

LUNGS

The **LUNG**

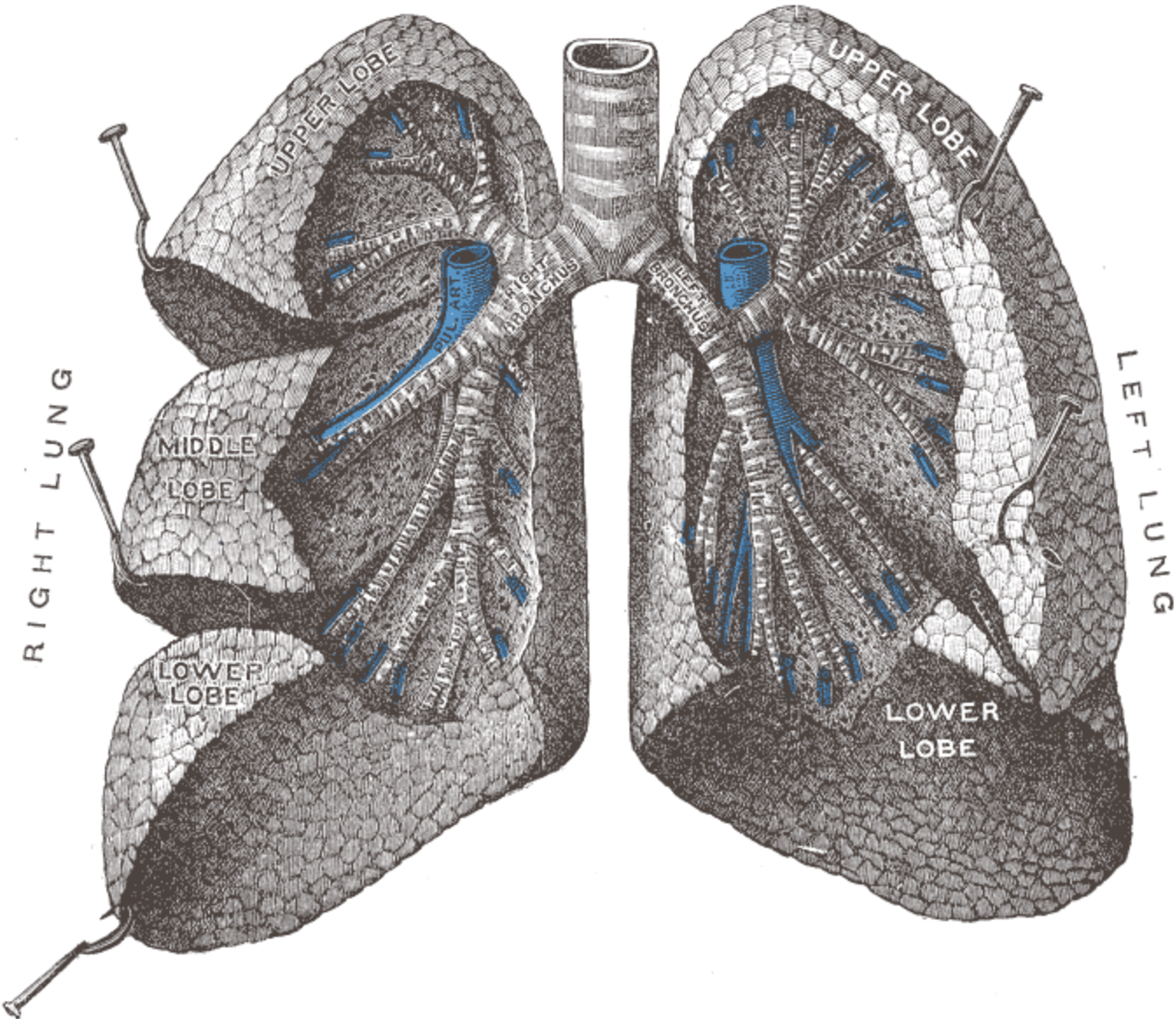
- **“Degenerative”**
- **Inflammatory**
- **Neoplastic and Pleura**
- **LAB: (Review, Cases, and/or Virtual Microscopy)**

OVERVIEW

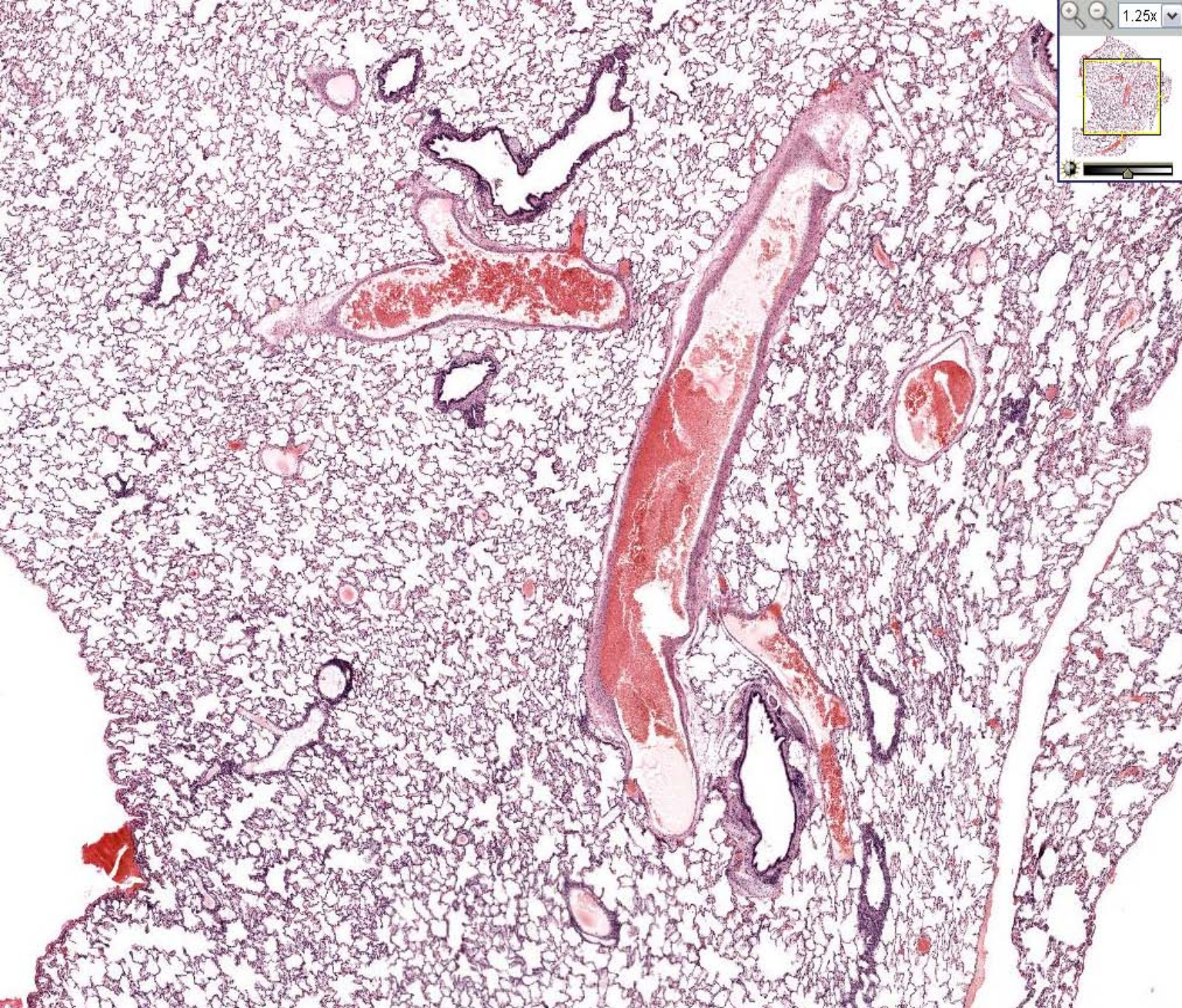
- Normal Anatomy and Histology
- Pathology
 - Congenital
 - Atelectasis
 - Acute Pulmonary Injury
 - Obstructive vs. Restrictive (infiltrative) concepts
 - **O**bststructive **P**ulmonary **D**isease (**COPD**)
 - Restrictive (Infiltrative) Pulmonary Disease
 - Vascular Pulmonary Diseases

OVERVIEW

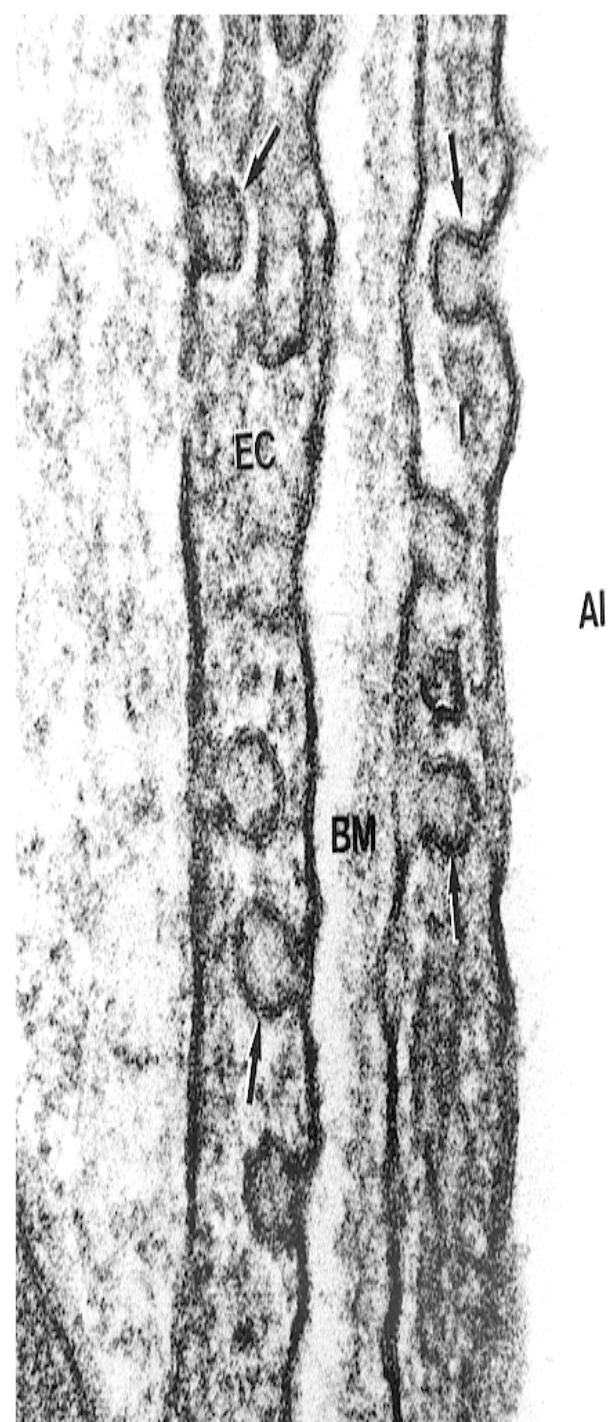
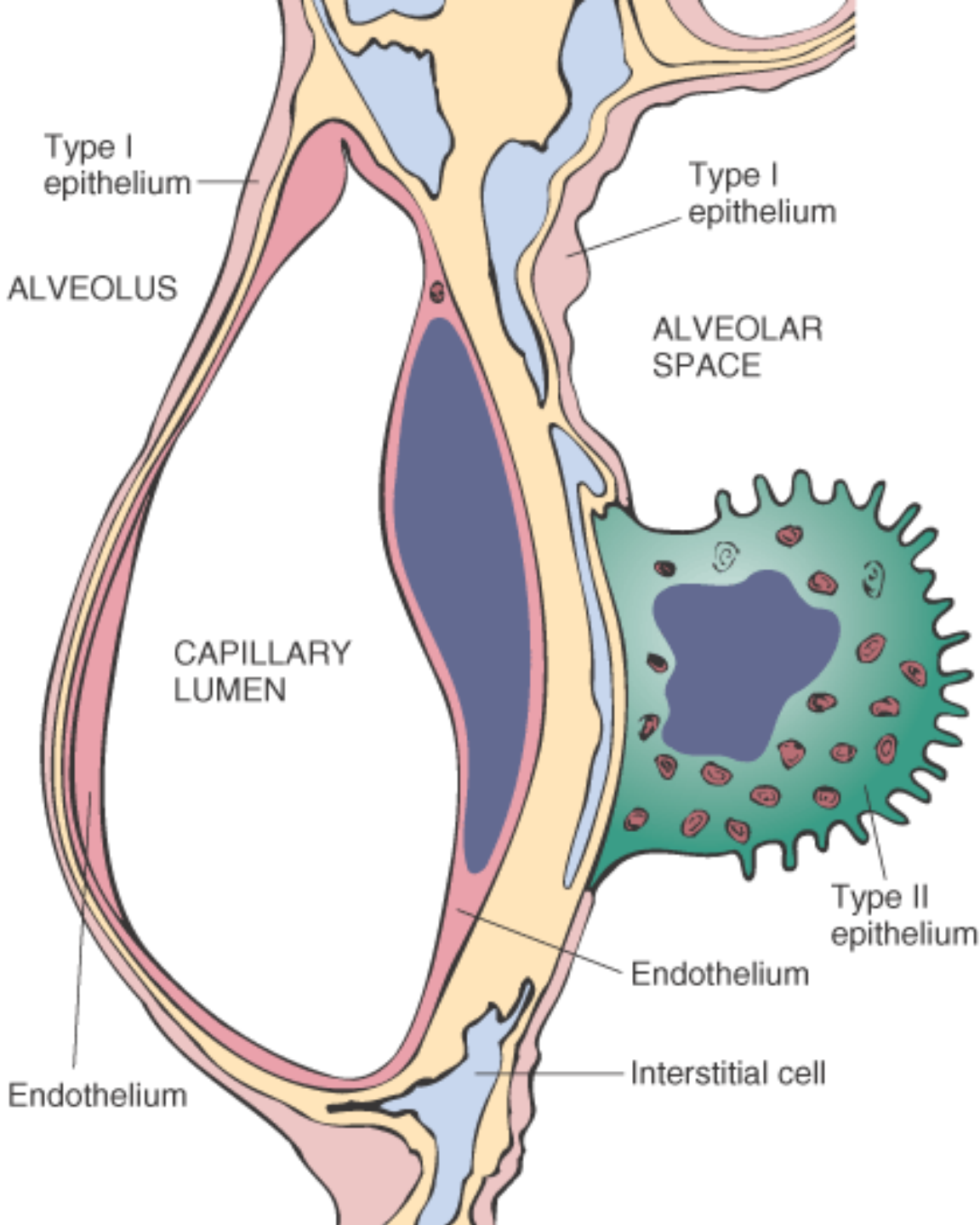
- **INFECTIONS**
- **NEOPLASMS and PLEURA**
(effusions, pneumothorax, tumors)



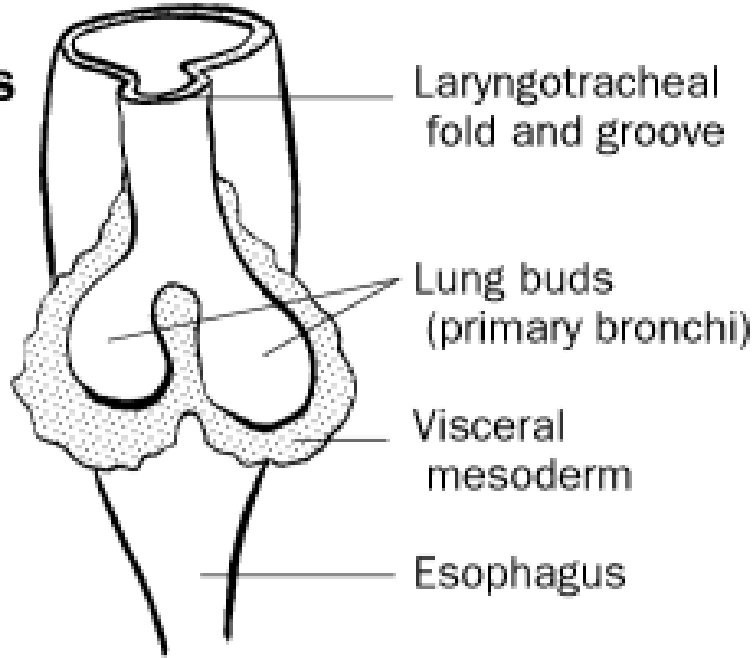
- WEIGHT**
- LOBES**
- SEGMENTS**
- BRONCHI**
- ARTERIES, pulmonary**
- ARTERIES, bronchial**
- VEINS**
- PLEURA, visceral**
- PLEURA, parietal**
- NERVES**



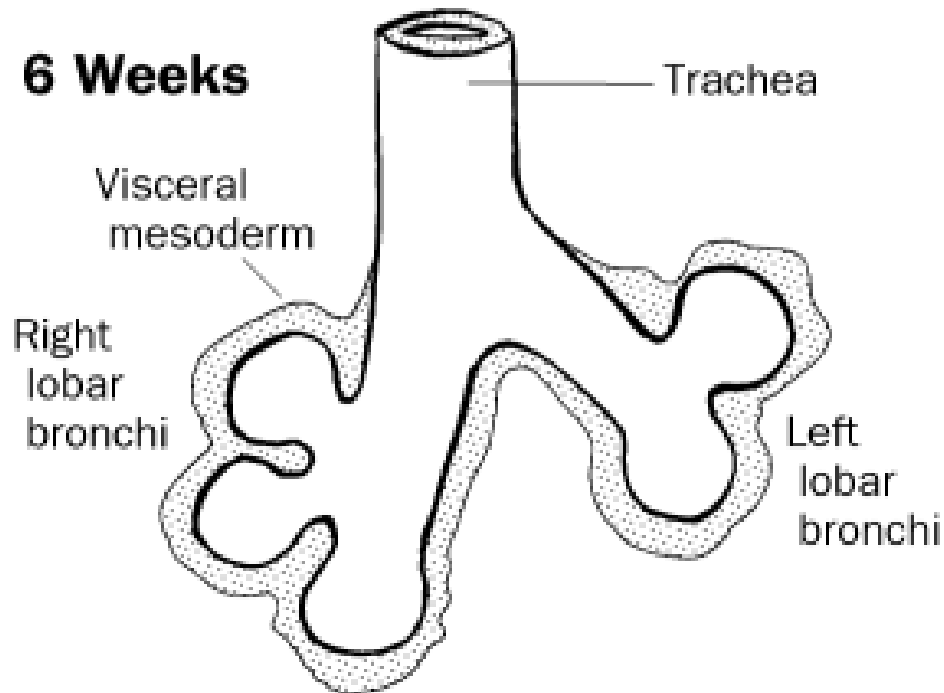
- Bronchi**
- Bronchioles**
- Terminal bronchioles**
- Alveolar ducts**
- Alveoli**
- Type 1 pneumocytes**
- Type 2 pneumocytes**
- Macrophages**
- Capillaries**



5 Weeks



6 Weeks



**N
O
R
M
A
L**



**C
X
R**

OVERVIEW

- **Pathology**

- **CONGENITAL**

- Atelectasis

- Acute Pulmonary Injury

- Obstructive vs. Restrictive (infiltrative) concepts

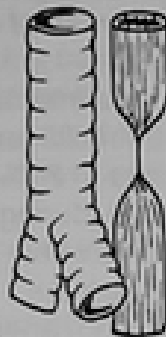
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CONGENITAL

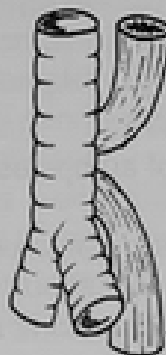
- Agenesia/Hypoplasia
- **Tracheal/bronchial anomalies, i.e.,
Tracheo-Esophageal (TE) fistula**
- Vascular anomalies
- Congenital Emphysema
- Foregut cysts
- Pulmonary Artery Malformations (CPAM)
- Sequestration (no connection to airways)



Esophageal atresia 9%



1%



2%



82%

Esophageal atresia + TE fistula



TE fistula without esophageal atresia 6%

OVERVIEW

- **Pathology**

- Congenital

- **ATALECTASIS**

- Acute Pulmonary Injury

- Obstructive vs. Restrictive (infiltrative) concepts

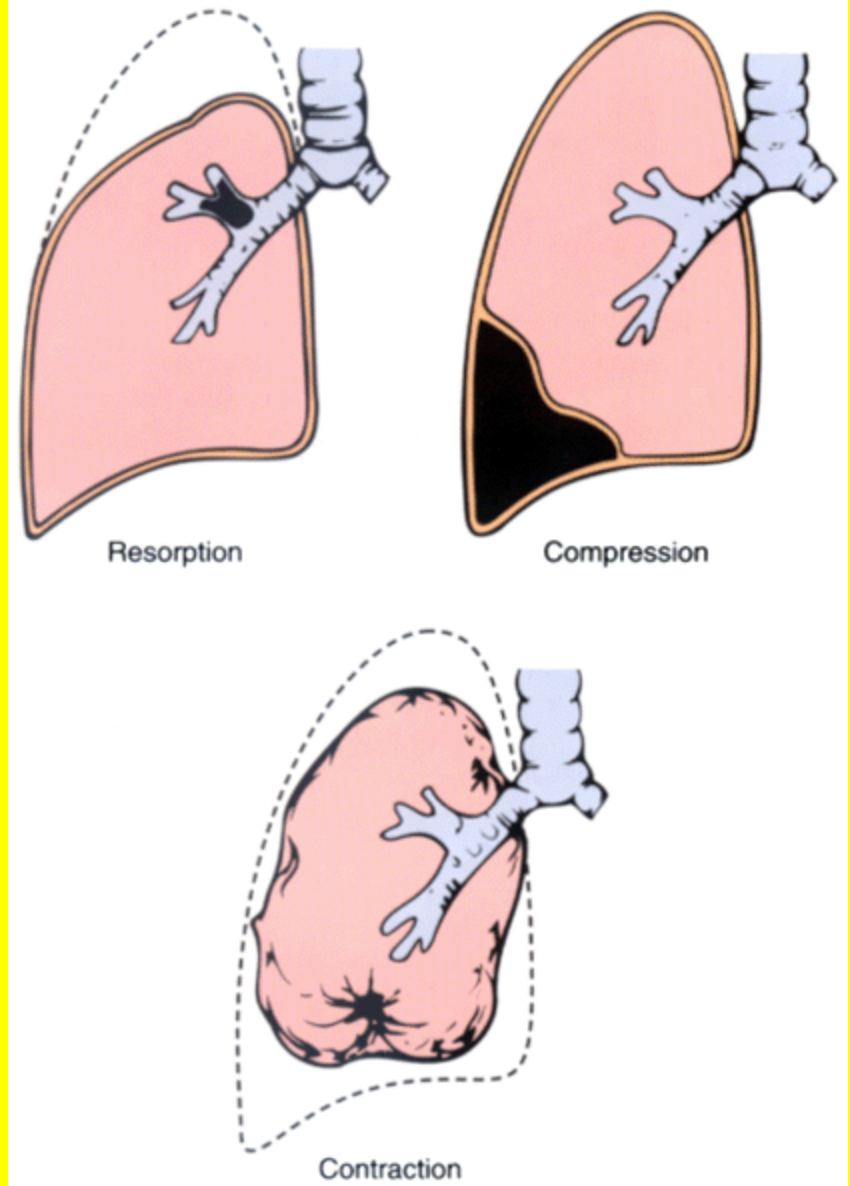
- **O**bststructive **P**ulmonary **D**isease (**COPD**)

