

جامعة  
الملك سعود  
King Saud University



# RESPIRATORY SYSTEM BLOCK

Pathology Practical



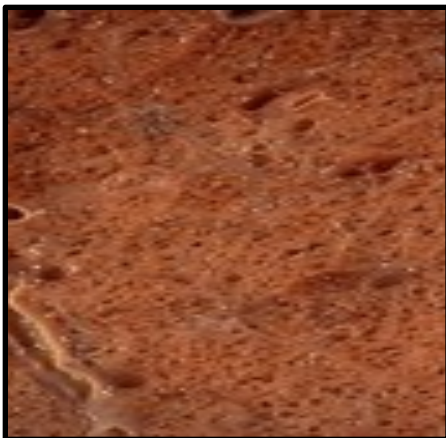
**RESTRICTIVE LUNG DISEASES**  
**ALLERGIC ALVEOLITIS (hypersensitivity pneumonitis )**  
**Case#1**

***Restrictive Lung Disease (Honeycomb lung) Gross***



- 1) Represent 15% of non-infectious diseases of lungs.
- 2) **End-stage:** diffuse interstitial pulmonary fibrosis (Honeycomb lung).
- 3) **Acute:** Acute Respiratory Distress Syndrome
- 4) **Chronic :** Occupational: Asbestosis, silicosis, coal worker pneumoconiosis.
- 5) Interstitial lung disease (interstitial pneumonia), Idiopathic pulmonary fibrosis

***Restrictive Lung Disease (Honeycomb lung) cut section***



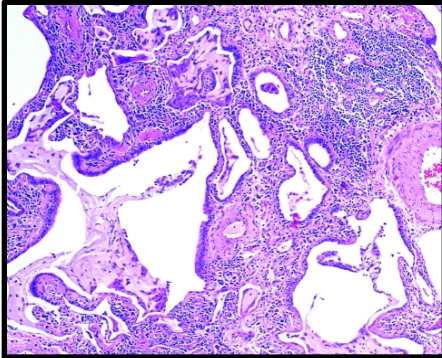
- 1) Honey comb lung
- 2) Cystic fibrosis filled with hemorrhage
- 3) Extensive fibrosis from restrictive lung disease

# Hyper sensitivity pneumonitis

Etiology : allergic reaction to pigeons poop

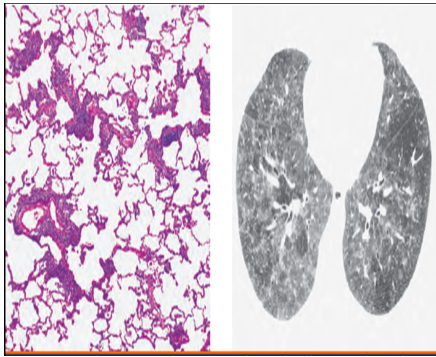
Doctor said you can choose same points for all pictures

## Restrictive Lung Disease (Honeycomb lung) – LPP



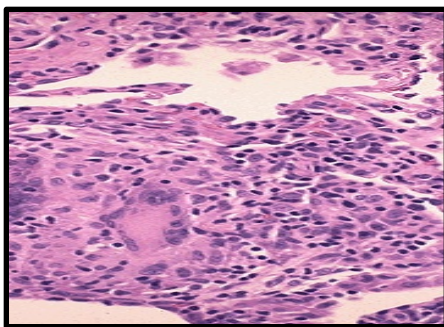
- 1) Pulmonary fibrosis with extensive interstitial collagen deposition .
- 2) Residual airspace dilation.
- 3) Loose granuloma (non caseating)
- 4) Giant cells
- 5) Inflammatory cells infiltration (lymphocytes)
- 6) Fibrosis

## Hypersensitivity Pneumonitis– Histopathology & Radiogram

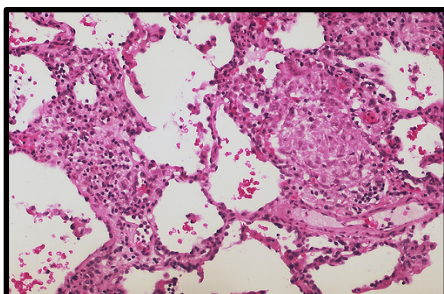


- Extrinsic allergic alveolitis
- Histopathology : shows interstitial inflammation along alveolar ducts (bronchiolocentric distribution ) .The inflammation is diffuse , lacks nodularity.
- Radiologically: a ground-glass pattern

