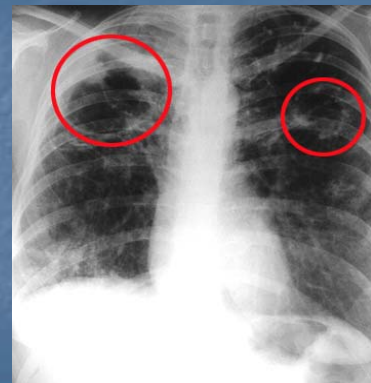
Tuberculosis



TB Chest X-Ray

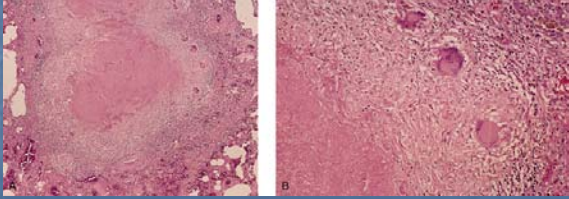


TB Chest X-Ray

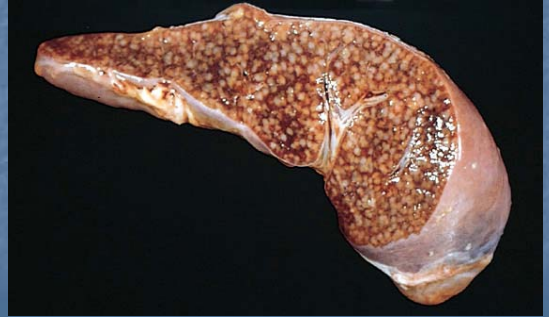


Granulomas of TB

- Caseous granulomas
- Giant cells
- Inert bug



Disseminated TB



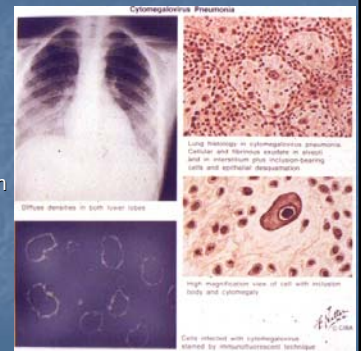
Skin Test

- PPD
- Injected intradermally
- Read in 2 days
- Measure swelling
 - Not redness
- Positivity maybe life long



CMV Pneumonia

- Common virus
- Infant and neonate
- Immune suppressed
 - HIV
 - Chemotherapy
- Characteristic inclusion



Lung Tumors

- 'Mass' on X-Ray
 - Space occupying lesion
 - Granuloma
- Neoplasm
- Benign
- Malignant
 - Primary vs. Metastatic

Benign

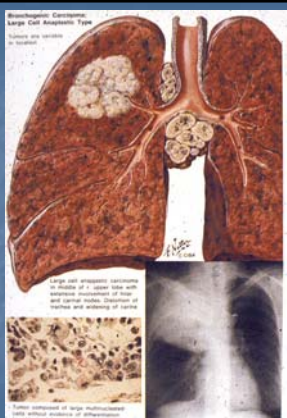
- Rare
- Hamartoma
 - A 'rest' of tissue from development
 - Cartilage most times

Malignant

- Primary, so called 'bronchiogenic'.
 - Squamous cell
 - Small cell
 - Adenocarcinoma
- Metastatic, just about any source
 - Kidney
 - Breast
 - Colon
 - Reproductive
 - Even the other lung

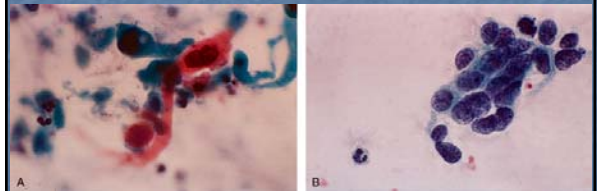
Bronchiogenic Carcinoma

- Squamous in most cases
- Chronic irritant leads to squamous metaplasia.
- Continued exposure leads to dysplasia and eventually cancer.
- Very aggressive.
- Surgery is about it.
- Poor response to chemotherapy and radiation