- Restrictive Pulmonary Disease

- Vascular Pulmonary Diseases

ATALECTASIS

- INCOMPLETE EXPANSION
- COLLAPSE



OVERVIEW

- Pathology

- Congenital

- Atelectasis

- ACUTE PULMONARY INJURY

- Pulmonary Edema

- ARDS (**D**iffuse **A**lveolar **D**amage)

- Acute Interstitial Pneumonia

- Obstructive vs. Restrictive (infiltrative) concepts

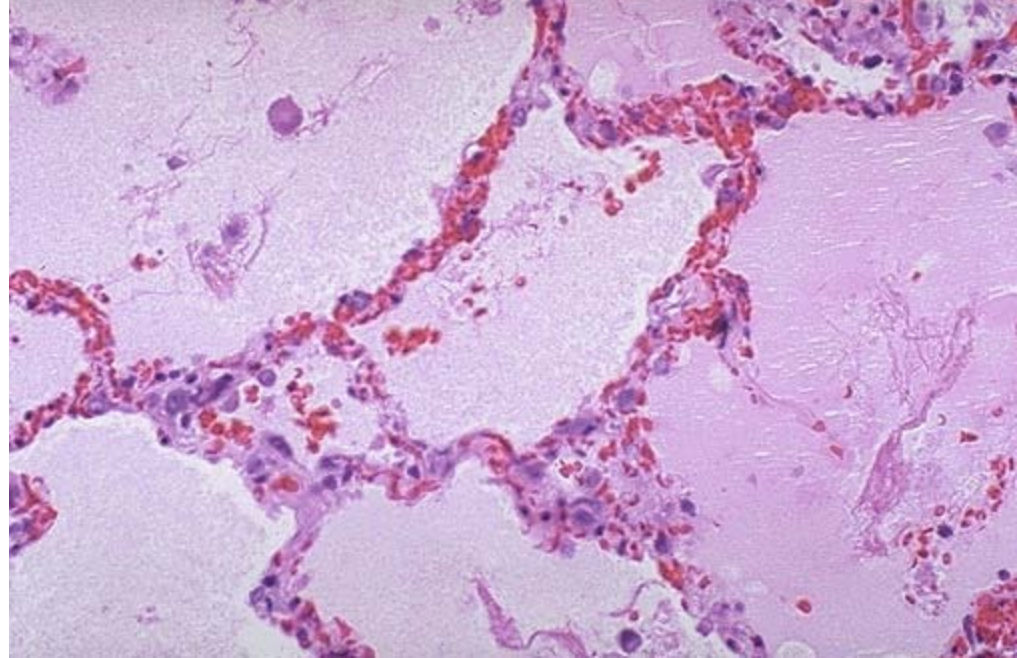
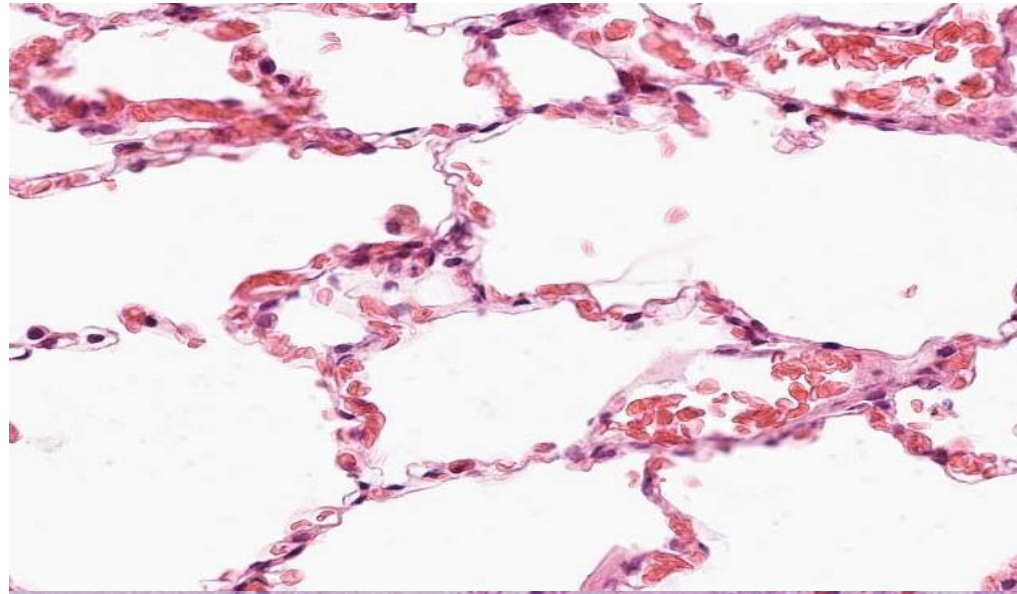
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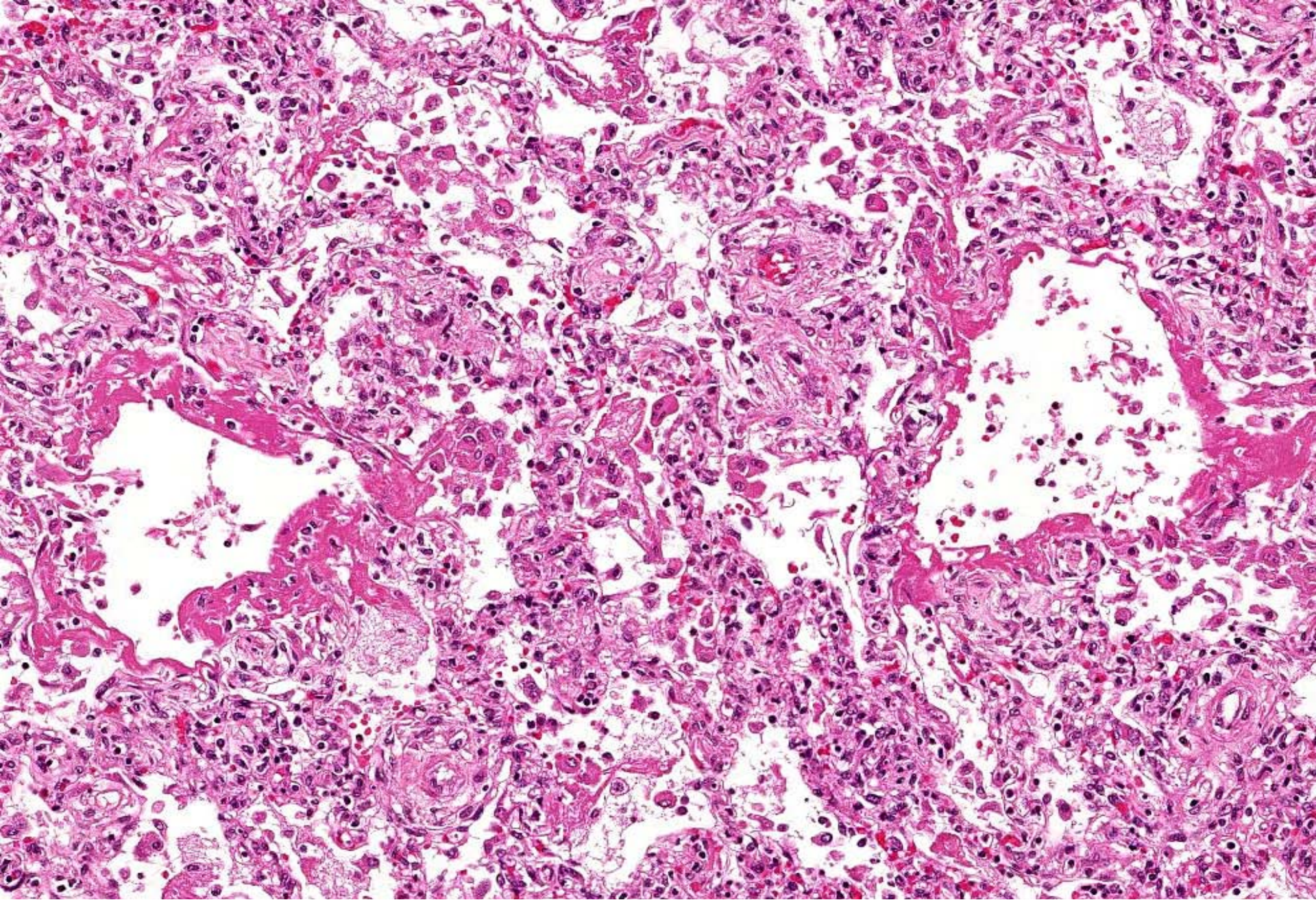
PULMONARY EDEMA

- IN-creased venous pressure
- DE-creased oncotic pressure
- Lymphatic obstruction
- Alveolar injury



ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS or D.A.D., i.e., Diffuse Alveolar damage) (aka, “SHOCK” lung)

- **NON-specific pattern of lung injury**
- **INFECTION**
- **PHYSICAL INJURY**
- **TOXIC**
- **CHEMICAL**
- **DIC**
- **ETC**



ARDS

ACUTE INTERSTITIAL PNEUMONIA

- Think of it as ARDS with NO known etiology!

OVERVIEW

- **Pathology**

- Congenital

- Atelectasis

- Acute Pulmonary Injury

- **OBSTRUCTION vs. RESTRICTION**

- **O**bststructive **P**ulmonary **D**isease (**COPD**)

- Restrictive (Infiltrative) Pulmonary Disease

- Vascular Pulmonary Diseases

OBSTRUCTION v. RESTRICTION

- **OBSTRUCTION**

- Air or blood?
- Large or small?
- Inspiration or Expiration?

- **Obstruction is SMALL AIRWAY EXPIRATION**

obstruction, i.e., wheezing

- **HYPEREXPANSION** on CXR

- **RESTRICTION**

- “Compliance”
- “Infiltrative”
- **REDUCED lung VOLUME, DYSPNEA, CYANOSIS**
- **REDUCED GAS TRANSFER**
- “GROUND GLASS” on CXR

OVERVIEW

- **Pathology**

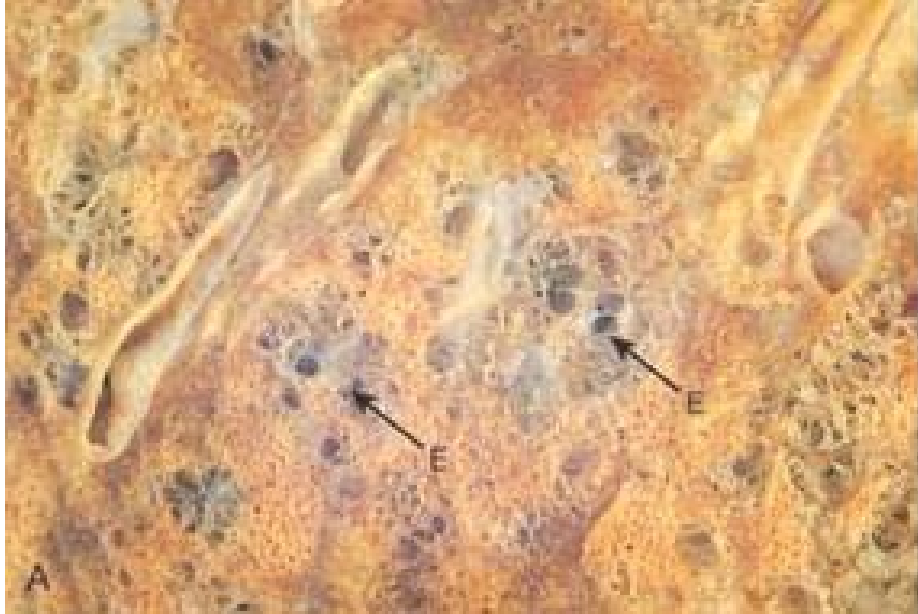
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OBSTRUCTION (cOPD)

- **EMPHYSEMA** (almost always chronic)
- **CHRONIC BRONCHITIS** → emphysema
- **ASTHMA**
- **BRONCHIECTASIS**

EMPHYSEMA

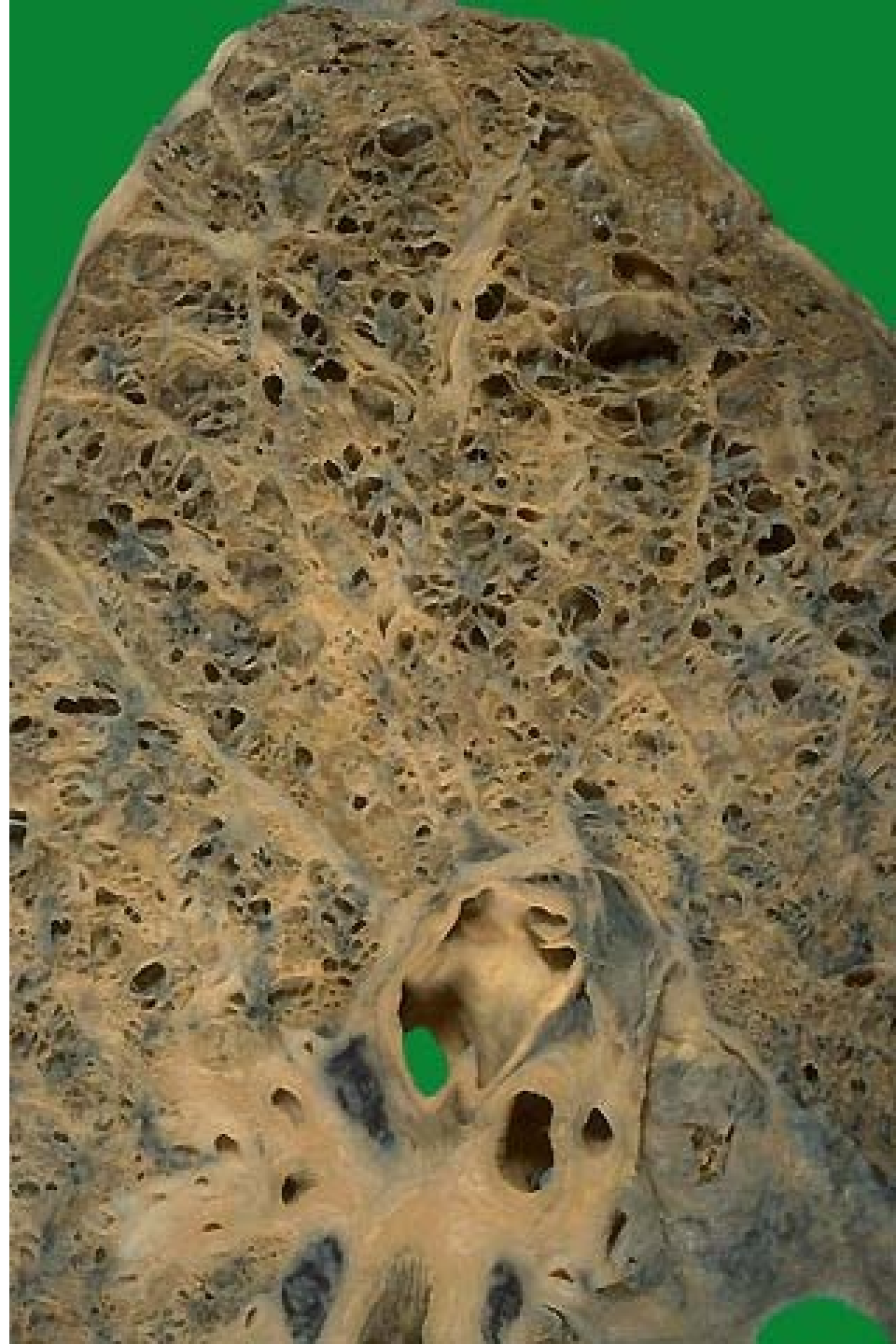
- COPD, or “END-STAGE” lung disease
- Centri-acinar, Pan-acinar, Paraseptal, Irregular
- Like cirrhosis, thought of as END-STAGE of multiple chronic small airway obstructive etiologies
- NON-specific
- IN-creased crepitance, BULLAE (BLEBS)
- Clinically linked to recurrent pneumonias, and progressive failure



CENTRO-acinar



PAN-acinar



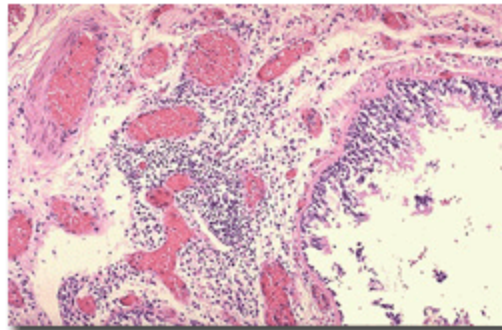


- 1) HYPER-expansion 2) “flattened” diaphragms (blunted),**
3) “bullae” 4) increased lucency* (why?)

CHRONIC BRONCHITIS

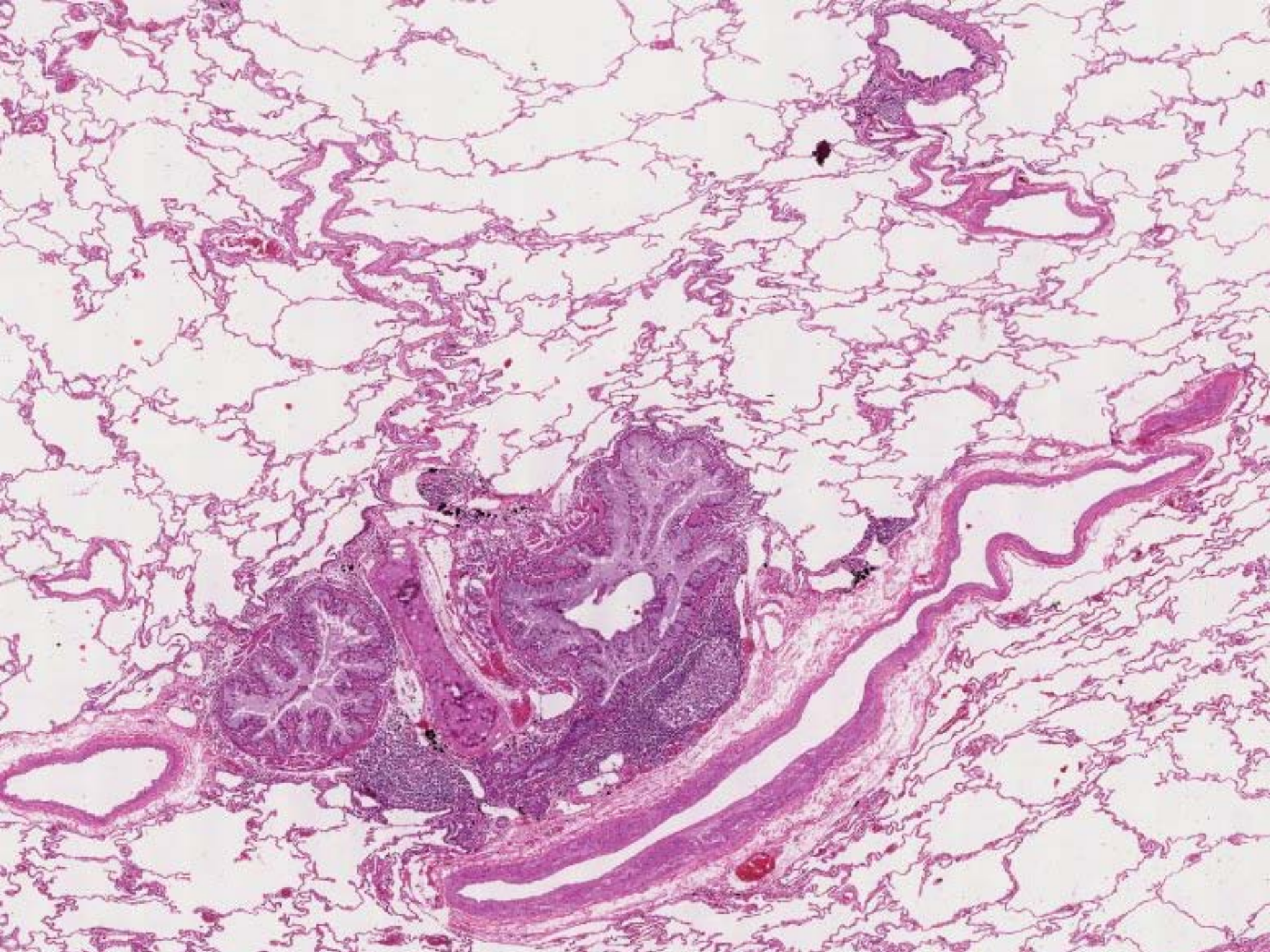
- INHALANTS, POLLUTION, CIGARETTES
- CHRONIC COUGH
- CAN OFTEN PROGRESS TO EMPHYSEMA

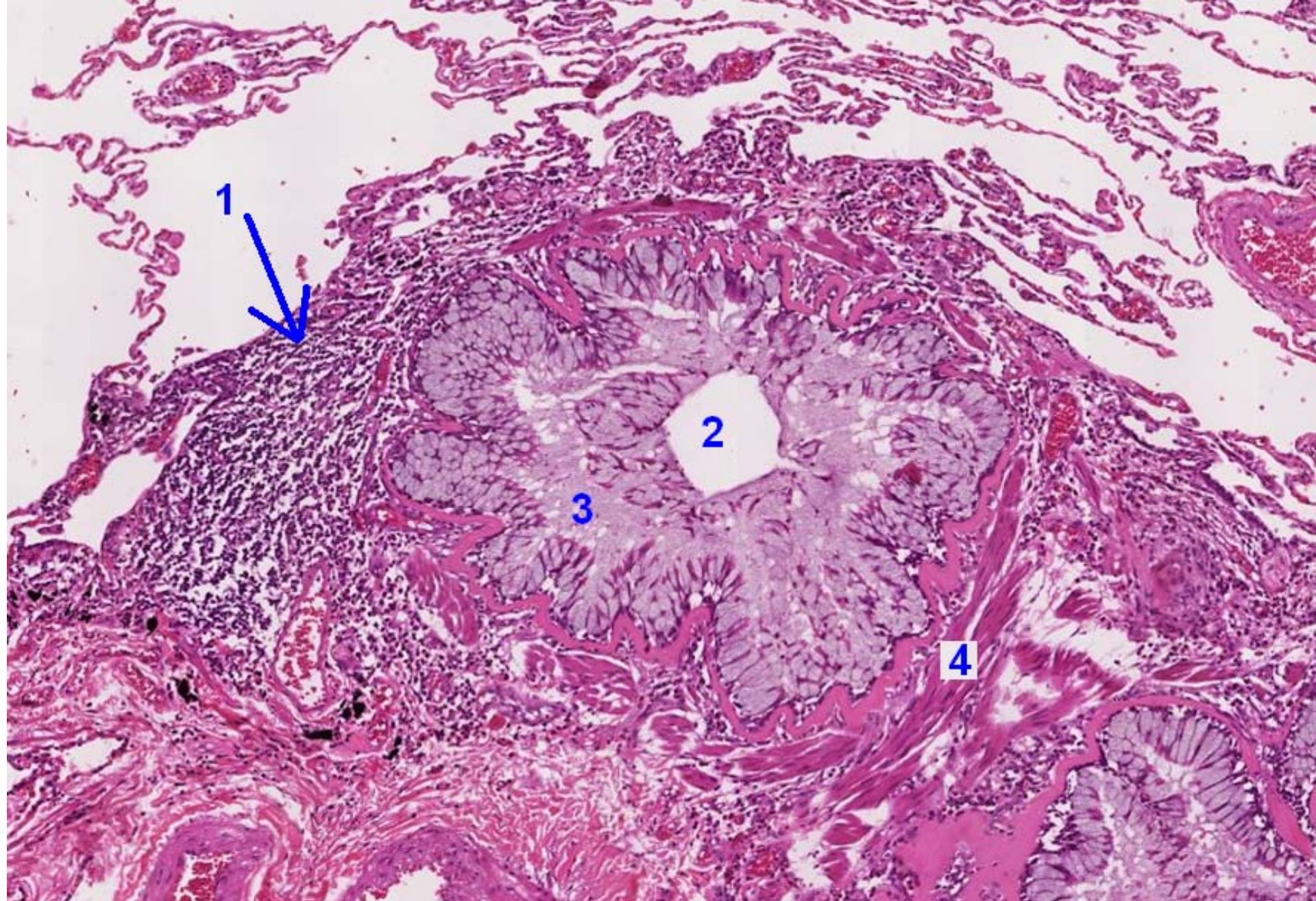
- MUCUS hypersecretion, early, i.e. goblet cell increase
- CHRONIC bronchial inflammatory infiltrate



ASTHMA

- Similar to chronic bronchitis but:
 - Wheezing is hallmark (bronchospasm, i.e. “wheezing”)
 - **STRONG** allergic role, i.e., eosinophils, IgE, allergens
 - Often starting in **CHILDHOOD**
 - **ATOPIC** (allergic) or **NON-ATOPIC** (infection)
 - Chronic small airway obstruction and infection
 - 1) Mucus hypersecretion with plugging, 2) lymphocytes/eosinophils, 3) lumen narrowing, 4) smooth muscle hypertrophy





What are the 4 classical histologic findings in bronchial asthma?