## Hypersensitivity Pneumonitis (HP)



- 1) Lymphocyte , plasma cells and inflammatory cells.
- 2) Interstitial fibrosis .
- 3) Giant cells .
- 4) Histiocytes .
- 5) Macrophages
- 6) Nodules of Fibroblasts



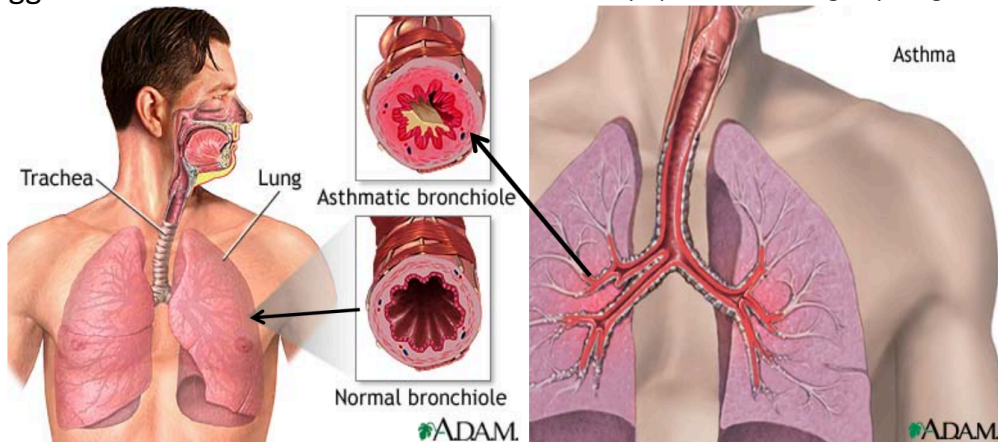
- 1) Lymphocyte , plasma cells and inflammatory cells.
- 2) Interstitial fibrosis .
- 3) Giant cells .
- 4) Histiocytes .
- 5) Macrophages
- 6) Collagen fibers .
- 7) Hyperplasia



## Bronchial Asthma – obstructive lung disease – Case #2

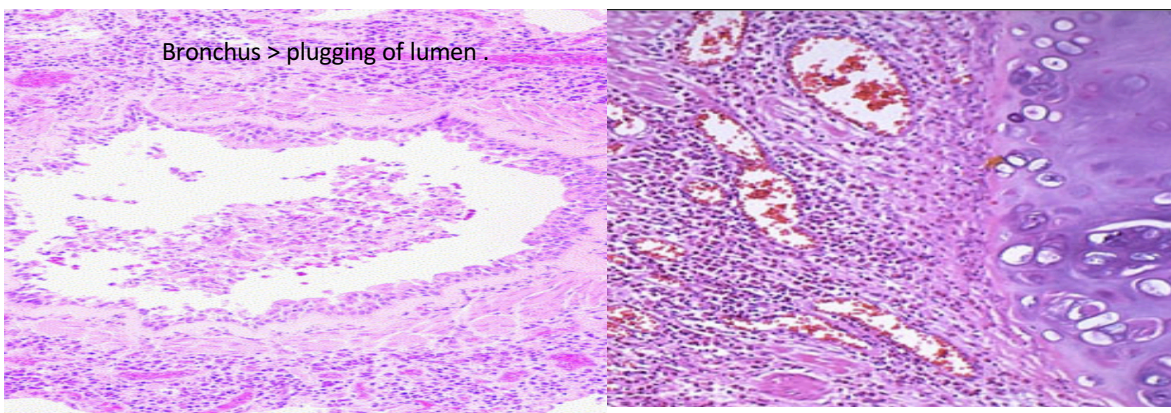
It's a **reversible and chronic inflammatory disorder of bronchial airways** that result in airway **obstruction** in response to external stimuli or triggers.