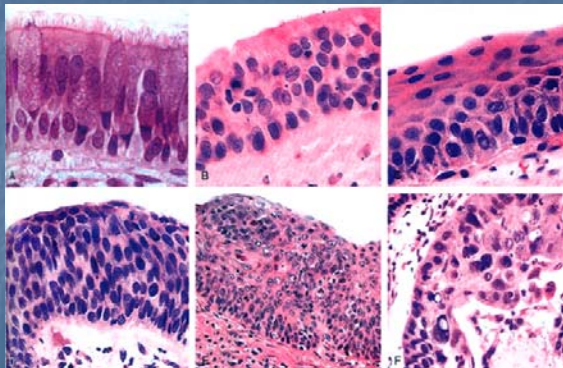


Pulmonary Cytology

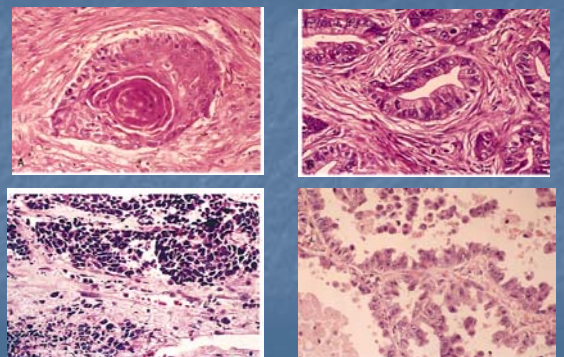
- Exfoliative cytology
 - Cough it up
 - Wash it out
- [Bronchoscopic biopsy](#)



Metaplasia, Dysplasia, Cancer

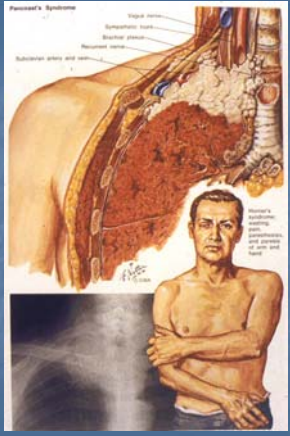


Basic Patterns of Bronchiogenic Carcinoma



What Lung Cancer Can Do

- Obstruct bronchus causing pneumonia
- Spread widely
- Odd hormonal activity
 - Small cell makes ADH and ACTH
 - Squamous cell makes PTH
- Multiple sclerosis like symptoms
 - Even without brain mets
- Pancoast's tumor ->
 - Horner's syndrome



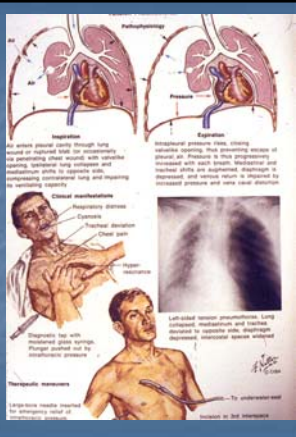
Metastatic Cancer to Lung

- Can come from anywhere
- Microscopic looks like tumor of origin
- Spreads by blood
 - Isolated masses ->
- Spreads by lymphatics
 - Diffuse involvement



Pleura

- Membranes surrounding lung and lining chest cavity
- Inflammation, Pleuritis
 - Sterile
 - Renal failure
 - Infectious
 - Bacteria, Lyme, Virus, TB
 - Either may lead to scarring and trapping of lung
- Hemothorax
- Pneumothorax ->



Pleural Tumors

- Metastatic
 - About anywhere
- Primary, mesothelioma
 - Mesothelial cells
 - Asbestos workers
 - Slow growing
 - Traps & invades lung



Upper Airway

- Allergic disease
- Sinusitis
- Larynx
 - Infections
 - Polyps
 - Squamous cancer