BRONCHIECTASIS

- **DILATATION** of the **BRONCHUS**, associated with, often, necrotizing inflammation
 - **CONGENITAL**
 - **TB**, other bacteria, many viruses
 - **BRONCHIAL OBSTRUCTION** (i.e., **LARGE AIRWAY, NOT SMALL AIRWAY**)
 - Rheumatoid Arthritis, SLE, IBD (**I**nflammatory **B**owel **D**isease)

BRONCHIECTASIS



OVERVIEW

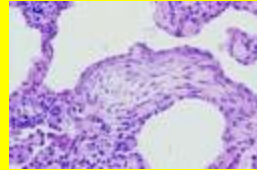
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PULMONARY DISEASES**
- Vascular Pulmonary Diseases

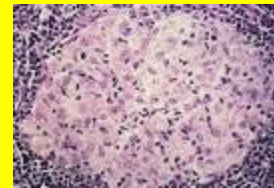
RESTRICTIVE (INFILTRATIVE)

- REDUCED COMPLIANCE, reduced gas exchange)
- Are also DIFFUSE
- HETEROGENEOUS

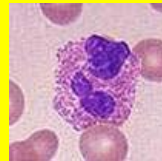
• FIBROSING



• GRANULOMATOUS



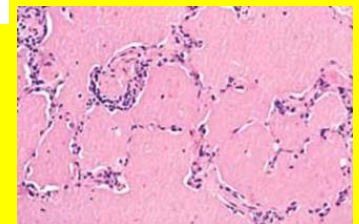
• EOSINOPHILIC



• SMOKING RELATED



• PAP (**P**ulmonary **A**lveolar **P**roteinosis)

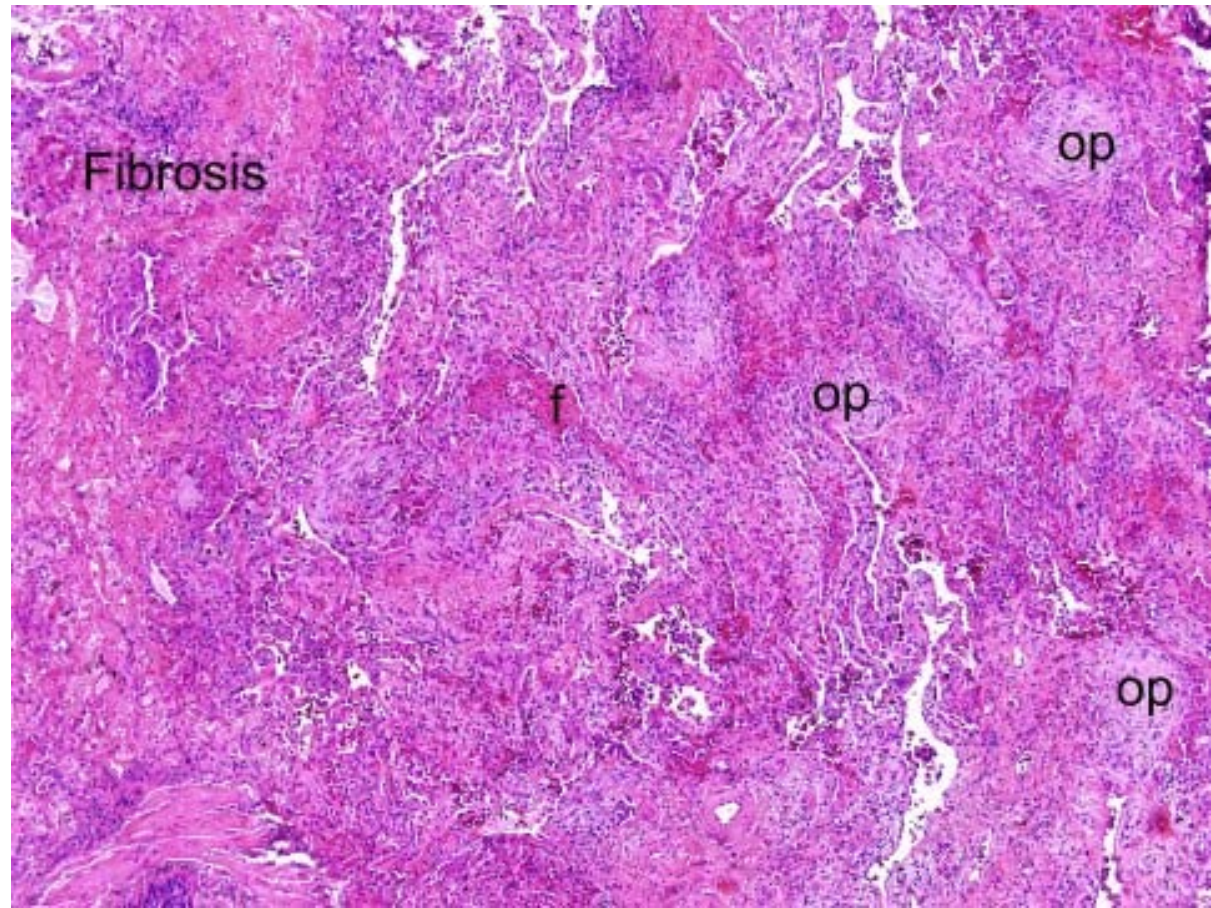


FIBROSING

- “IDIOPATHIC” PULMONARY FIBROSIS (IPF)
- NONSPECIFIC INTERSTITIAL FIBROSIS
- “CRYPTOGENIC” ORGANIZING PNEUMONIA
- “COLLAGEN” VASCULAR DISEASES
- PNEUMOCONIOSES
- DRUG REACTIONS
- RADIATION CHANGES

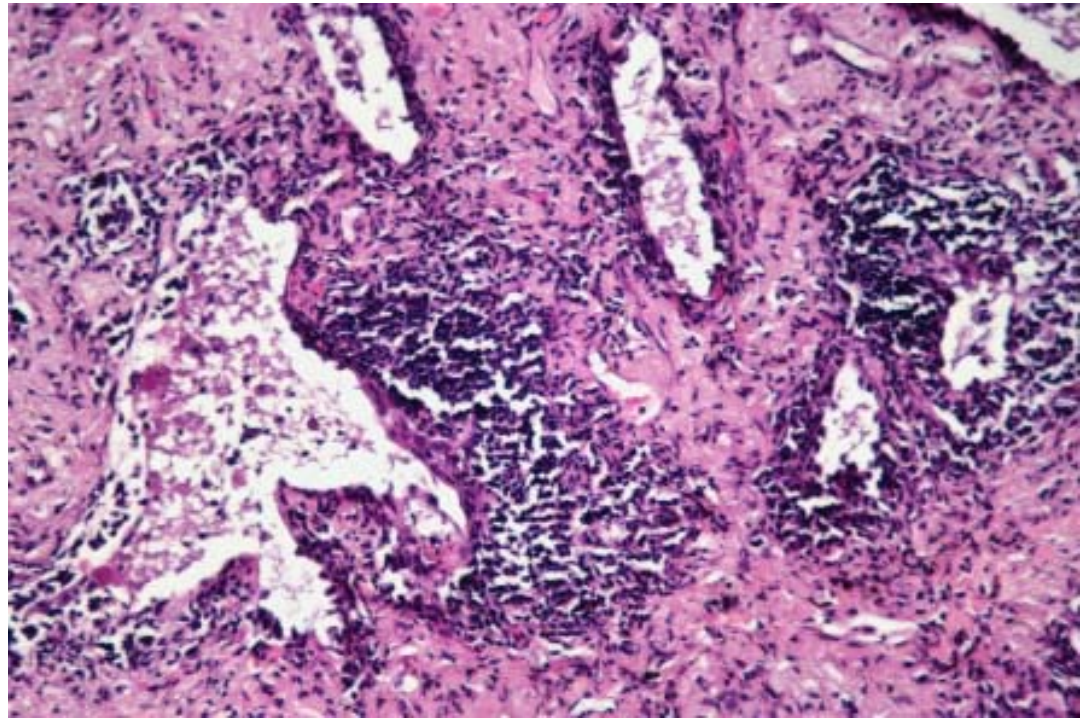
IPF (UIP)

- **IDIOPATHIC**, i.e., not from any usual caused, like lupus, scleroderma
- **FIBROSIS**



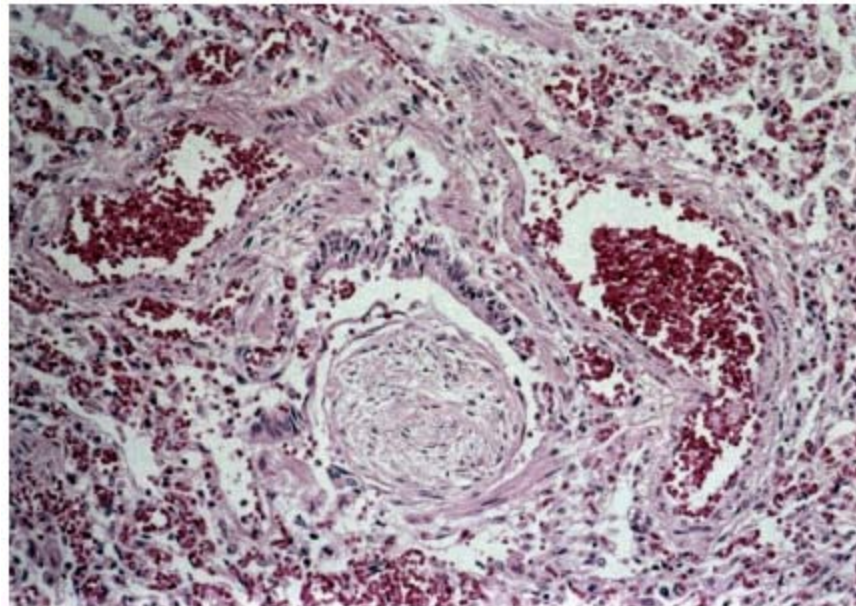
NON-SPECIFIC INTERSTITIAL PNEUMONIA

- **WASTEBASKET DIAGNOSIS**, of ANY pneumonia (pneumonitis) of any known or unknown etiology
 - **FIBROSIS**
 - **CELLULAR INFILTRATE** (LYMPHS & PLASMA CELLS)



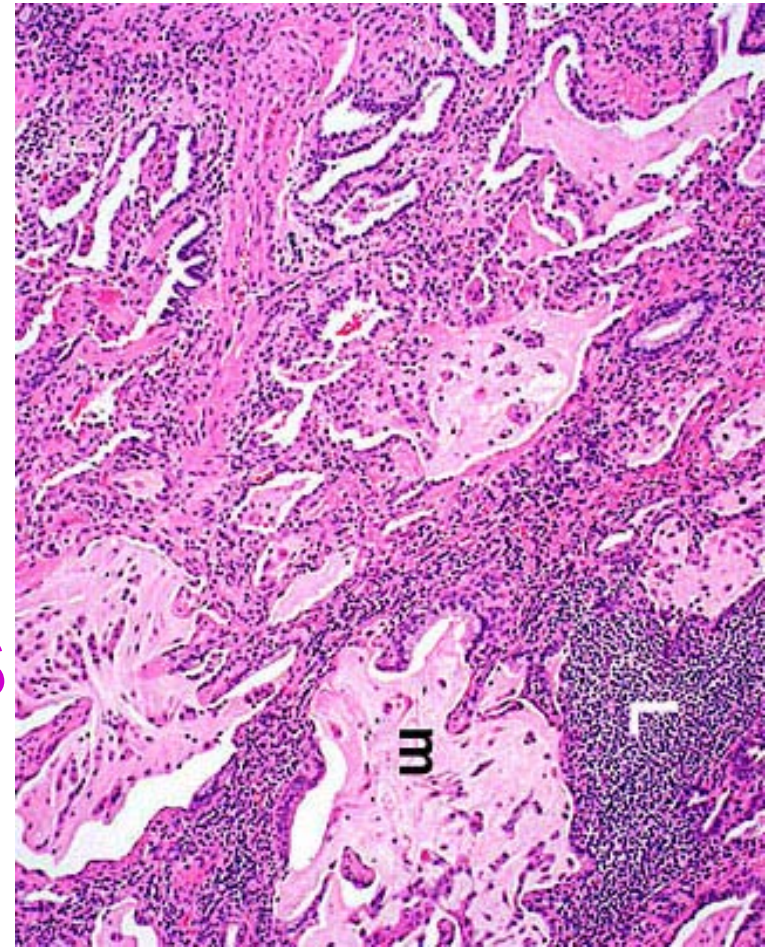
CRYPTOGENIC ORGANIZING PNEUMONIA (COP)

- IDIOPATHIC
- “BRONCHIOLITIS OBLITERANS”



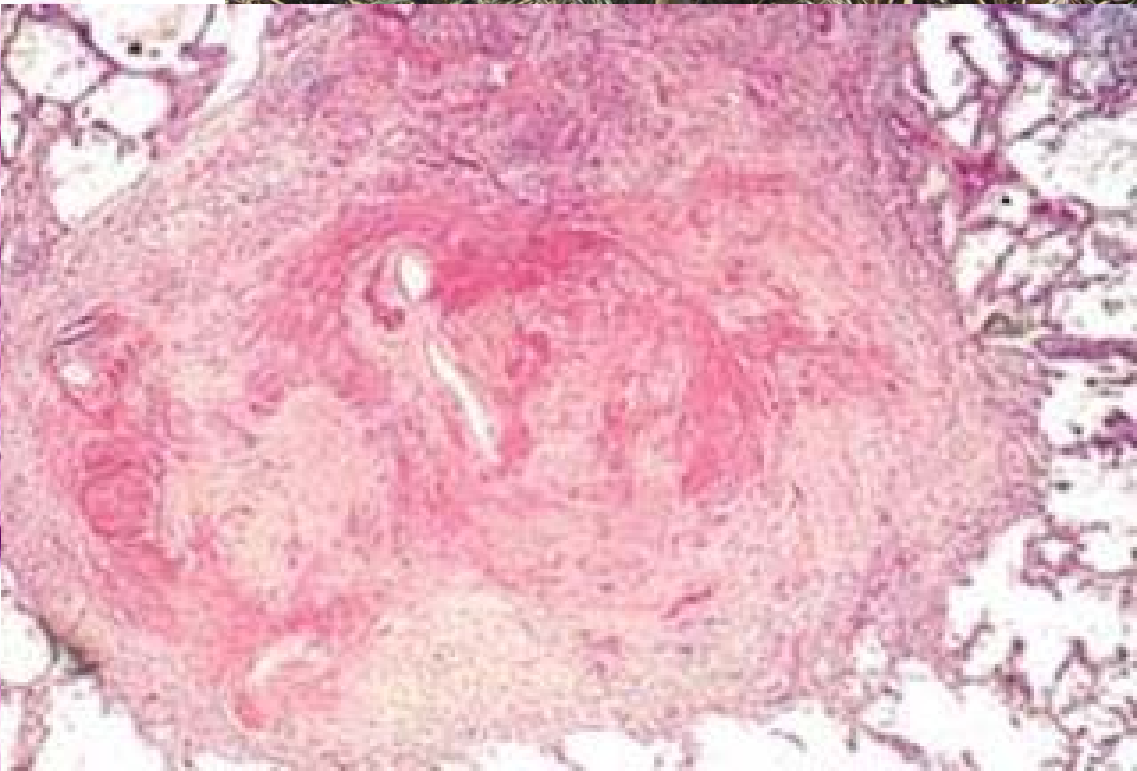
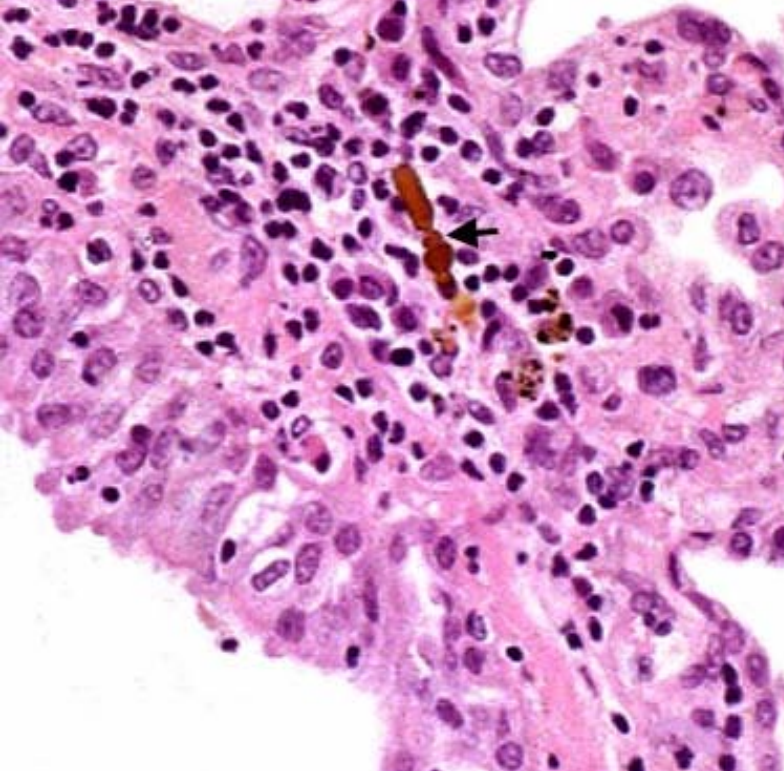
“COLLAGEN” VASCULAR DISEASES

- Rheumatoid Arthritis
- SLE (“Lupus”)
- Progressive Systemic Sclerosis (Scleroderma)



PNEUMOCONIOSES

- “OCCUPATIONAL”
- “COAL MINERS LUNG”
- DUST OR CHEMICALS OR ORGANIC MATERIALS
 - Coal (anthracosis)
 - Silica
 - Asbestos
 - Be, FeO, BaSO₄, **CHEMO**
 - HAY, FLAX, BAGASSE, INSECTICIDES, etc.