Clinical symptoms: wheezing, dry cough ,and dyspnea



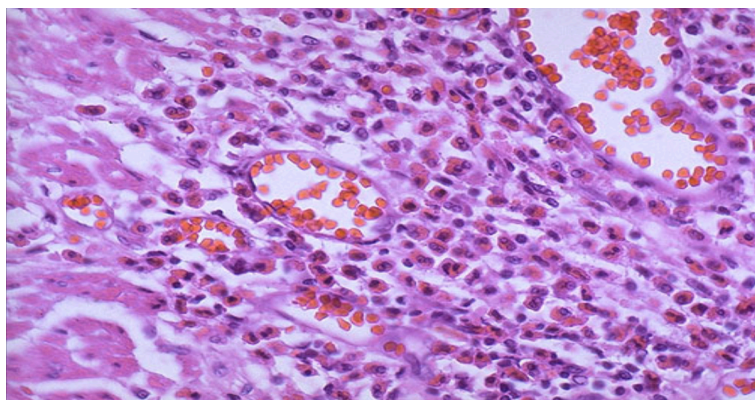
**-Thickened bronchial wall.**

**-Bronchial narrowing and increased mucus secretion.**



Histological features:

- ***Sub-basement membrane fibrosis and thickening.***
- ***Hypertrophy of bronchial glands and smooth muscles.***
- ***intense inflammatory infiltrate by eosinophils***
- ***Increased submucosal vascularity.***

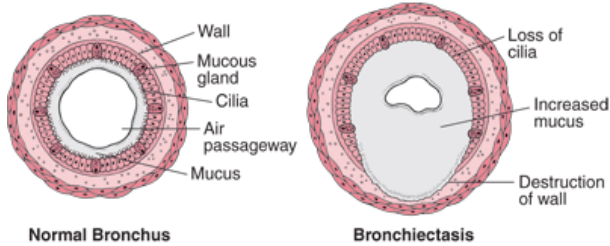


Numerous **eosinophils** are prominent from their bright red cytoplasmic granules.

Several "Needle-like" structures/crystals known as **Charcot Leyden Crystals** can be seen in the sputum.



# Bronchiectasis – Obstructive lung disease – Case #3



In Bronchiectasis (necrotizing inflammatory disorder) mucus production increases, the cilia are destroyed or damaged, and areas of the bronchial wall become chronically inflamed and are destroyed. Males are infertile.

## Gross Pathology



Permanent dilatation of bronchi and bronchioles caused by destruction of muscle and elastic tissue resulting from or associated with chronic necrotizing infection -Markedly distended peripheral bronchi.

**Radiology: Honeycomb**



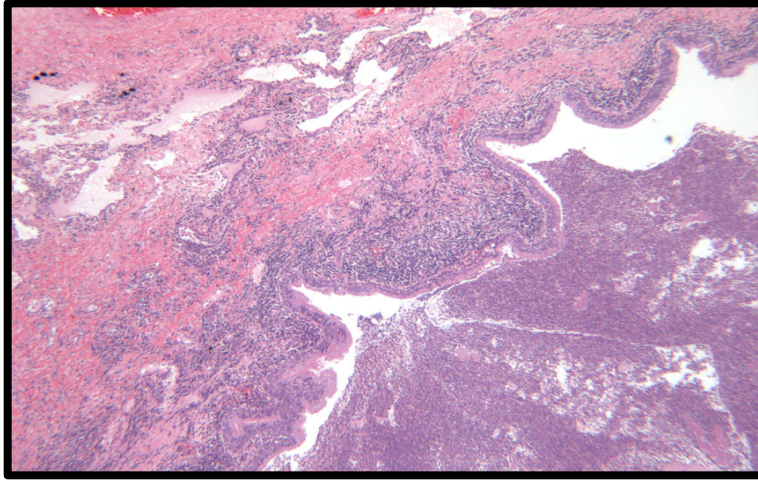
Bronchiectasis occurs when there is obstruction or infection with inflammation and destruction of bronchi so that there is permanent dilation.



Scar formation with adhesion fibrosis between the lobes. Fibrous pleural adhesions are common in persons who have had past episodes of inflammation of the lung that involve the pleura.

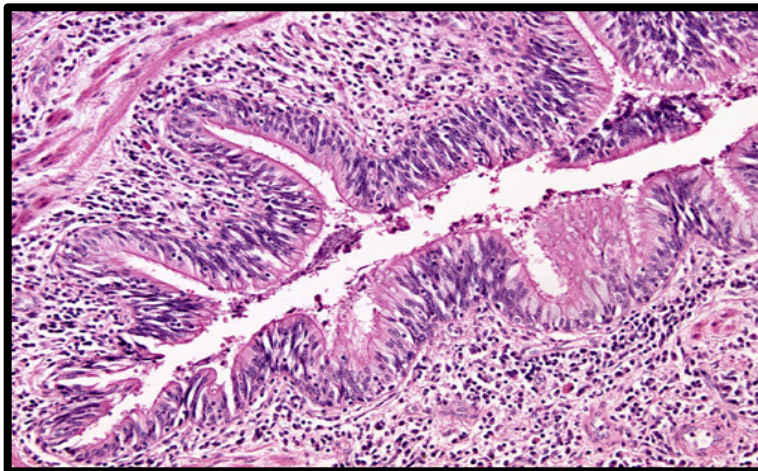
# Bronchiectasis

## Microscopy LPF:



Section of a dilated bronchus with florid **acute on chronic inflammation of the bronchial wall and surrounding interstitial fibrosis.**

## Microscopy HPF:



Chronic inflammation, **ulceration of bronchial wall, ossification of bronchial cartilage, thickened pleura** .Variable inflammation and fibrosis of alveoli .



## COPD | Chronic bronchitis – case #4

The Diagnosis of Chronic Bronchitis is based on clinical features  
 Persistent productive cough (with sputum) for at least 3 consecutive months in at least 2 consecutive years.

Inflammatory process mostly associated with viral and bacterial infections

- usually seen in smokers.
- Reid index 0.4: ratio of outer surface till the epithelium by glands.

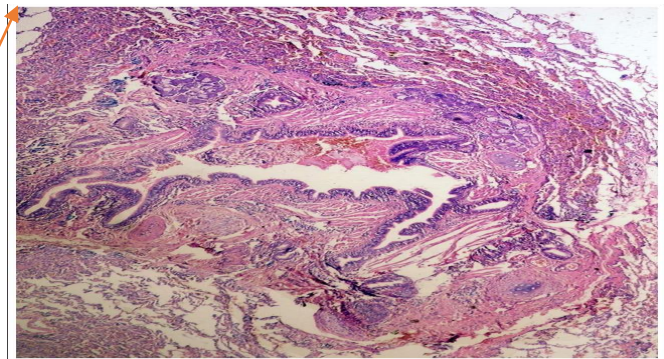


Normal

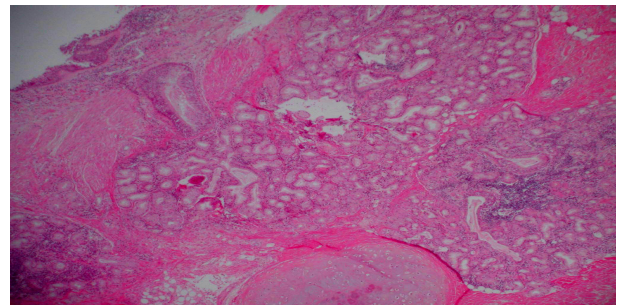
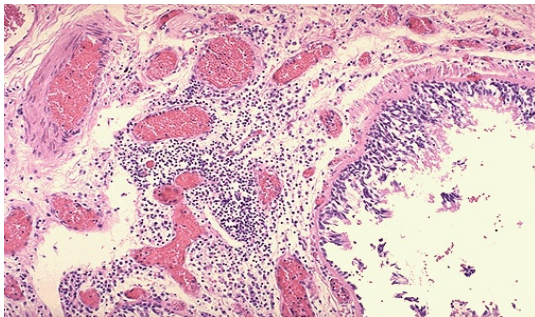


Chronic Bronchitis

- Muscularis mucosae is hypertrophic .
- chronic inflammatory cells ( lymphocytes-plasma cells ) .
- goblet cells and sero-mucous glands are hyperplastic .
- metaplasia of cylindric ciliated epithelium into multi-layered squamous epithelium .
- increased number of goblet cells .
- disquamated epithelial cells (catrrhal inflammation).



LPF



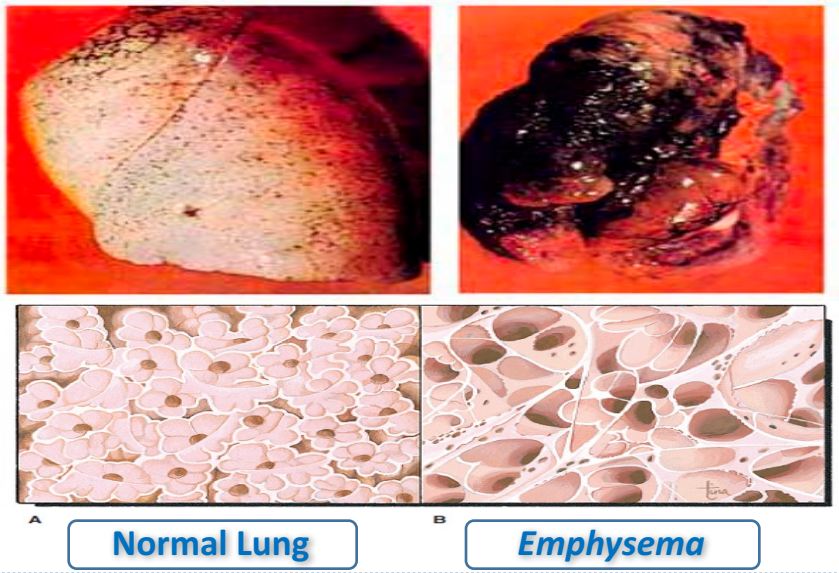
- Chronic inflammatory infiltrate .
- bronchial wall is occupied by submucosal mucus glands .
- sputum production .
- variable dysplasia .
- squamous metaplasia .
- bronchiolitis obliterans .