GRANULOMATOUS

- **SARCOIDOSIS**, i.e., NON-caseating granulomas (IDIOPATHIC)
- **HYPERSENSITIVITY** (DUSTS, bacteria, fungi, **Farmer's Lung**, **Pigeon Breeder's Lung**)

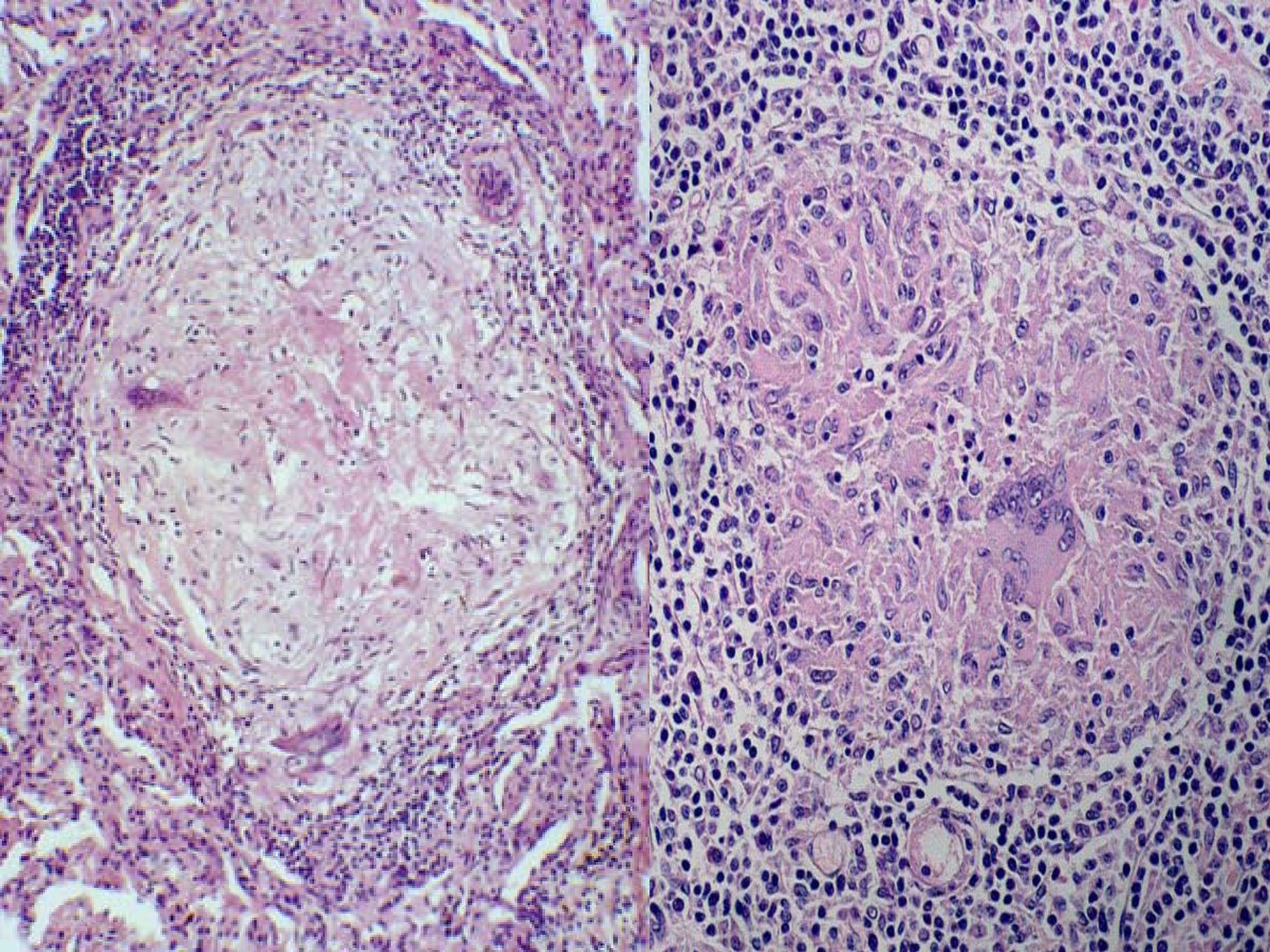
SARCOIDOSIS

- Mainly LUNG, but eye, skin or ANYWHERE
- UNKNOWN ETIOLOGY
- IMMUNE, GENETIC factors
- F>>M
- B>>W
- YOUNG ADULT BLACK WOMEN



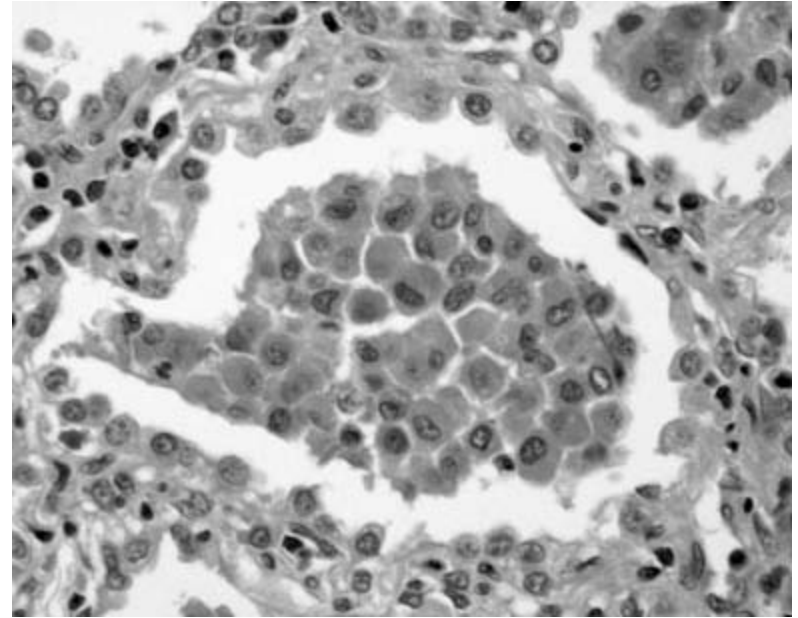
NON-Caseating Granulomas are the RULE

“Asteroid” bodies within these granulomas are virtually diagnostic



SMOKING RELATED

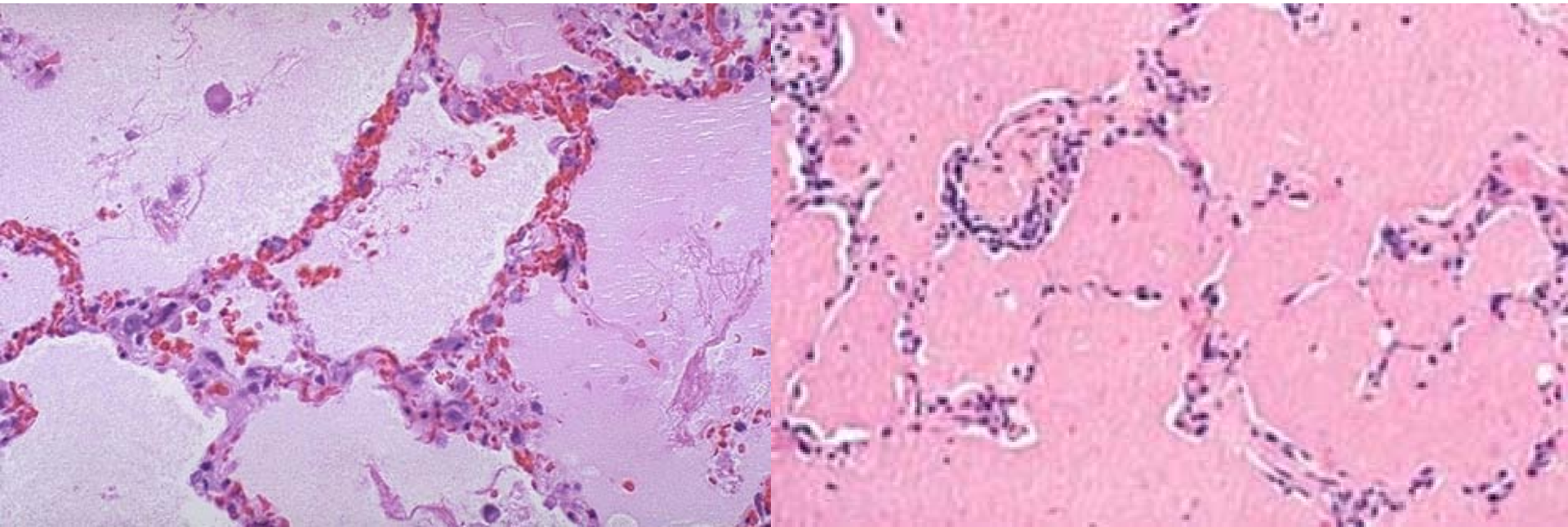
- **DIP**
(**Desquamative Interstitial Pneumonia**)
 - M>>F
 - **CIGARETTES**
 - **100% Survival**



**Alveolar
Macrophages**

PAP (Pulmonary Alveolar Proteinosis)

- Very RARE, usually acquired
- Proteinaceous Material in Alveoli
- MINIMAL cellular infiltrate
- Like Pulmonary Edema, but MUCH Protein



OVERVIEW

- **Pathology**

- Congenital
- Atelectasis
- Acute Pulmonary Injury
- Obstruction vs. Restriction
- Obstructive Pulmonary Diseases (COPD)
- Restrictive (Infiltrative) Pulmonary Diseases
- **VASCULAR PULMONARY DISEASES**

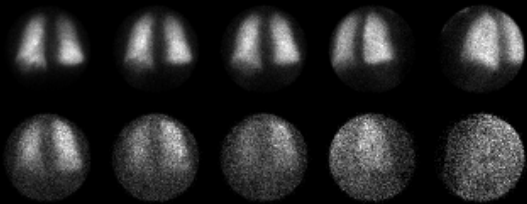
VASCULAR PULMONARY DISEASES

- **PULMONARY EMBOLISM** (with or usually WITHOUT infarction)
- **PULMONARY HYPERTENSION**, leading to cor pulmonale
- **HEMORRHAGIC SYNDROMES**
 - **GOODPASTURE SYNDROME**
 - **HEMOSIDEROSIS**, idiopathic
 - **WEGENER GRANULOMATOSIS**

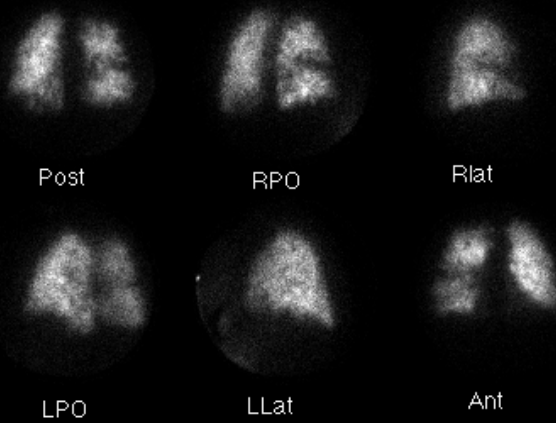
P.E.

- Usually secondary to debilitated states with immobilization, or following surgery
- Usually deep leg and deep pelvic veins (DVT), NOT superficial veins
- Follows Virchow's triad, i.e., 1) flow problems, 2) endothelial disruption, 3) hypercoagulability
- Usually do NOT infarct, usually ventilate
- When they DO infarct, the infarct is hemorrhagic
- Decreased PO₂, acute chest pain, V/Q MIS-match
- DX: Chest CT, V/Q scan, angiogram
- RX: short term heparin, then long term coumadin

Ventilation



Perfusion

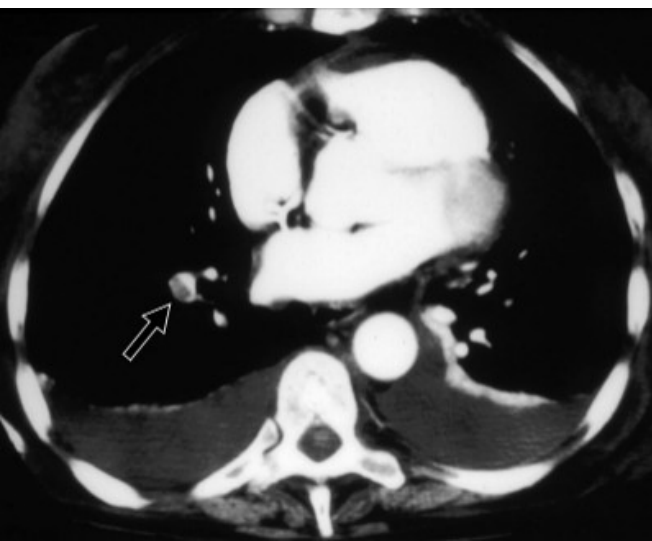


VQ scan

CT

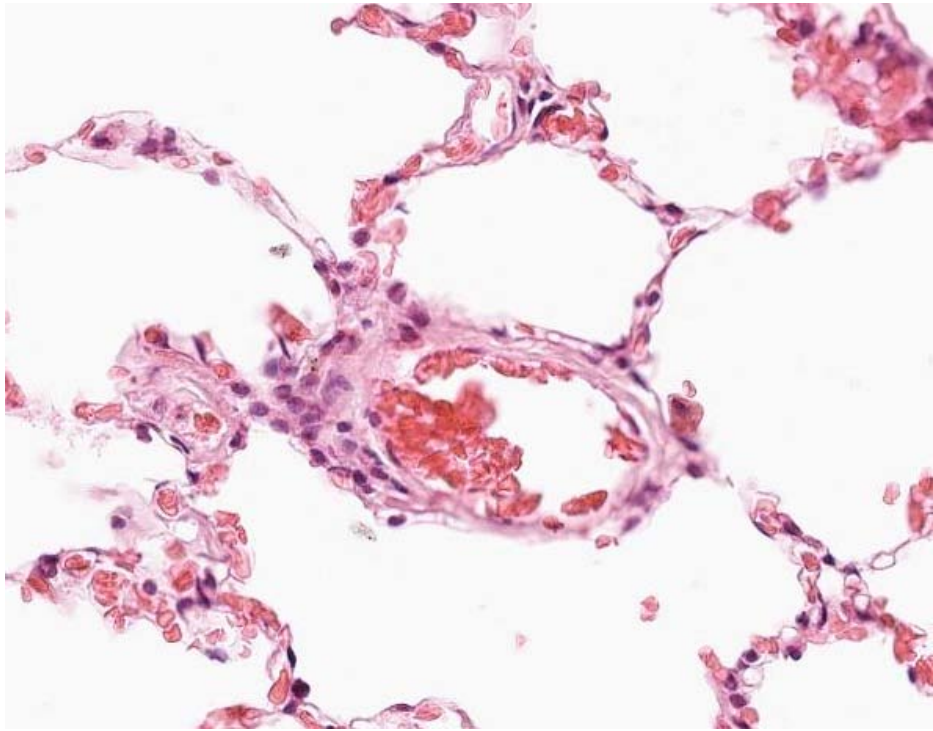
CXR

GROSS
"saddle"
embolism

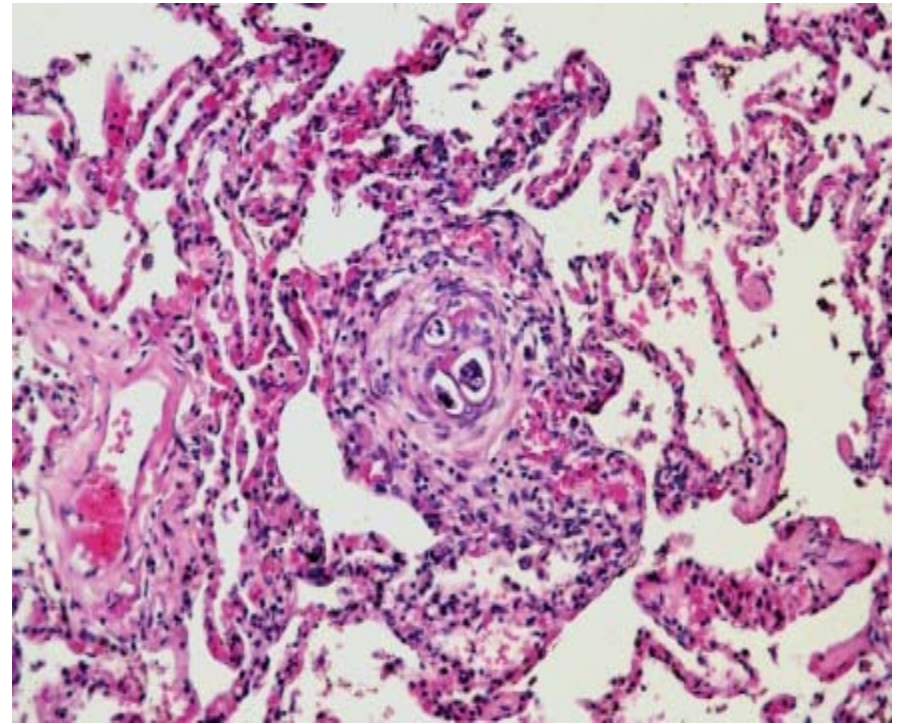


PULMONARY HYPERTENSION

- **COPD, C"IPD** (vicious cycle)
- **CHD** (Congenital HD, increased left atrial pressure)
- Recurrent **PEs**
- Autoimmune, e.g., PSS (**Scleroderma**), i.e., fibrotic pulmonary vasculature



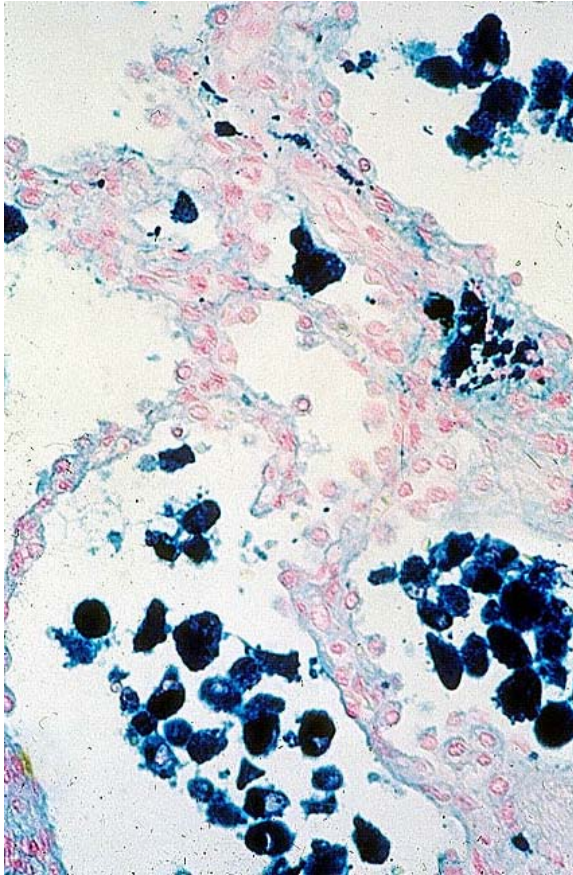
NORMAL pulmonary arteriole



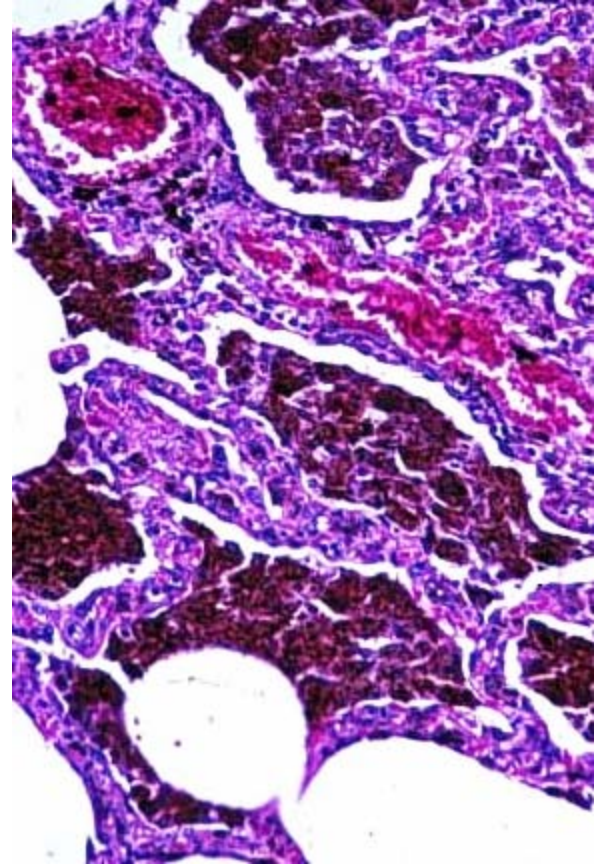
VERY thickened arteriole in pulmonary hypertension

HEMORRHAGIC SYNDROMES

- **GOODPASTURE** Syndrome: Ab's to the alpha-3 chains of collagen IV, GBM deposits too!
- **IDIOPATHIC PULMONARY HEMOSIDEROSIS**, to be differentiated from chronic CHF
- **WEGENER GRANULOMATOSIS**



CHF, **CHRONIC**



**IDIOPATHIC
PULMONARY
HEMOSIDEROSIS**

PNEUMONIA



PULMONARY INFECTIONS

COMMUNITY-ACQUIRED BACTERIAL ACUTE PNEUMONIAS

Streptococcus Pneumoniae

Haemophilus Influenzae

Moraxella Catarrhalis

Staphylococcus Aureus

Klebsiella Pneumoniae

Pseudomonas Aeruginosa

Legionella Pneumophila

COMMUNITY-ACQUIRED ATYPICAL (VIRAL AND MYCOPLASMAL) PNEUMONIAS

Morphology.

Clinical Course.

Influenza Infections

Severe Acute Respiratory Syndrome (SARS)

NOSOCOMIAL PNEUMONIA

ASPIRATION PNEUMONIA

LUNG ABSCESS

Etiology and Pathogenesis.