- Hyper secretion of mucus in large airways .(Early)
- hypertrophy of submucosal glands in trachio-bronchial tree .
- increase in goblet cells in small aiwrways , contributes to excessive mucus production and airway obstruction . (later)

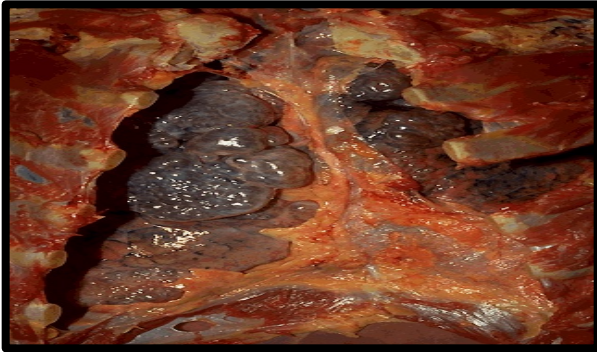


## Case 4: Emphysema -COPD#

Emphysema can result from enzyme deficiency (alpha-1-Antitrypsin).

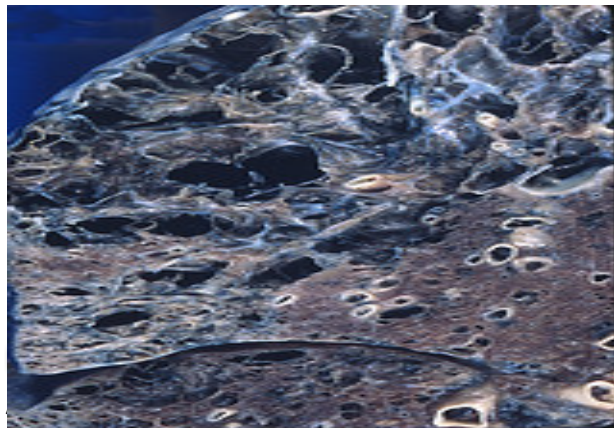
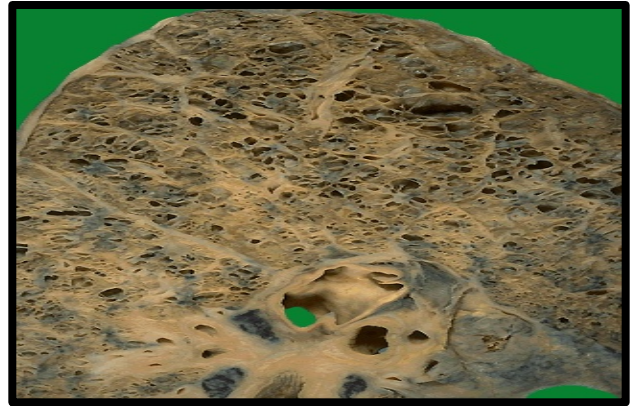


### Emphysema Gross Pathology



Opened chest cavity shown: Numerous large emphysematous bullae.