CHRONIC PNEUMONIA

Histoplasmosis, Morphology

Blastomycosis, Morphology

Coccidioidomycosis, Morphology

PNEUMONIA IN THE IMMUNOCOMPROMISED HOST

PULMONARY DISEASE IN HUMAN IMMUNODEFICIENCY VIRUS INFECTION

BASIC CONSIDERATIONS

- PNEUMONIA vs. PNEUMONITIS
- DIFFERENTIATION from INJURIES, OBSTRUCTIVE DISEASES, RESTRICTIVE DISEASES, VASCULAR DISEASES
- DIFFERENTIATION FROM NEOPLASMS
- CLASSICAL STAGES of INFLAMMATION
- LOBAR- vs. BRONCHO-
- INTERSTITIAL vs. ALVEOLAR
- COMMUNITY vs. NOSOCOMIAL
- ETIOLOGIC AGENTS vs. HOST IMMUNITY
- 2 PRESENTING SYMPTOMS
- 2 DIAGNOSTIC METHODS
- **ANY ORGANISM CAN CAUSE PNEUMONIA!!!**

PREDISPOSING FACTORS

- **LOSS OF COUGH REFLEX**
- **DIMINISHED MUCIN or CILIA FUNCTION**
- **ALVEOLAR MACROPHAGE INTERFERENCE**
- **VASCULAR FLOW IMPAIRMENTS**
- **BRONCHIAL FLOW IMPAIRMENTS**

Although pneumonia is one of the most common causes of death, it usually does **NOT occur in healthy people spontaneously**

Classifications of PNEUMONIAS

- **COMMUNITY ACQUIRED**
- **COMMUNITY ACQUIRED, ATYPICAL**
- **NOSOCOMIAL**
- **ASPIRATION**
- **CHRONIC**
- **NECROTIZING/ABSCESS FORMATION**
- **PNEUMONIAS in
IMMUNOCOMPROMISED HOSTS**

Classifications of PNEUMONIAS

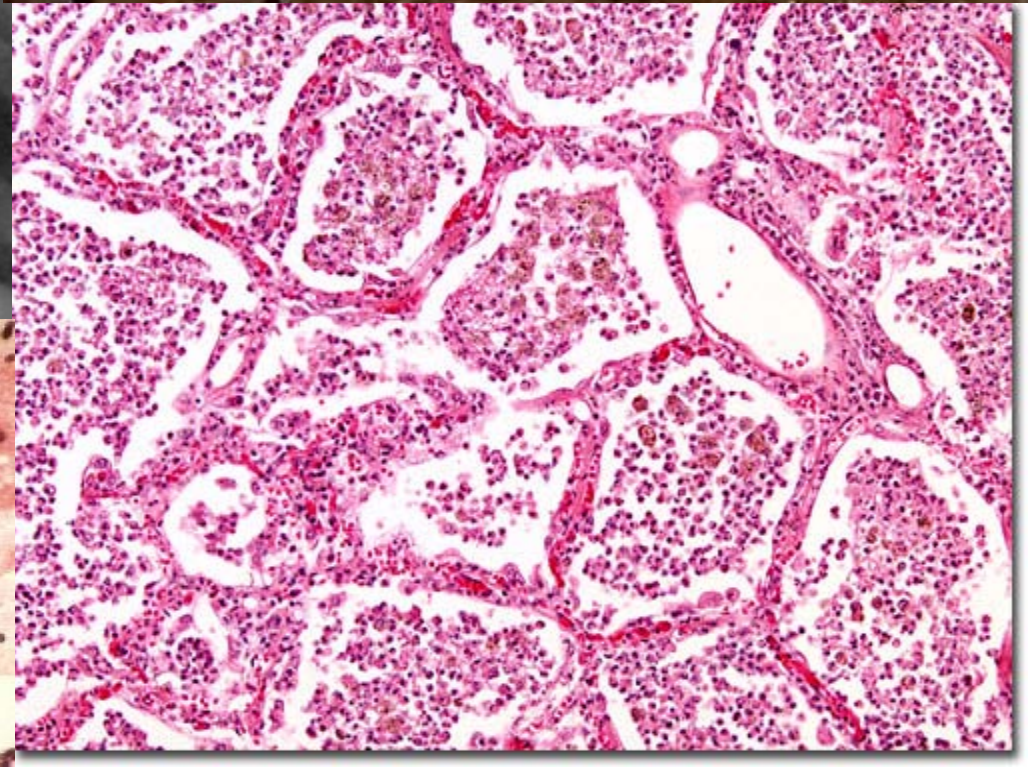
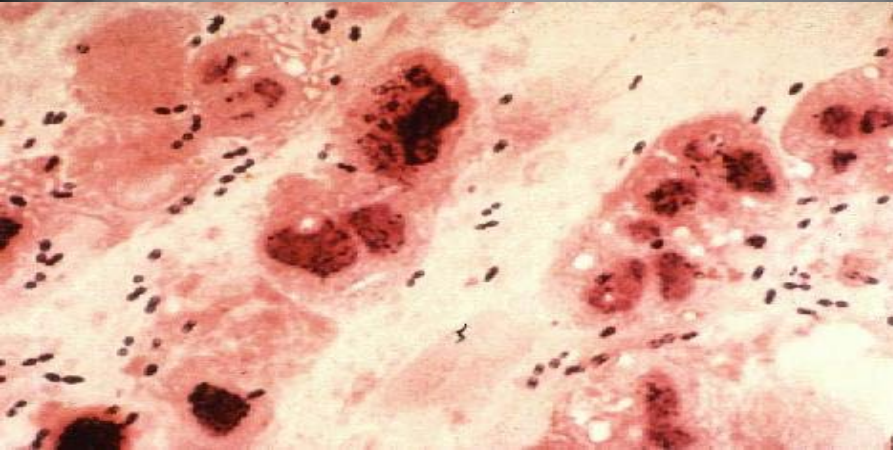
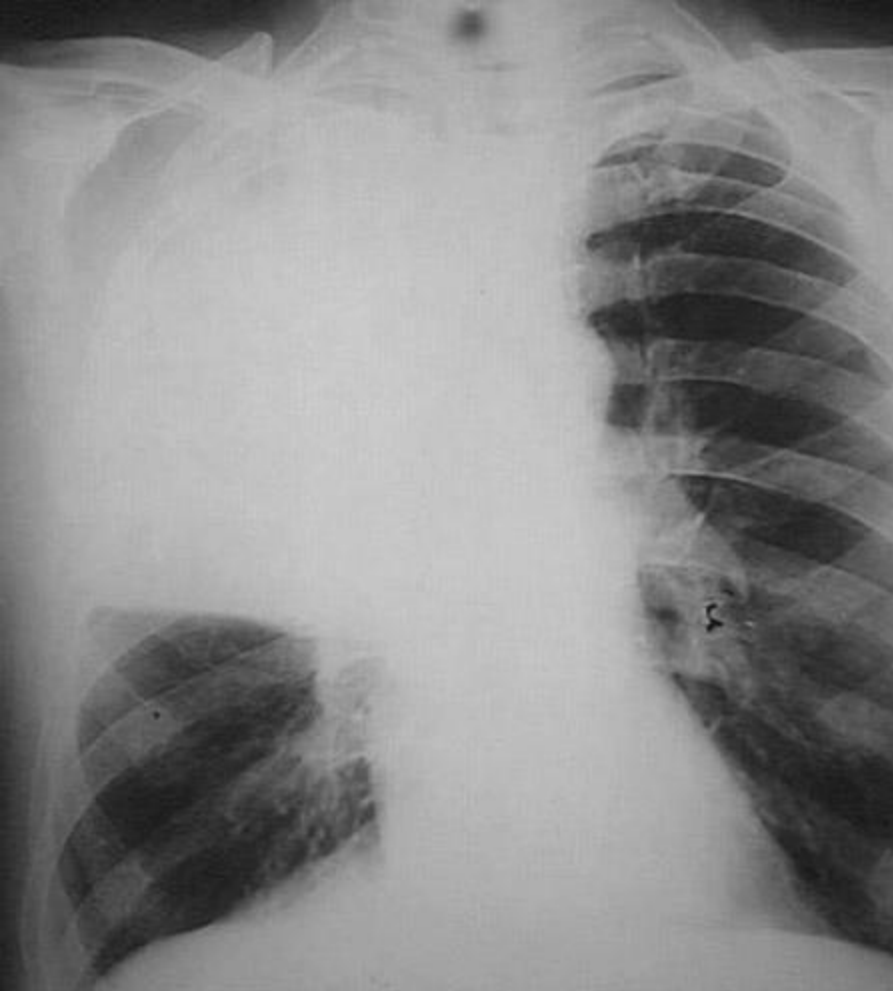
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COMMUNITY ACQUIRED

- **STREPTOCOCCUS PNEUMONIAE (i.e., “diplococcus”)**
- **HAEMOPHILUS INFLUENZAE (“H-Flu”)**
- **MORAXELLA**
- **STAPHYLOCOCCUS (STAPH)**
- **KLEBSIELLA PNEUMONIAE**
- **PSEUDOMONAS AERUGINOSA**
- **LEGIONELLA PNEUMOPHILIA**

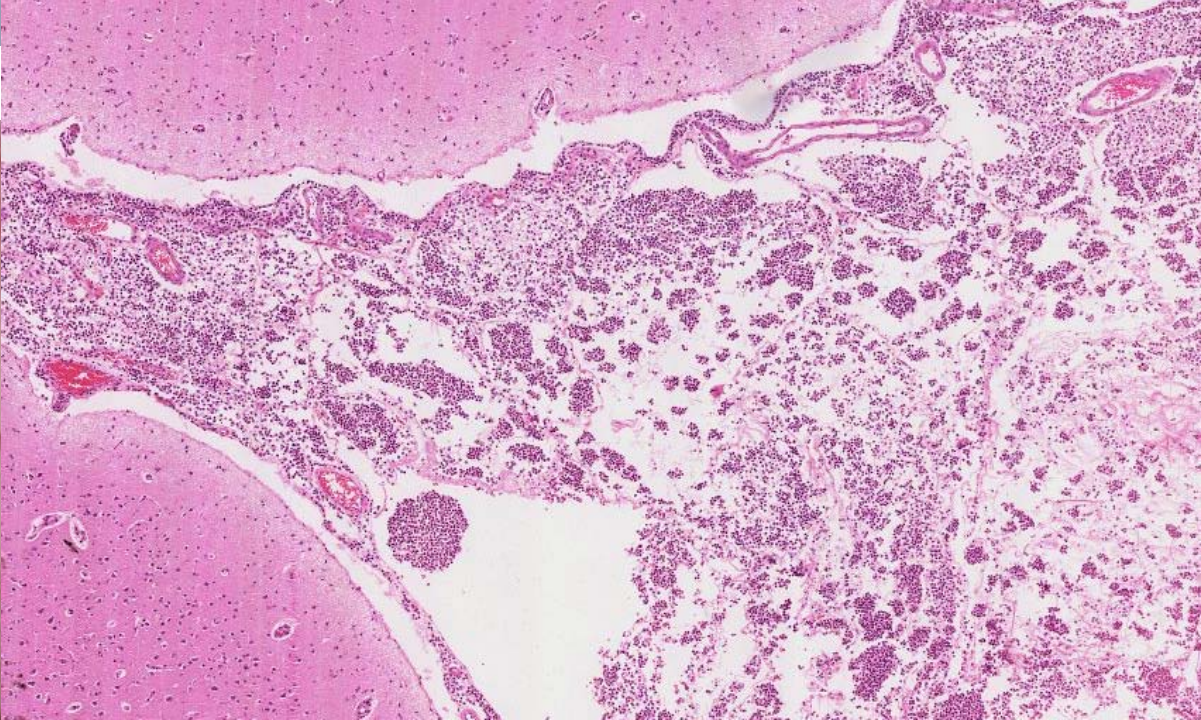
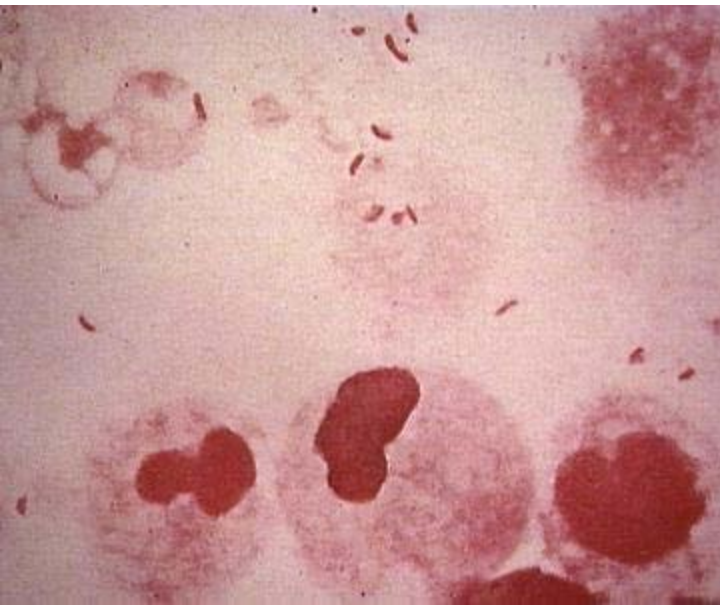
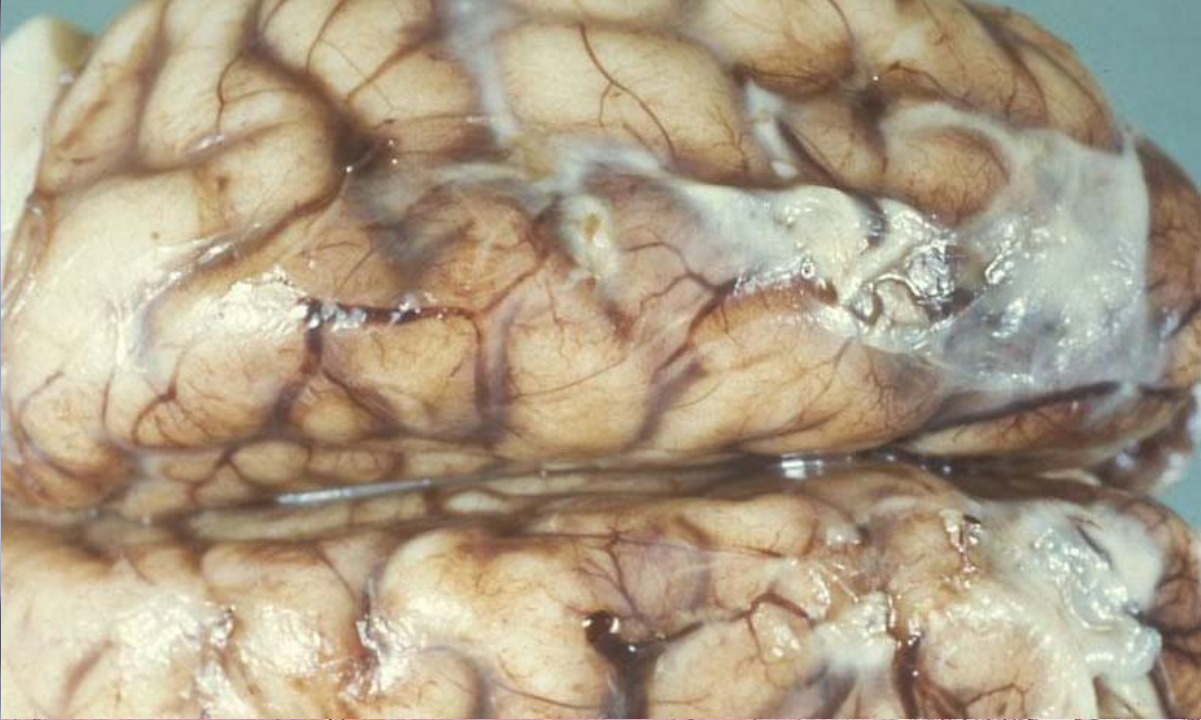
STREPTOCOCCUS

- The classic LOBAR pneumonia
- Normal flora in 20% of adults
- Only 20% of victims have + blood cultures
- “Penicillins” are often 100% curative
- Vaccines are often 100% preventive



HAEMOPHILUS PNEUMONIA

- Commonest in **CHILDREN <2**, with otitis, URI, meningitis, cellulitis, osteomyelitis
- **PNEUMONIAS** in **CHILDREN <2** are often thought of as being H Flu until proven otherwise, otitis, meningitis too
- Most common pneumonia from **COPD** in adults
- **BACTRIM** (Trimethoprim-Sulfa) most common treatment



MORAXELLA CATARRHALIS

- 2nd most common COPD pneumonia, after haemophilus
- Gram NEGATIVE coccobacillus

STAPH aureus

- **Most common pneumonia following viral pneumonias**
- **M.R.S.A., of course, is usually NOT “community” acquired**

KLEBSIELLA PNEUMONIAE

- DEBILITATED
MALNOURISHED PEOPLE
- **ALCOHOLICS** with pneumonia are often thought of as having Klebsiella until proven otherwise

PSEUDOMONAS Aeruginosa

- **Usually NOT community acquired but nosocomial**
- **CYSTIC FIBROSIS patients with pneumonia are presumed to have PSEUDOMONAS until proven otherwise**

LEGIONELLA (pneumophila)

- **Often in OUTBREAKS**
- **Often LOBAR**
- **Spread by water “droplets”**
- **Often immunosuppressed patients,
but remember.....**

Although pneumonia is one of the most common causes of death, it usually does **NOT occur in healthy people spontaneously**

MORPHOLOGY

- ACUTE
- ORGANIZING
- CHRONIC
- FIBROSIS vs. FULL RESOLUTION

- “HEPATIZATION”, RED vs. GREY
- CONSOLIDATION
- “INFILTRATE”, XRAY vs. HISTOPATH
- Loss of “CREPITANCE”

Classifications of PNEUMONIAS

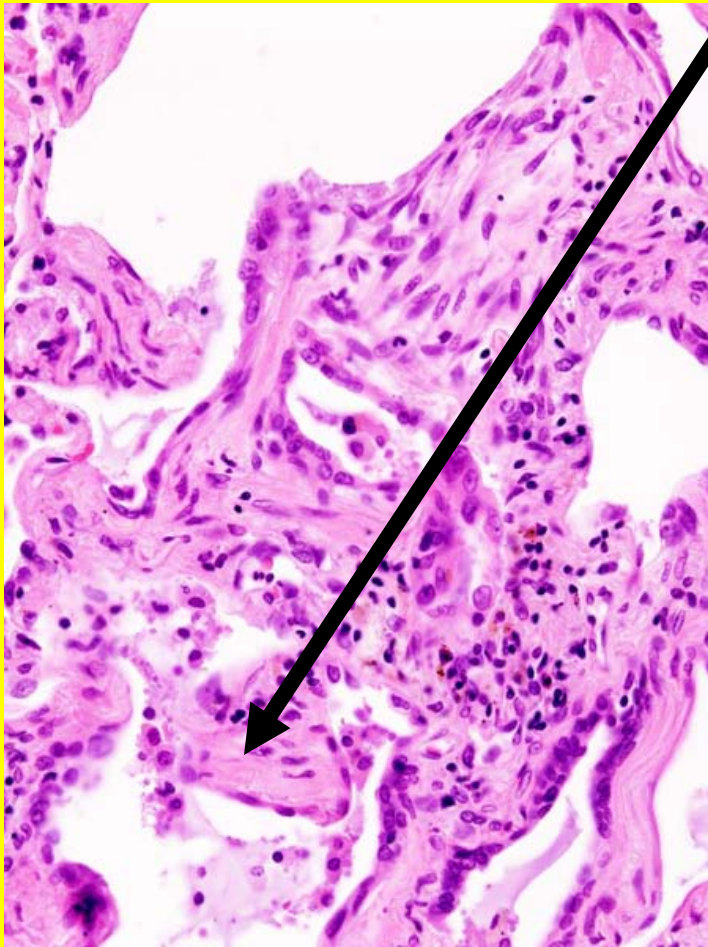
- COMMUNITY ACQUIRED
- **COMMUNITY ACQUIRED,
ATYPICAL**
- NOSOCOMIAL
- ASPIRATION
- CHRONIC
- NECROTIZING/ABSCESS FORMATION
- PNEUMONIAS in IMMUNOCOMPROMISED HOSTS

COMMUNITY ACQUIRED, (atypical)

- **VIRAL (INFLUENZA)**
- **MYCOPLASMAL (MYCOPLASMA PNEUMONIAE (obligate intracellular))**
- **NOT BACTERIAL**
- **CULTURES NOT HELPFUL**

VIRAL PNEUMONIAS

- Frequently “interstitial”, NOT alveolar



INFLUENZA VIRUS

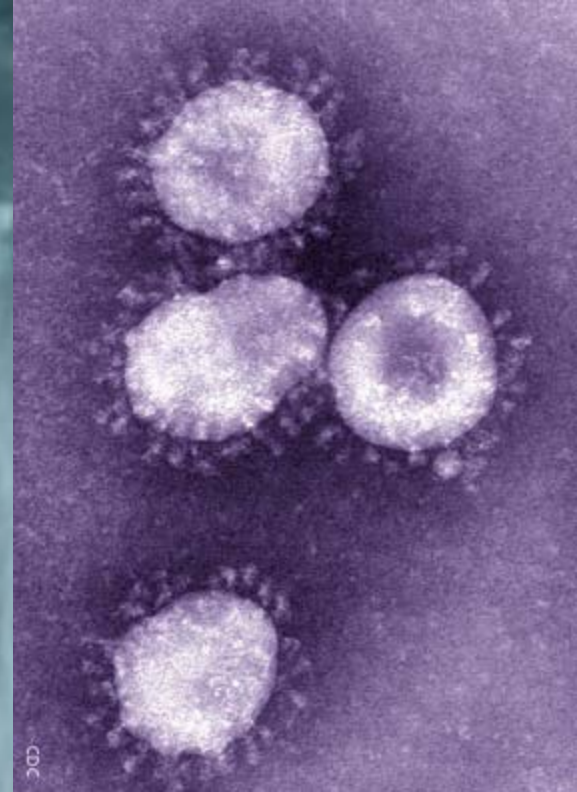
- **A,B,C**
- **1915, 1918, PAN-demics, type A**
- **Has MUTATED throughout history, many STRAINS, avian swine, etc.**
- **B and C in children**
- **Exact strains can be ID's by PCR**



SARS

(Severe Acute Respiratory Syndrome)

- **CORONA-VIRUS**
- **2002 China outbreak**
- **Spread CHIEFLY in Asia**
- **Like most other NON-bacterial pneumonias confirmed by PCR**
- **Like most viral pneumonias, interstitium infiltrated, some giant cells often present**



**S
A
R
S**

Classifications of PNEUMONIAS

- COMMUNITY ACQUIRED
- COMMUNITY ACQUIRED, ATYPICAL
- **NOSOCOMIAL**
- ASPIRATION
- CHRONIC
- NECROTIZING/ABSCESS FORMATION
- PNEUMONIAS in
IMMUNOCOMPROMISED HOSTS

NOSOCOMIAL

- Acquired in HOSPITALS, also called “hospital acquired”, versus “community acquired” pneumonias.
 - DEBILITATION
 - CATHETERS, VENTILATORS
 - ENTEROBACTER, PSEUDOMONAS
 - STAPH (MRSA)
 - **MRSA (MR=Methicillin Resistant)**
- OTHER Common causes of Noso. Pneum.
 - P. aeruginosa
 - Klebsiella
 - E. coli
 - S. pneumoniae
 - H. influenzae

Classifications of PNEUMONIAS

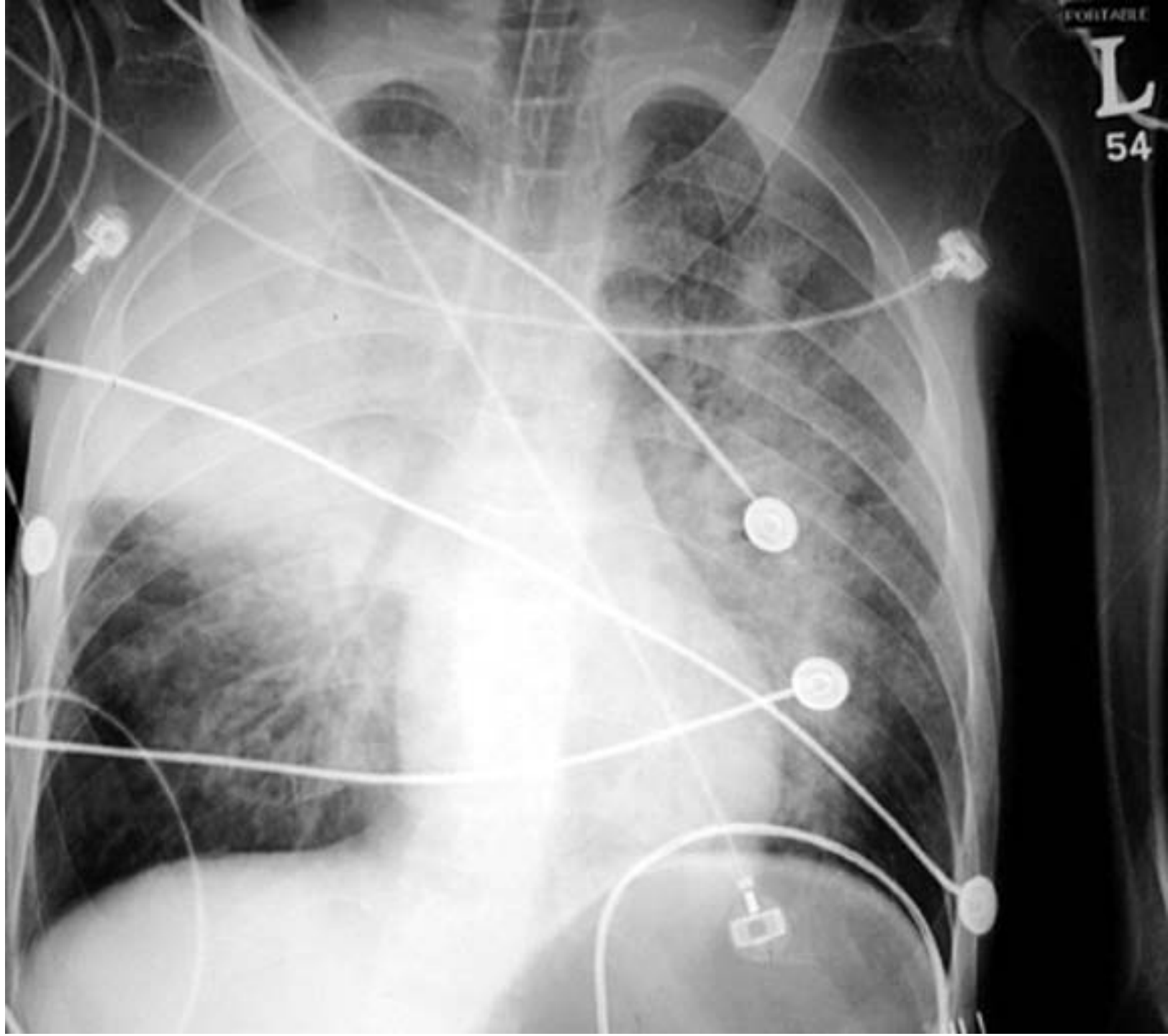
- COMMUNITY ACQUIRED
- COMMUNITY ACQUIRED, ATYPICAL
- NOSOCOMIAL
- **ASPIRATION**
- CHRONIC (often granulomatous)
- NECROTIZING/ABSCESS FORMATION
- PNEUMONIAS in
IMMUNOCOMPROMISED HOSTS

ASPIRATION PNEUMONIAS

- UNCONSCIOUS PATIENTS
- PATIENTS IN PROLONGED BEDREST
- LACK OF ABILITY TO SWALLOW OR GAG
- USUALLY CAUSED BY **ASPIRATION OF GASTRIC CONTENTS**
- **POSTERIOR LOBES** (gravity dependent) MOST COMMONLY INVOLVED, ESPECIALLY THE **SUPERIOR SEGMENTS** of the **LOWER LOBES**
- Often lead to **ABSCESSSES**

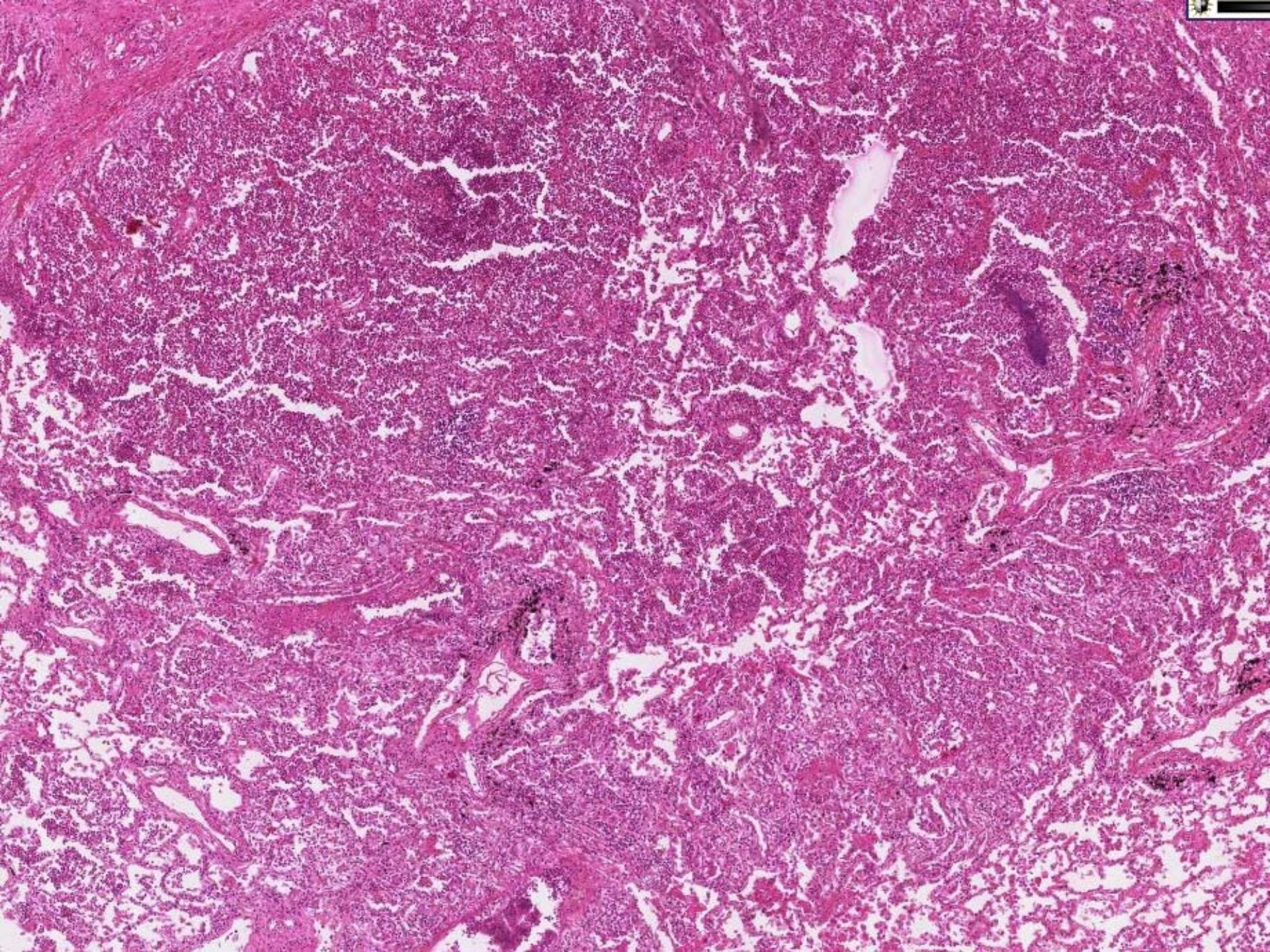
PORTABLE

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54



LUNG ABSCESSSES

- **ASPIRATION**
- **SEPTIC EMBOLIZATION**
- **NEOPLASIA**
- **From NEIGHBORING structures:**
 - **ESOPHAGUS**
 - **SPINE**
 - **PLEURA**
 - **DIAPHRAGM**
- **ANY pneumonia** which is severe and destructive, and UN-treated enough



Classifications of PNEUMONIAS

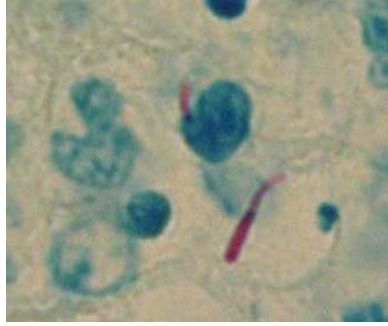
- COMMUNITY ACQUIRED
- COMMUNITY ACQUIRED, ATYPICAL
- NOSOCOMIAL
- ASPIRATION
- **CHRONIC**
- NECROTIZING/ABSCESS FORMATION
- PNEUMONIAS in
IMMUNOCOMPROMISED HOSTS

CHRONIC Pneumonias

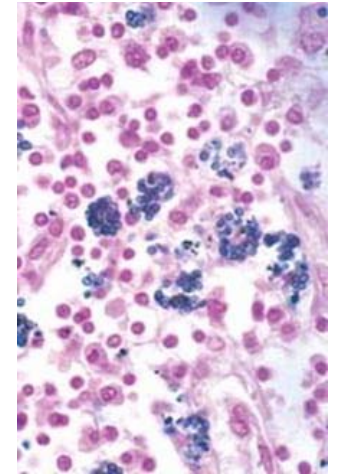
- USUALLY NOT persistences of the community or nosocomial bacterial infections, but CAN BE, at least histologically
- Often SYNONYMOUS with the 4 classic fungal or **granulomatous** pulmonary infections, i.e., TB, Histo-, Blasto-, Coccidio-
- If you see pulmonary granulomas, think of a CHRONIC process, often years

CHRONIC Pneumonias

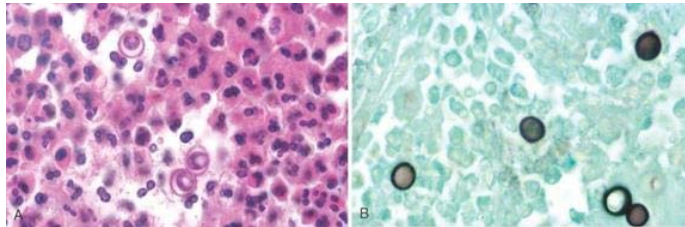
- TB



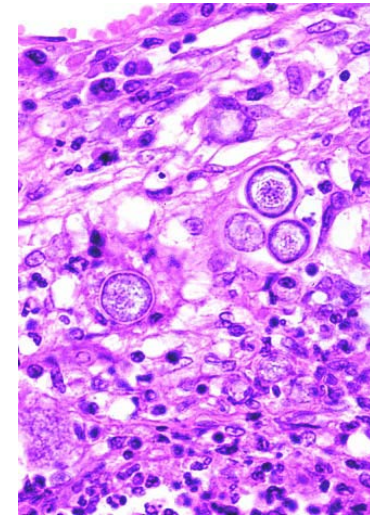
- HISTO-PLASMOSIS



- BLASTO-MYCOSIS

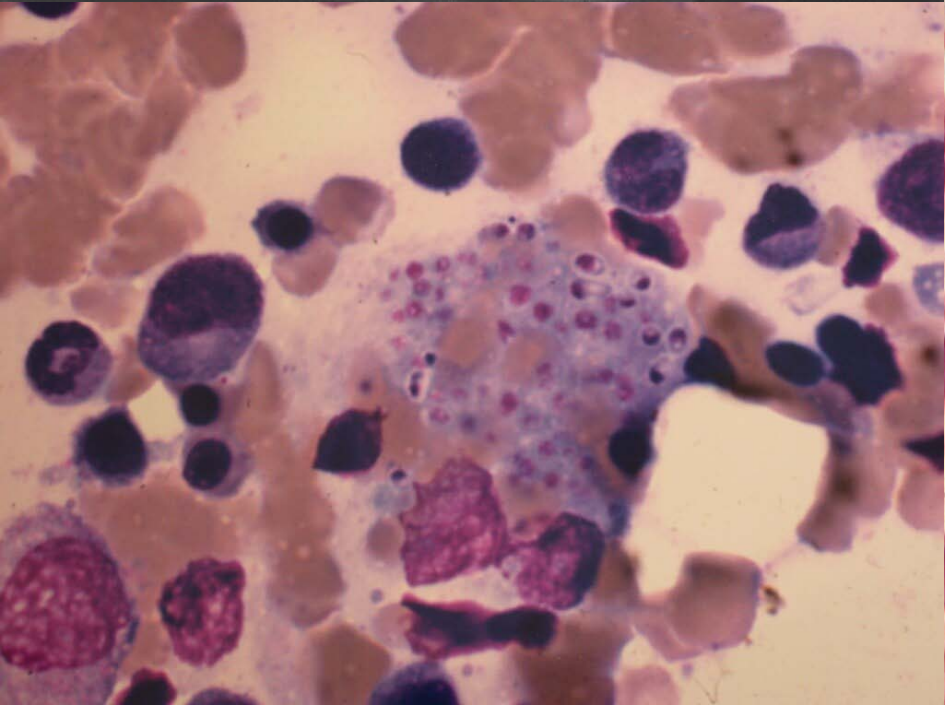
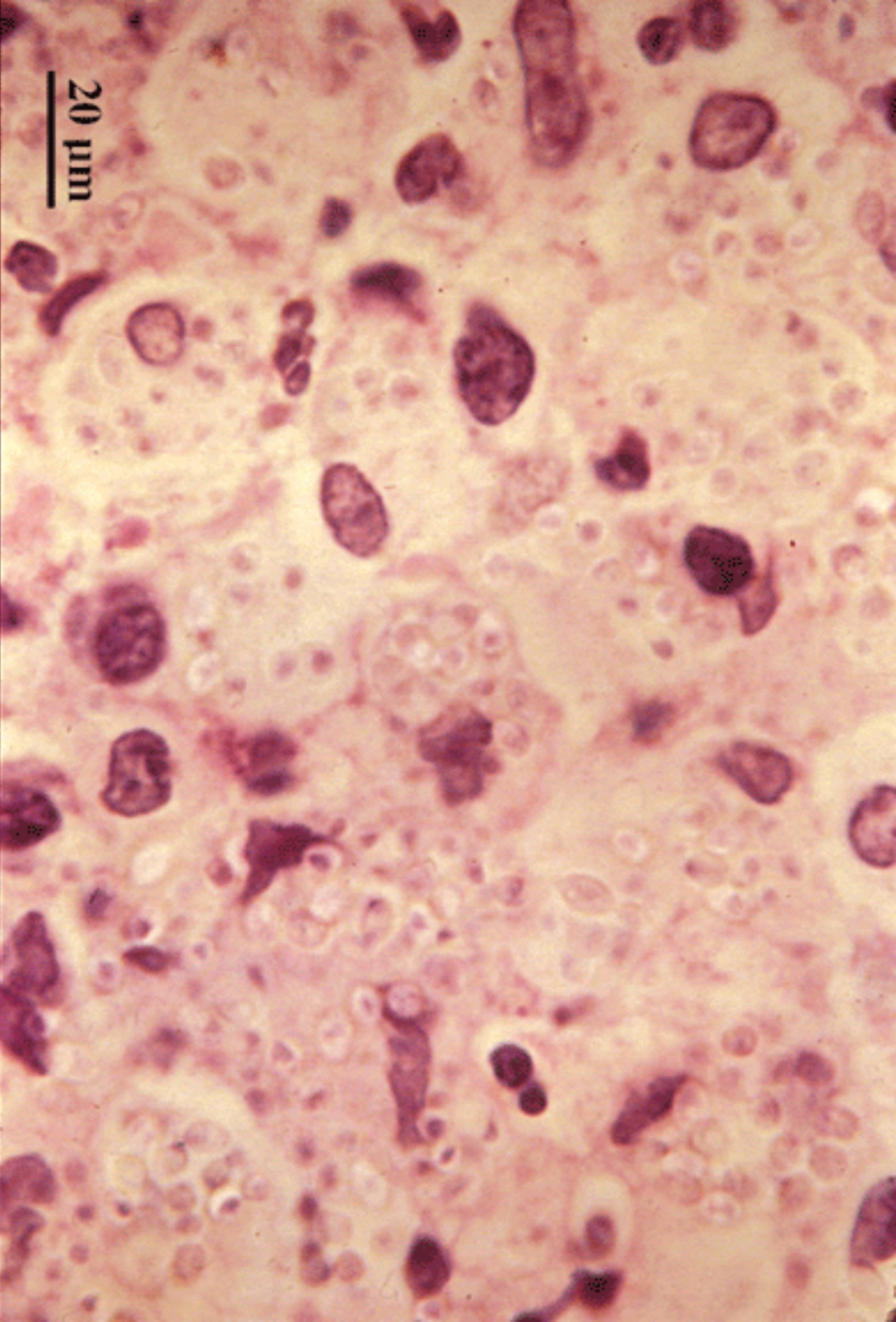


- COCCIDIO-MYCOSIS



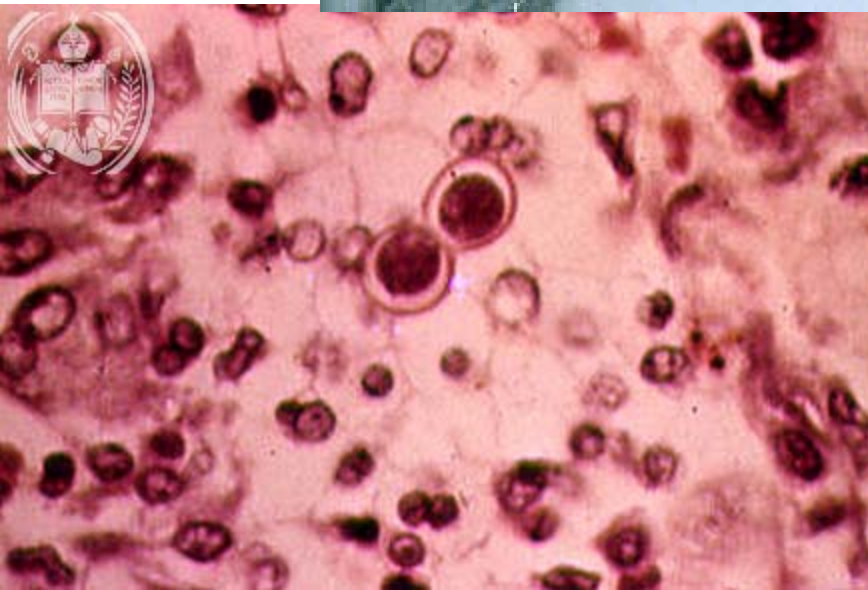
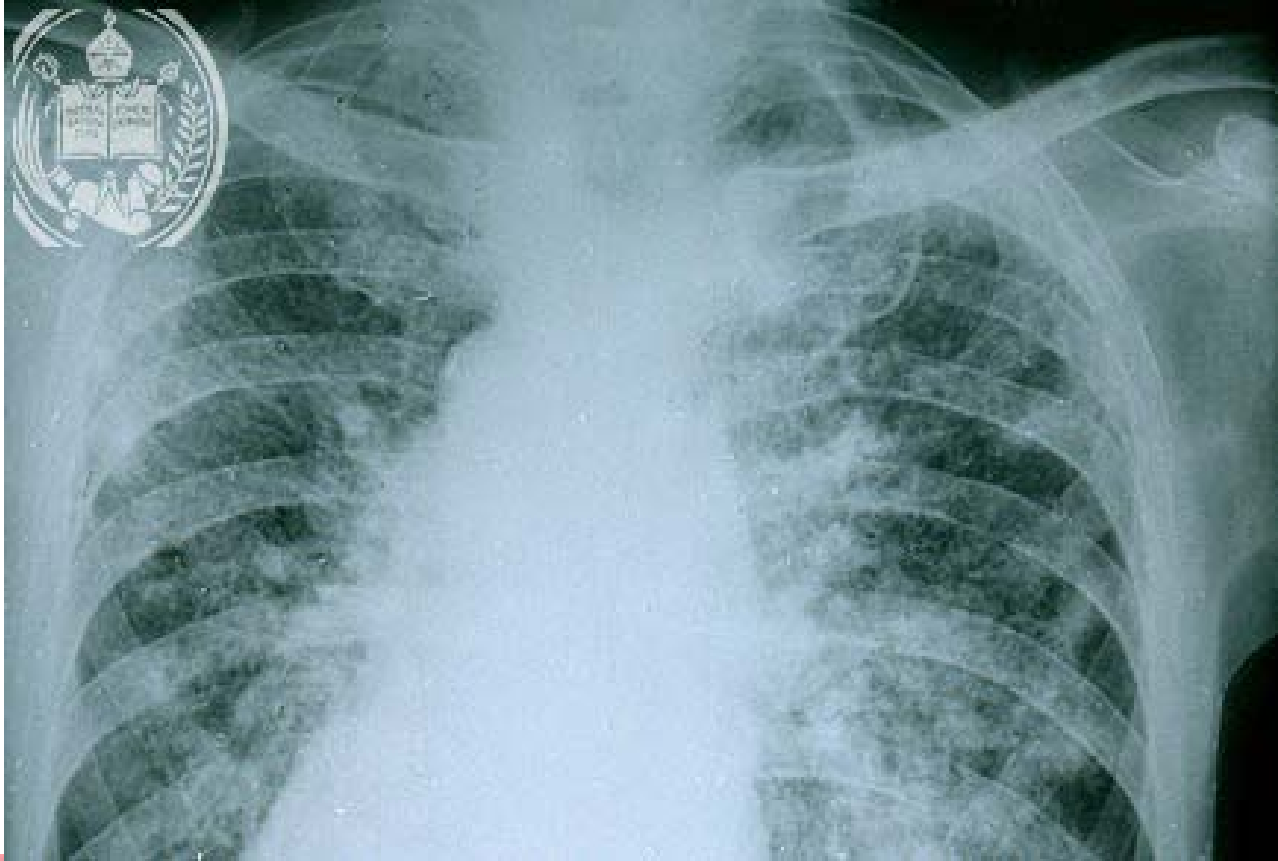
HISTOPLASMOSIS

- Spores in bird or bat droppings
- Mimics TB
- Histoplasma CAPSULATUM
- Pulmonary granulomas, often large and calcified
- Tiny organisms live in macrophages
- Ohio, Mississippi valley
- MANY other organs can be affected