**Bullae:** are large abnormal dilated airspaces that bulge out from beneath the pleura.



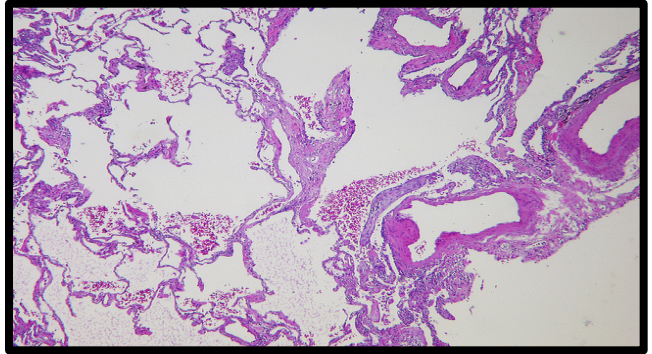
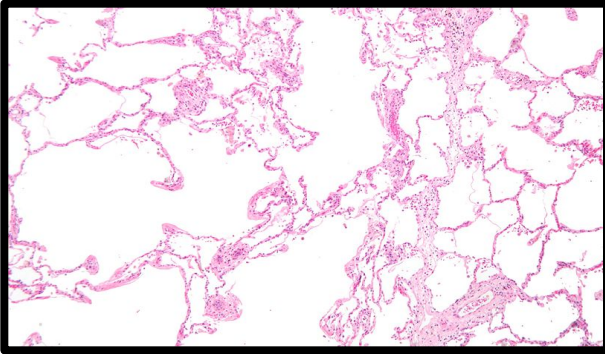
space larger than 1cm



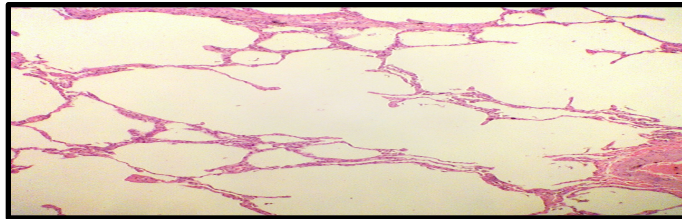
carbon deposits characteristic of smoking.

## #Case 4:Emphysema

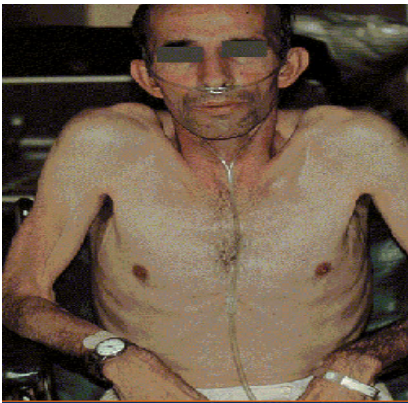
### Panacinar Emphysema Microscopic Pathology



- Rupture of alveolar septa.
- Ruptured septa project with in air space on the form of spurs.



- Destruction of tissue leaves emphysematous spaces with little surface area.
- Few capillaries and large air spaces.
- Large vessel at lower left



#### Emphysema clinical features:

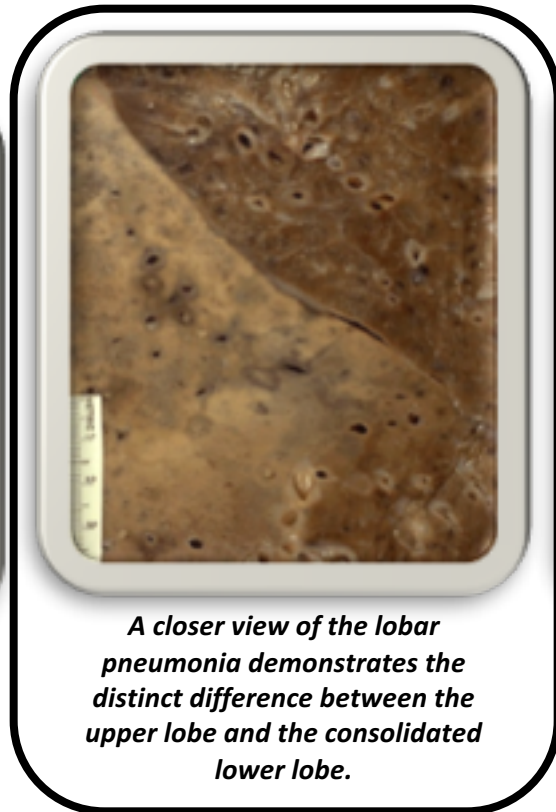
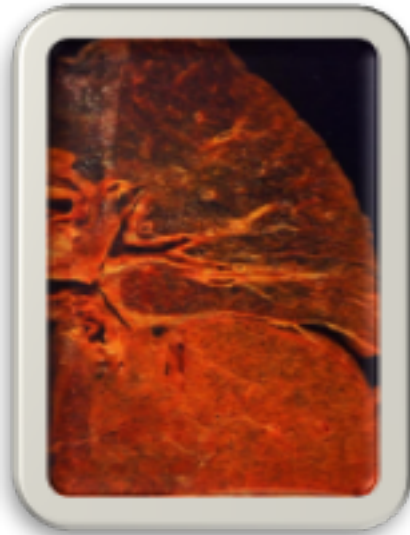
- Thin “pink puffer” patient
- Hyperinflated chest (Barrel chest)
- Weight loss