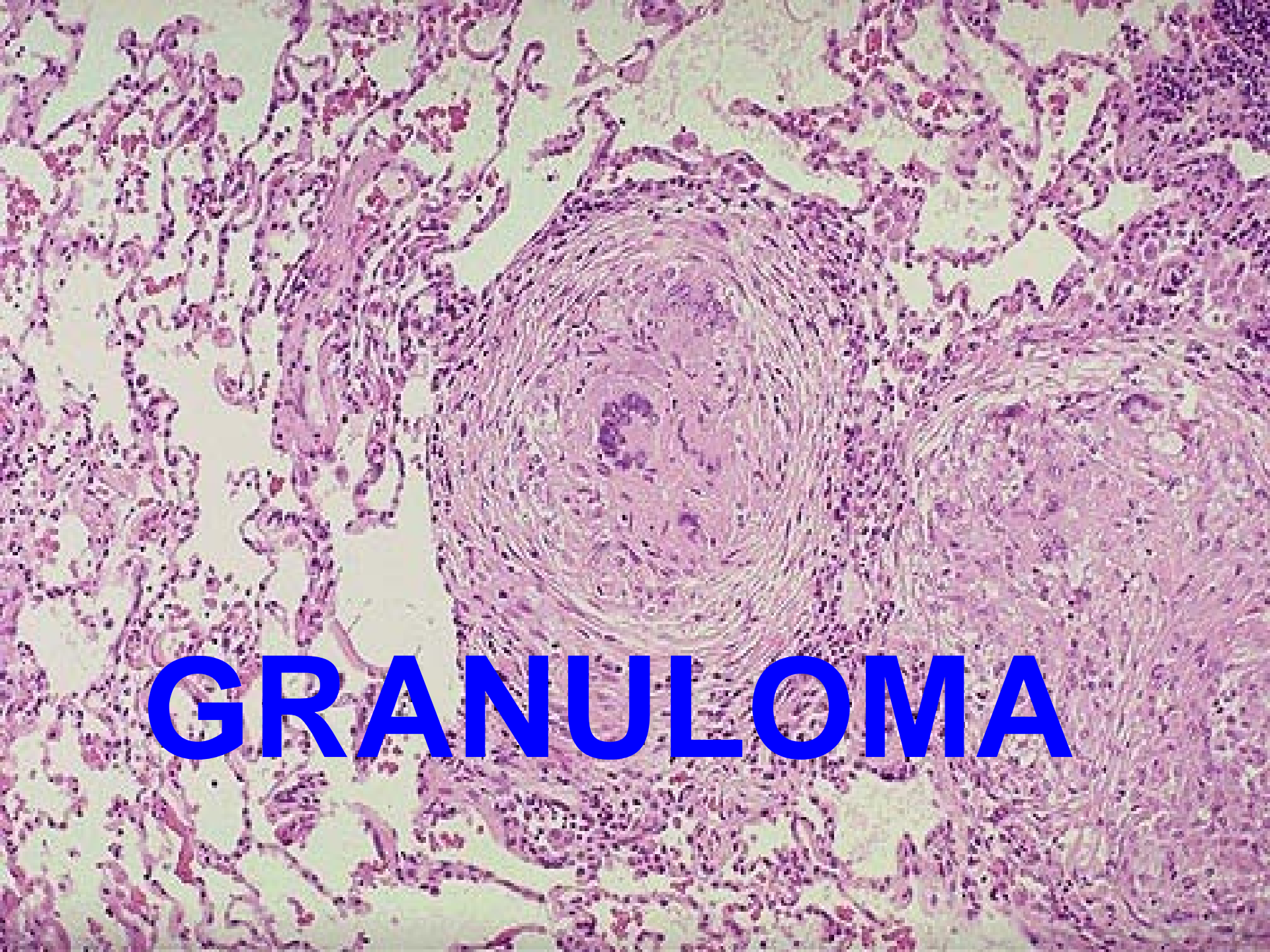
BLASTOMYCOSIS

- Spores in soil
- Mimics TB, like ALL the granulomatous lung diseases do.
- Blastomyces DERMATIDIS
- Pulmonary granulomas, often large and calcified
- Large distinct SPHERULES
- Ohio, Mississippi valley, Great Lakes, WORLDWIDE
- MANY other organs can be affected, especially SKIN



COCCIDIOMYCOSIS

- Spores in **soil**
- Mimics TB
- *Coccidioides IMMITIS*
- Pulmonary granulomas, often large and calcified
- Tiny organisms live in macrophages
- American **SOUTHWEST**
- **MANY** other organs can be affected

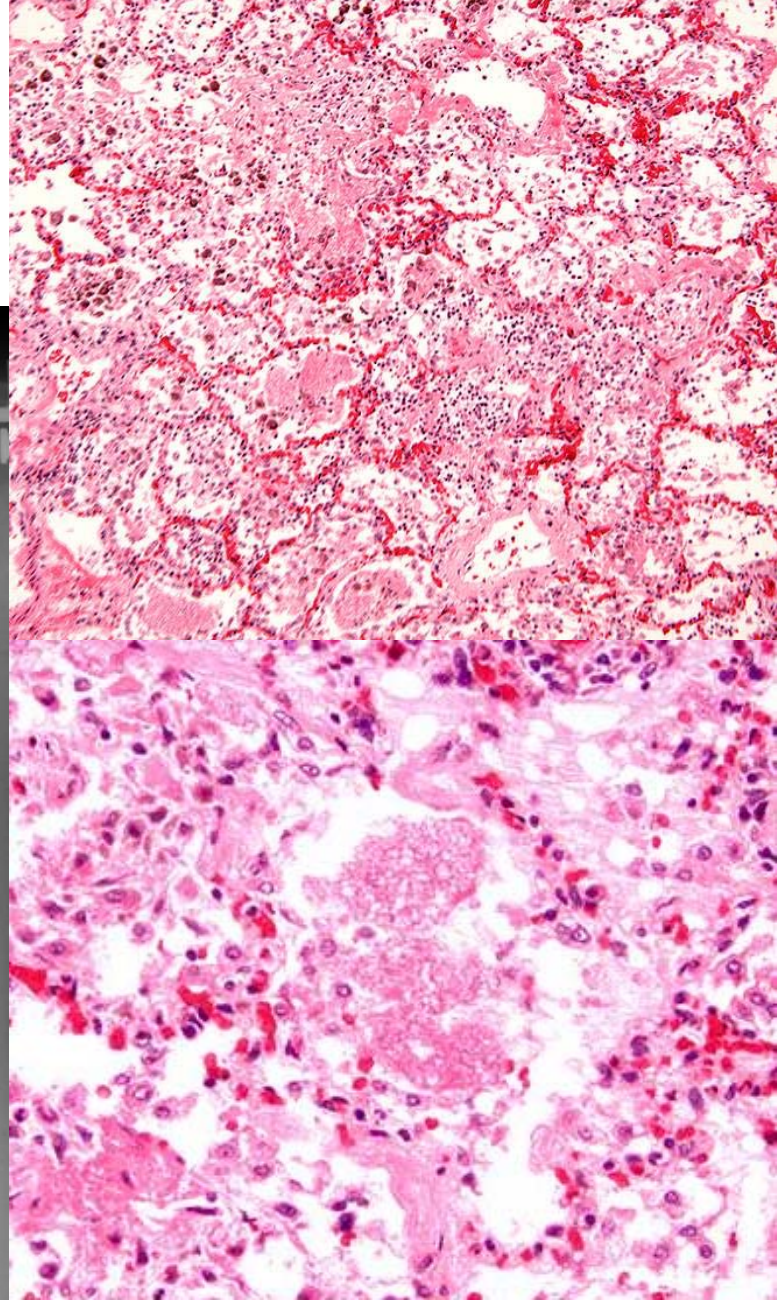
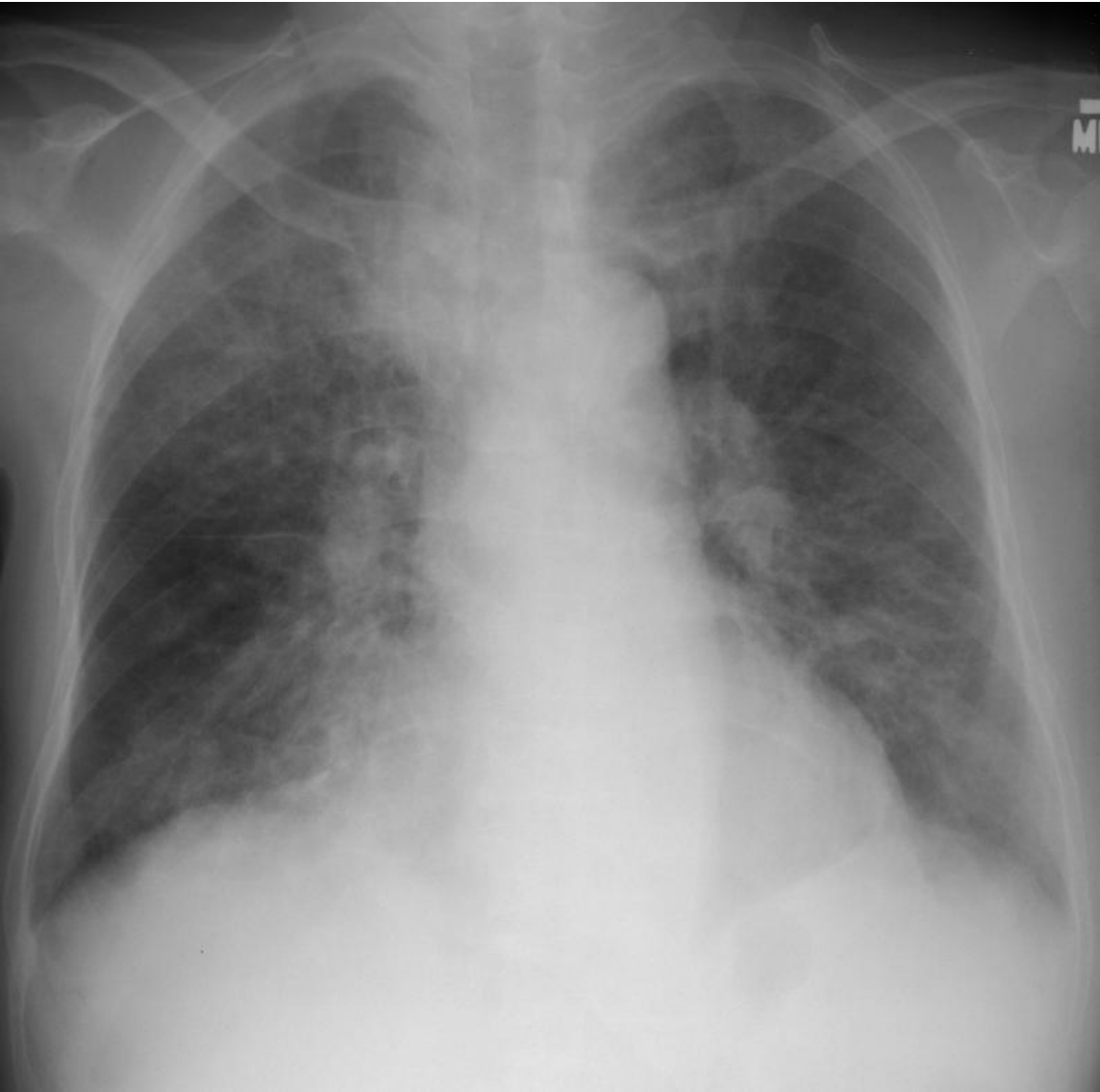


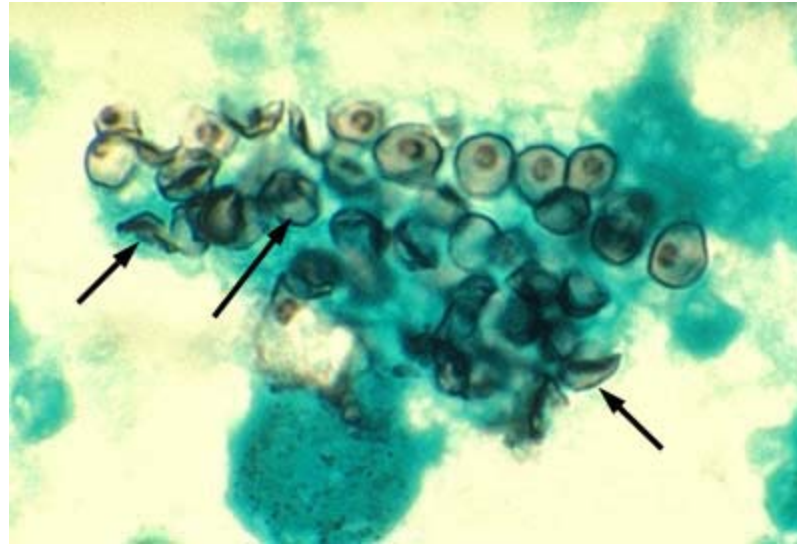
GRANULOMA

COMPROMISED HOSTS

- PNEUMOCYSTIS CARINII
- CYTOMEGALOVIRUS (CMV)
- FUNGI

PCP





**Methenamine SILVER
stain for
Pneumocystis Carinii**

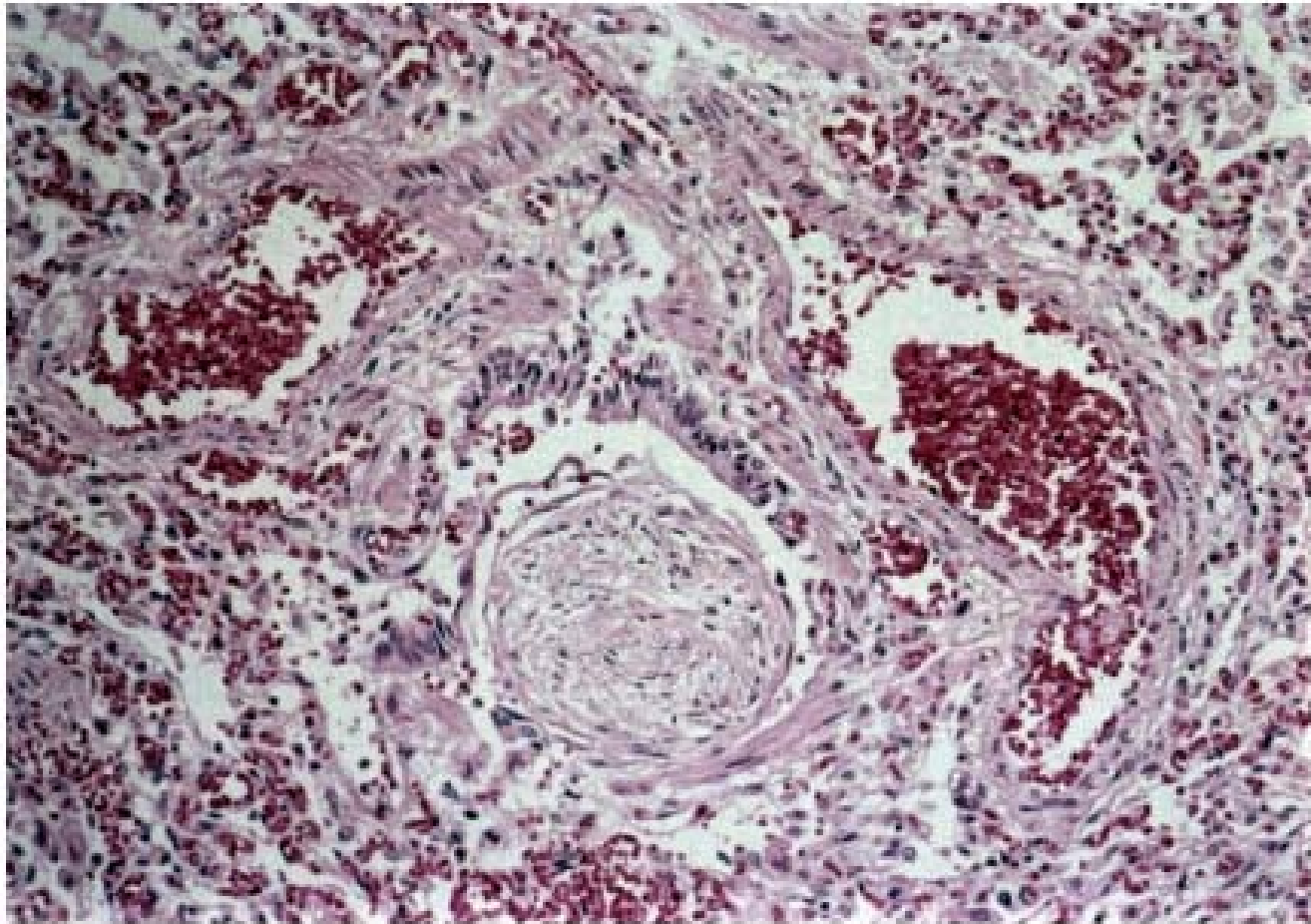
LUNG TRANSPLANTATION

Any end-stage lung disease in which the patient can tolerate long term immunosuppression, and often just ONE lung is enough, donors very SCARCE!

- EMPHYSEMA
- Pulmonary Fibrosis
- Cystic Fibrosis
- Pulmonary Hypertension

Lung Transplant Pathology

- **Infections** (immunocompromised patients)
 - Bacterial
 - Viral (CMV)
 - Fungal
 - PCP
- **ACUTE** rejection, pneumonias, usually weeks to months
- **CHRONIC** rejection, HALF of all patients by 3-5 years, “bronchiolitis obliterans”



LUNG TUMORS

- Benign, malignant, epithelial, mesenchymal, but 90% are CARCINOMAS
- BIGGEST USA killer. Why? Ans: Prevalence not as high as prostate or breast but mortality higher. Only **15%** 5 year survival.
- **TOBACCO** has polycyclic aromatic hydrocarbons, such as benzopyrene, anthracenes, radioactive isotopes
- Radiation, asbestos, radon
- C-MYC, K-RAS, EGFR, HER-2/neu

PATHOGENESIS

- **NORMAL BRONCHIAL MUCOSA**
- **METAPLASTIC/DYSPLASTIC MUCOSA**
- **CARCINOMA-IN-SITU (squamous, adeno)**
- **INFILTRATING (i.e., “INVASIVE”) cancer**

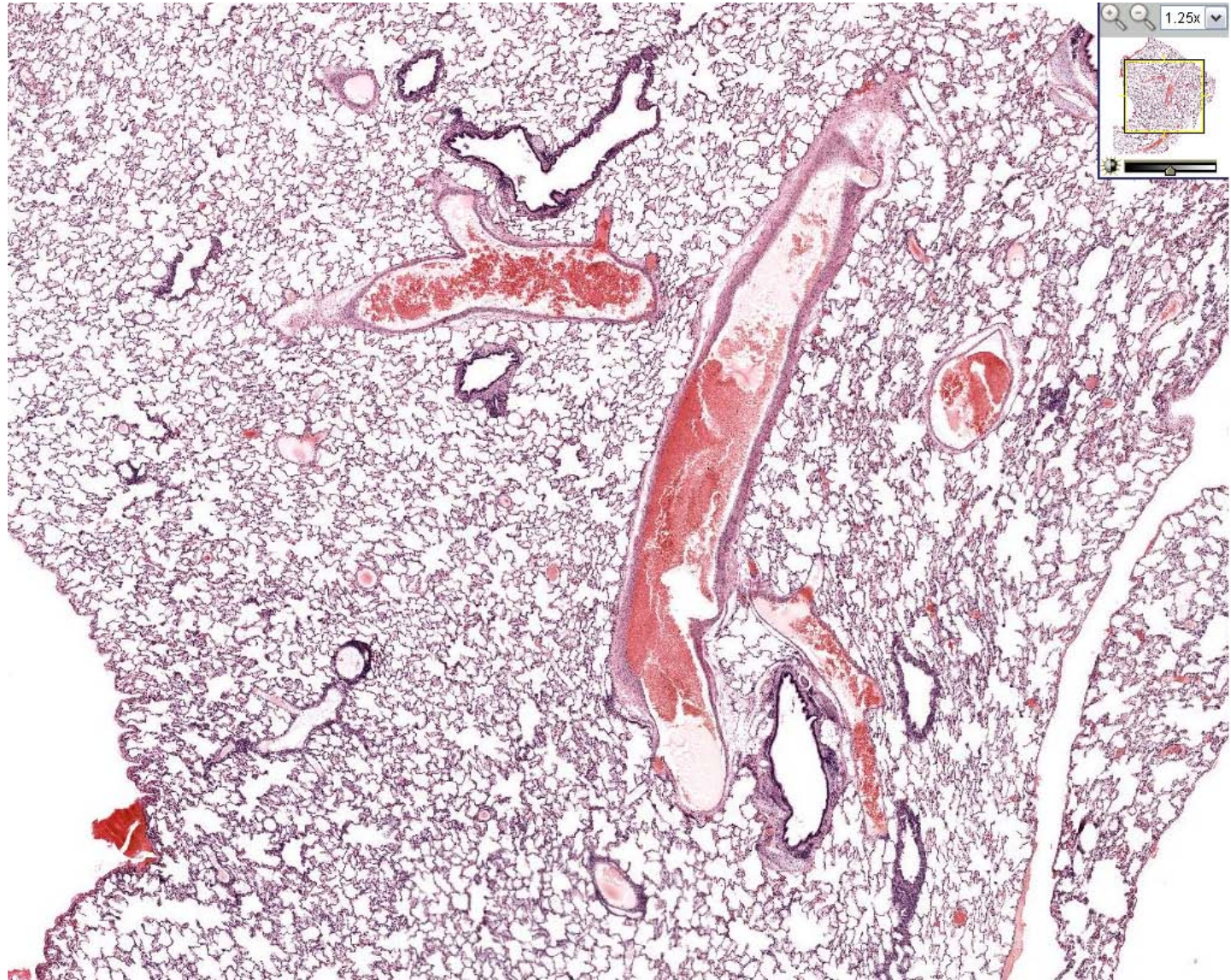
TWO TYPES

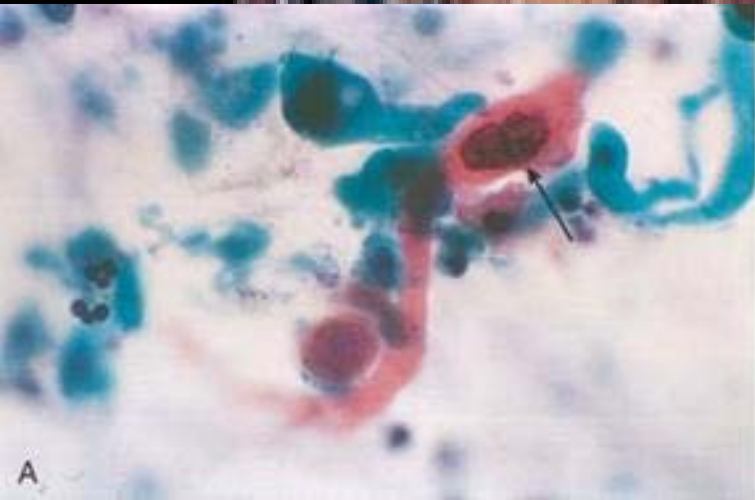
- **NON-SMALL CELL**
 - SQUAMOUS CELL CARCINOMA
 - ADENOCARCINOMA
 - LARGE CELL CARCINOMA
- **SMALL CELL CARCINOMA**