Type of Emphysema	Cause
Centriacinar ( Centrilobular )	Smoking
Panacinar ( Panlobar)	Alpha-1 antitrypsin
Distal acinar ( paraseptal )	Unknown cause leading to pneumothorax
Irregular	Inflammatory condition

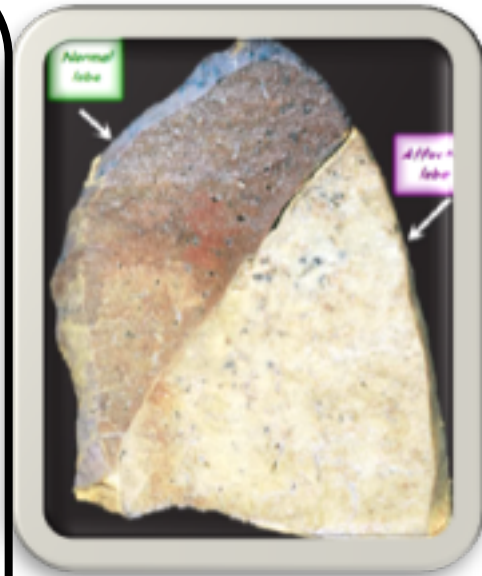


# Lobar Pneumonia – “Lower respiratory tract infection” – case #5

Gross:



*A closer view of the lobar pneumonia demonstrates the distinct difference between the upper lobe and the consolidated lower lobe.*



Lobar Pneumonia of the right  
Lower lobe

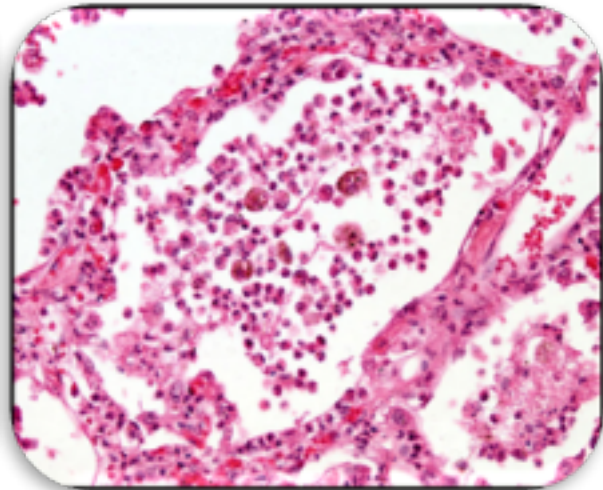
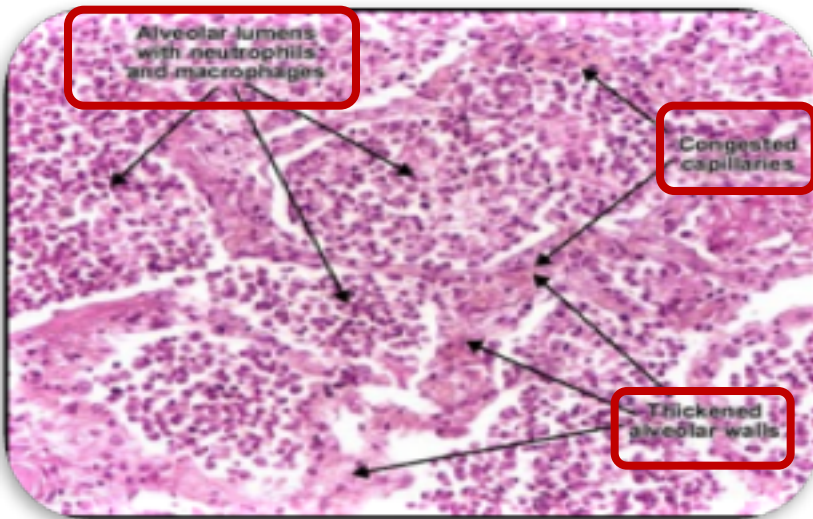


Lobar Pneumonia of the right  
middle lobe

***A localized focus of consolidation caused by lobar pneumonia can be seen in both X-ray films taken from 2 different patients .***