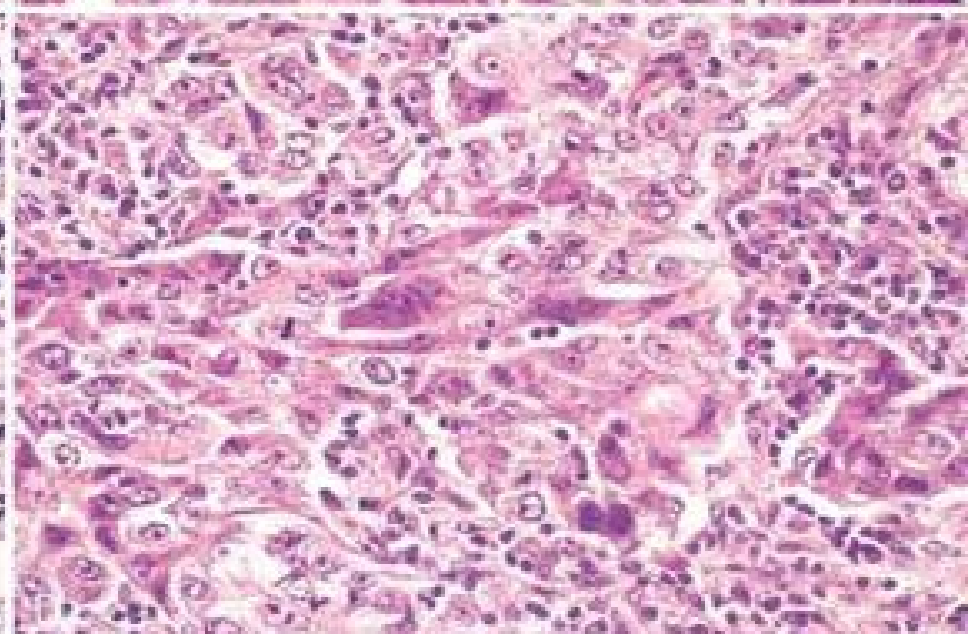
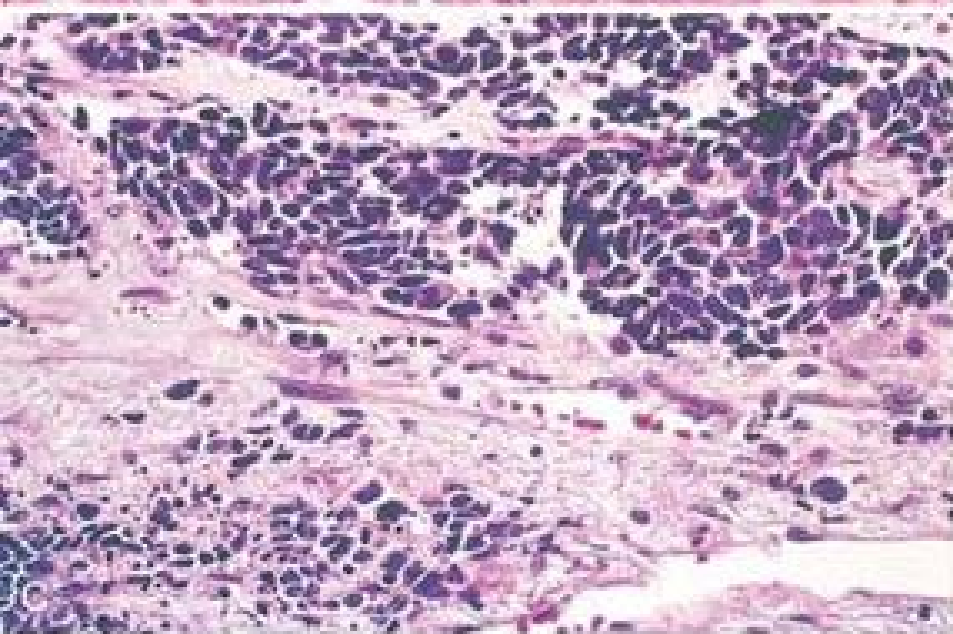
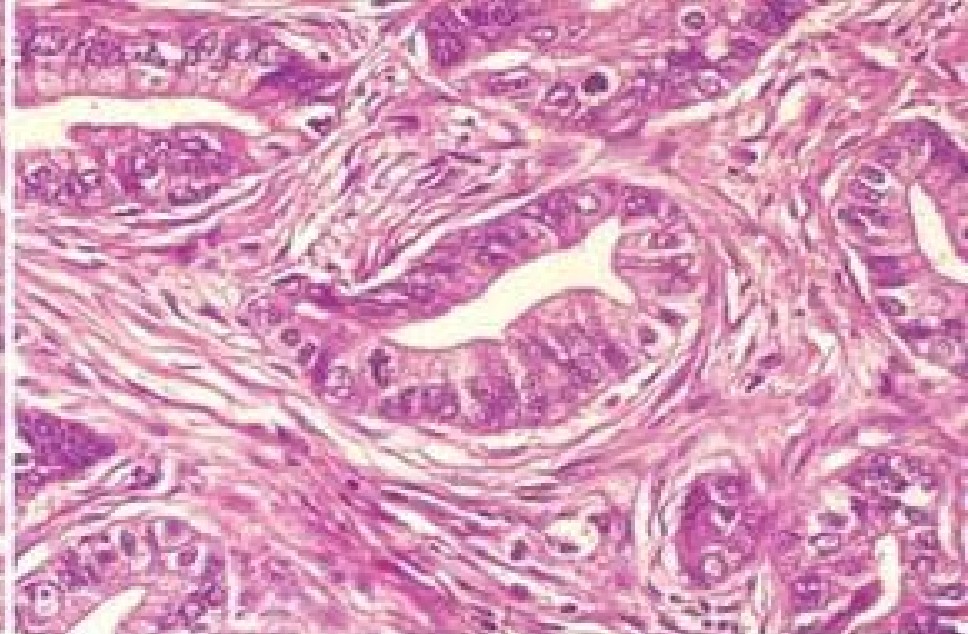
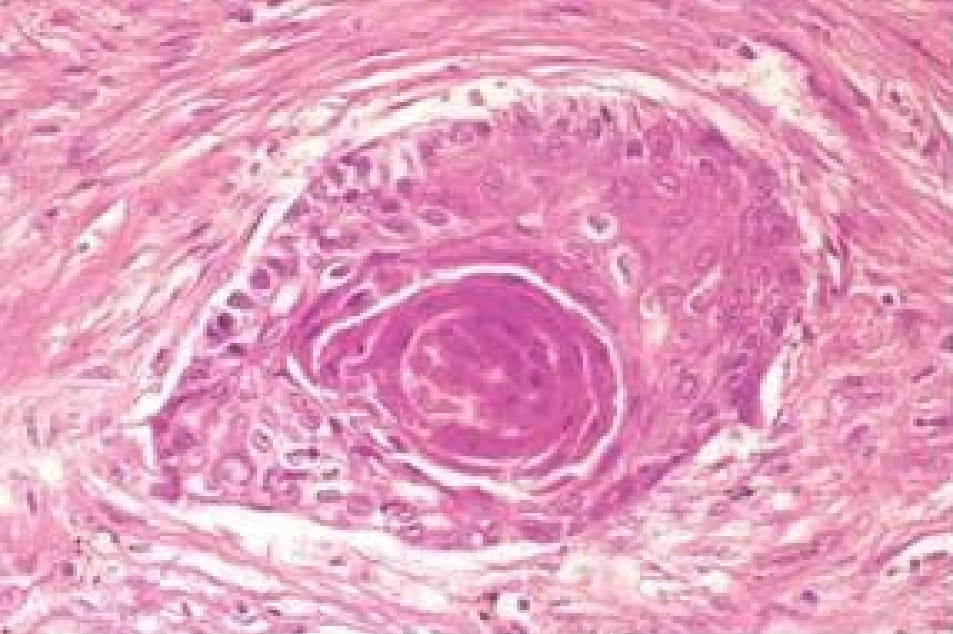
The BIG list

- Squamous cell carcinoma
- Small cell carcinoma
- Combined small cell carcinoma
- Adenocarcinoma: Acinar, papillary, bronchioloalveolar, solid, mixed subtypes
- Large cell carcinoma
- Large cell neuroendocrine carcinoma
- Adenosquamous carcinoma
- Carcinomas with pleomorphic, sarcomatoid, or sarcomatous elements
- Carcinoid tumor: Typical, atypical
- Carcinomas of salivary gland type
- Unclassified carcinoma

OTHER TUMORS







TNM, Lung

- T1** Tumor <3 cm without pleural or main stem bronchus involvement
- T2** Tumor >3 cm or involvement of main stem bronchus 2 cm from carina, visceral pleural involvement, or lobar atelectasis
- T3** Tumor with involvement of chest wall (including superior sulcus tumors), diaphragm, mediastinal pleura, pericardium, main stem bronchus 2 cm from carina, or entire lung atelectasis
- T4** Tumor with invasion of mediastinum, heart, great vessels, trachea, esophagus, vertebral body, or carina or with a malignant pleural effusion
- N0** No demonstrable metastasis to regional lymph nodes
- N1** Ipsilateral hilar or peribronchial nodal involvement
- N2** Metastasis to ipsilateral mediastinal or subcarinal lymph nodes
- N3** Metastasis to contralateral mediastinal or hilar lymph nodes, ipsilateral or contralateral scalene, or supraclavicular lymph nodes
- M0** No (known) distant metastasis
- M1** Distant metastasis present

LOCAL effects of LUNG CANCER

Clinical Feature	Pathologic Basis
Pneumonia, abscess, lobar collapse	Tumor obstruction of airway
Lipid pneumonia	Tumor obstruction; accumulation of cellular lipid in foamy macrophages
Pleural effusion	Tumor spread into pleura
Hoarseness	Recurrent laryngeal nerve invasion
Dysphagia	Esophageal invasion
Diaphragm paralysis	Phrenic nerve invasion
Rib destruction	Chest wall invasion
SVC syndrome	SVC compression by tumor
Horner syndrome	Sympathetic ganglia invasion
Pericarditis, tamponade	Pericardial involvement
SVC, superior vena cava.	

SYSTEMIC effects of LUNG CANCER

(PARA-NEOPLASTIC SYNDROMES)~ 5%

ADH (hyponatremia)

ACTH (Cushing)

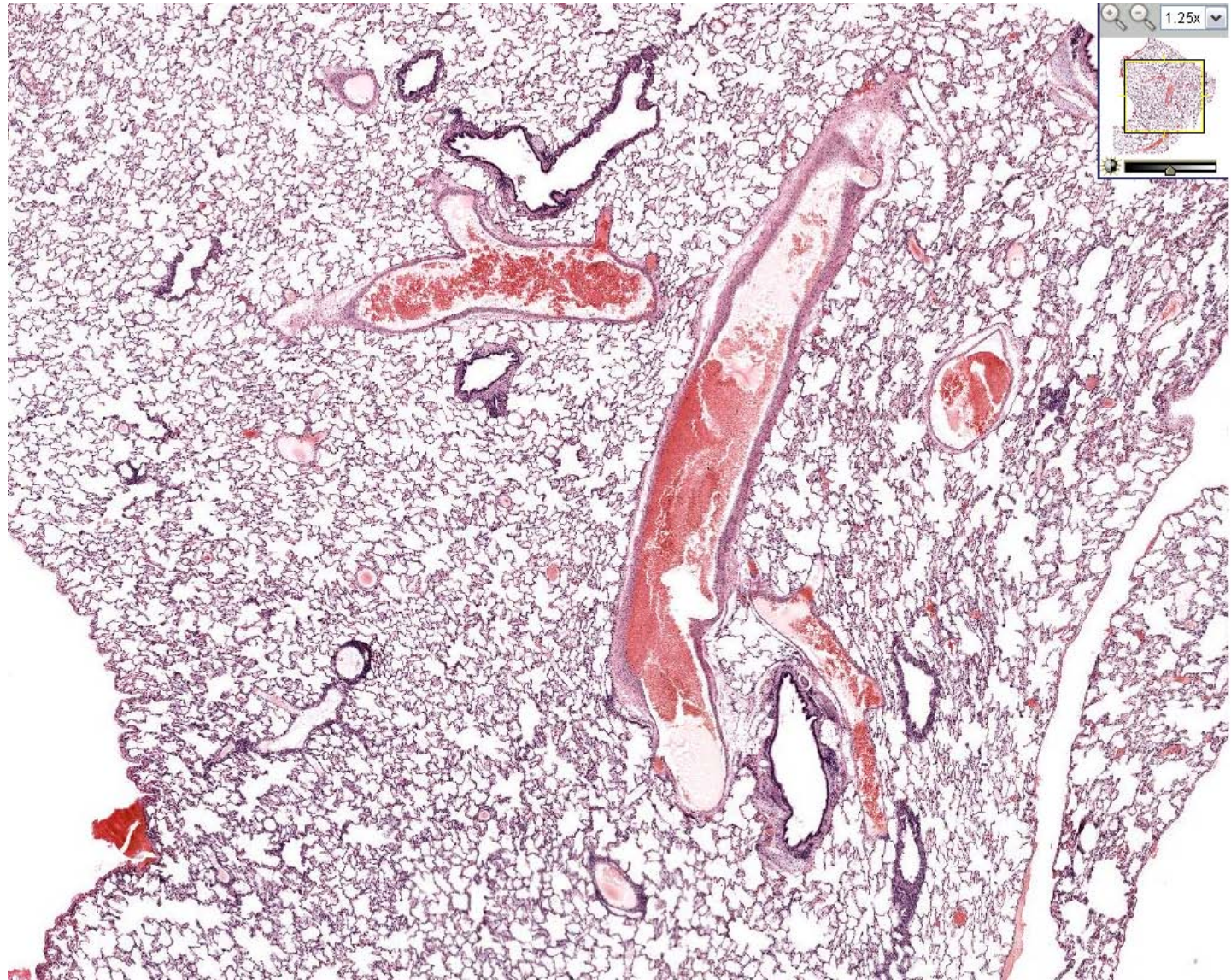
PTH (Hyper-CA)

CALCITONIN (Hypo-CA)

GONADOTROPINS

SEROTONIN/BRADYKININ

OTHER TUMORS



METASTATIC TUMORS

- LUNG is the **MOST COMMON** site for all metastatic tumors, regardless of site of origin
- It is the site of **FIRST CHOICE** for metastatic sarcomas for purely anatomic reasons!

PLEURA

- PLEURITIS
- PNEUMOTHORAX
- EFFUSIONS
 - HYDRO-THORAX (Peric-, Perito-)
 - HEMO-THORAX (Peric-, Perito-)
 - CHYLO-THORAX (Peric-, Perito-)
- MESOTHELIOMAS

PLEURITIS

- Usual bacteria, viruses, etc.
- Infarcts
- Lung abscesses, empyema
- TB
- “Collagen” diseases, e.g., RA, SLE
- Uremia
- Metastatic

PNEUMOTHORAX

- SPONTANEOUS, TRAUMATIC, THERAPEUTIC
- OPEN or CLOSED
- “TENSION” pneumothorax, “valvular” effect
- “Bleb” rupture
- Perforating injuries
- Post needle biopsy

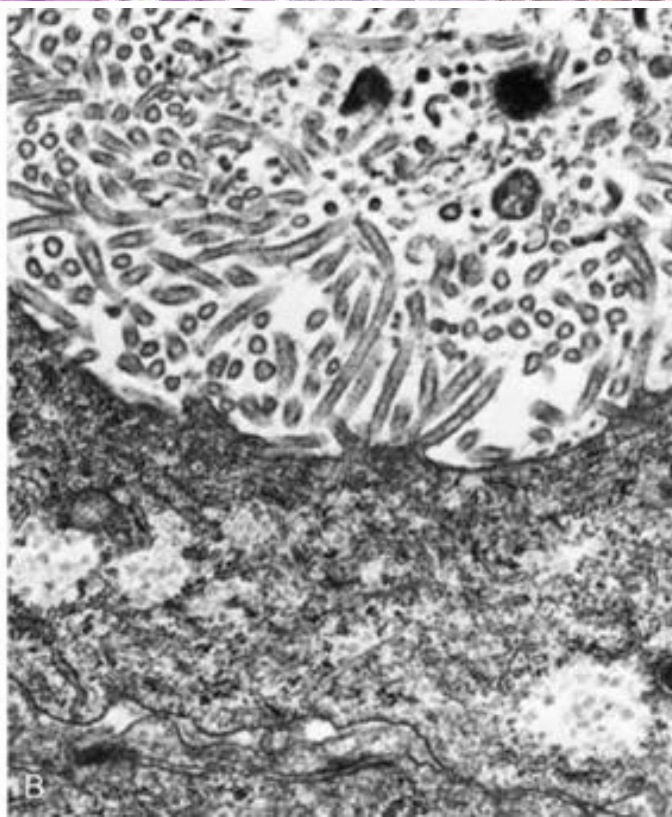
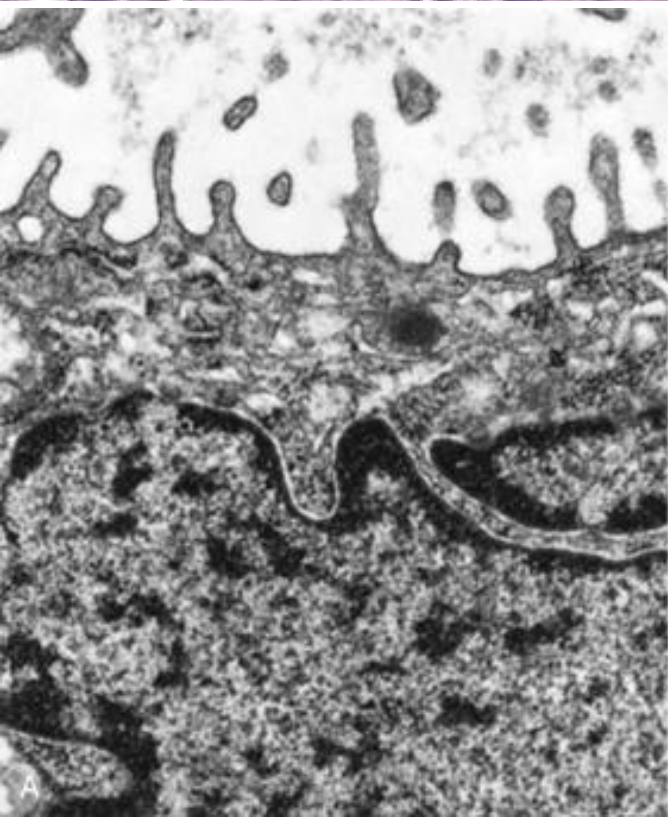
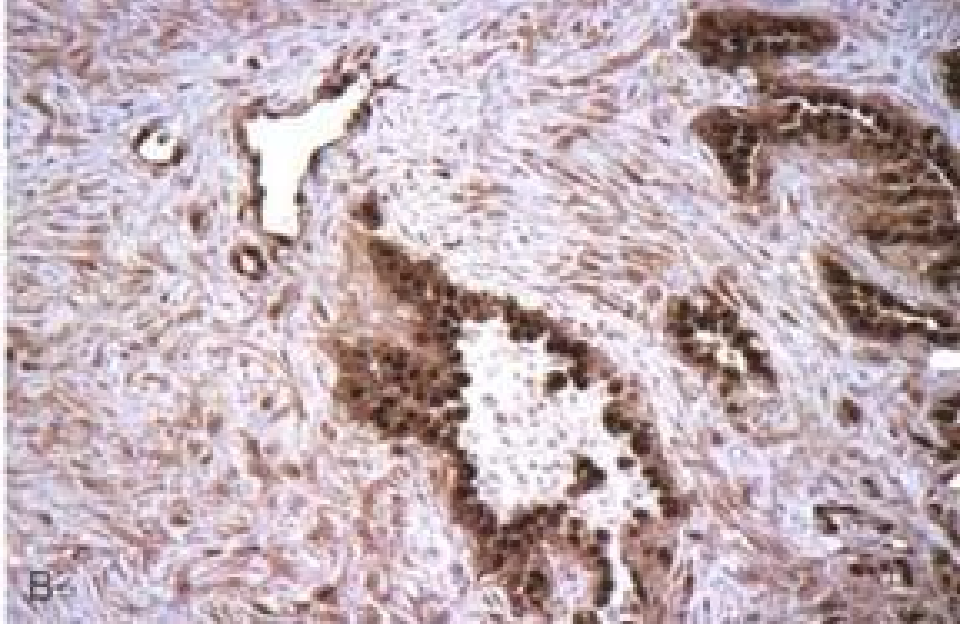
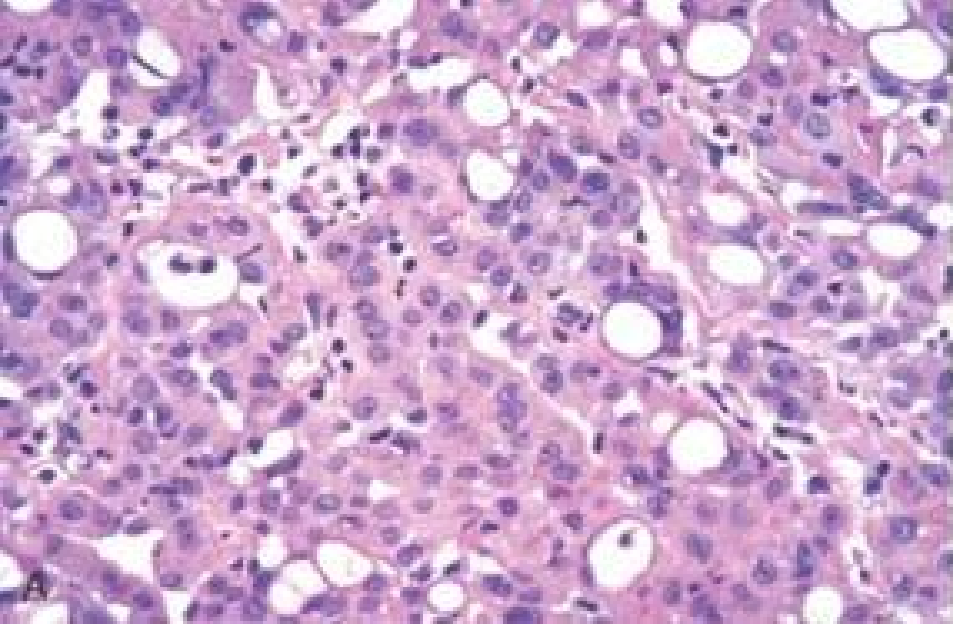
EFFUSIONS

- **TRANSUDATE (HYDROTHORAX)**
- **EXUDATE (HYDROTHORAX)**
- **BLOOD (HEMOTHORAX)**
- **LYMPH (CHYLOTHORAX)**

MESOTHELIOMAS

- **“Benign” vs. “Malignant”**
differentiation does not matter, but a self limited localized nodule can be regarded as benign, and a spreading tumor can be regarded as malignant
- **Visceral or parietal pleura, pericardium, or peritoneum**
- **Most are regarded as asbestos caused or asbestos “related”**





H&E,
IMMUNOCHEMISTRY

← EM