# histopathology:



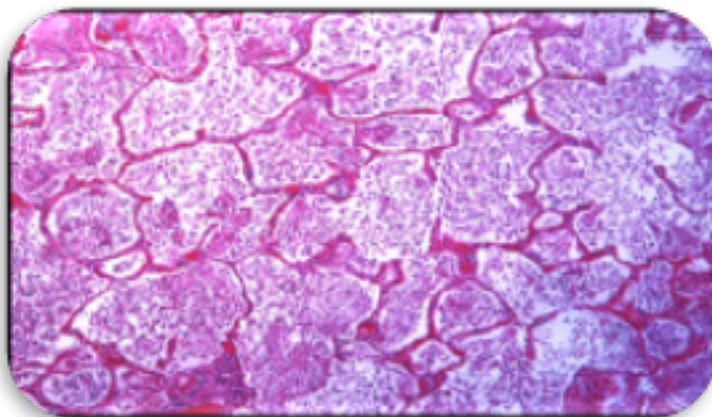
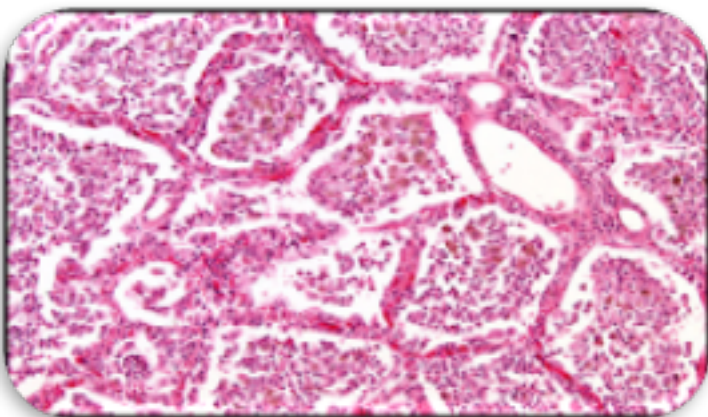
first 2 days: Congestion

2-4 days: Red hepatisation (fibrinous alveolitis)

4-8 days: Grey hepatisation (leukocytic alveolitis)


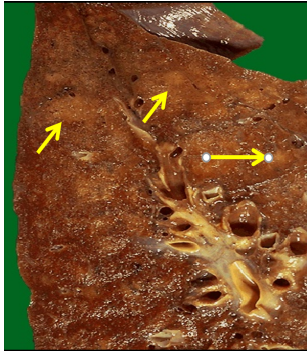
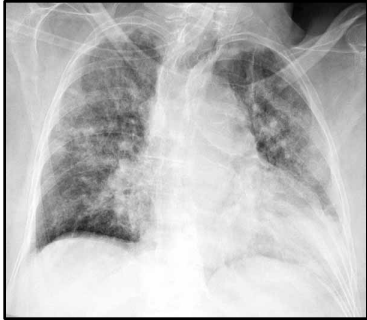
After 8 days: Resolution

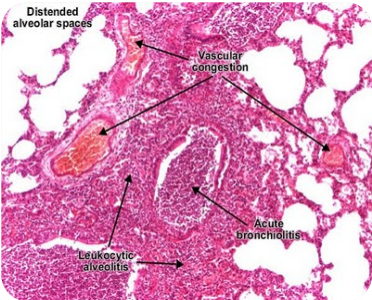
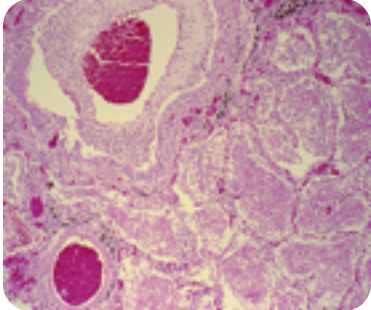
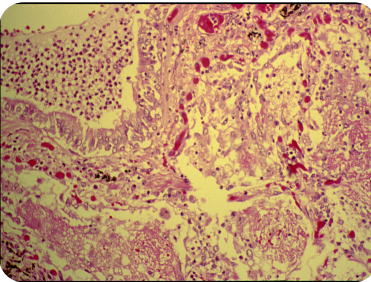
*High power field of alveolar exudate and thickened alveolar wall*



All the alveoli are filled with **fibrinous exudate containing fibrin threads, polymorphs, macrophages and red cells**. Alveolar walls are congested. Pleura is covered by fibrinous exudate.

. Bronchopneumonia- "lowe respiratory tract infection" – case #6

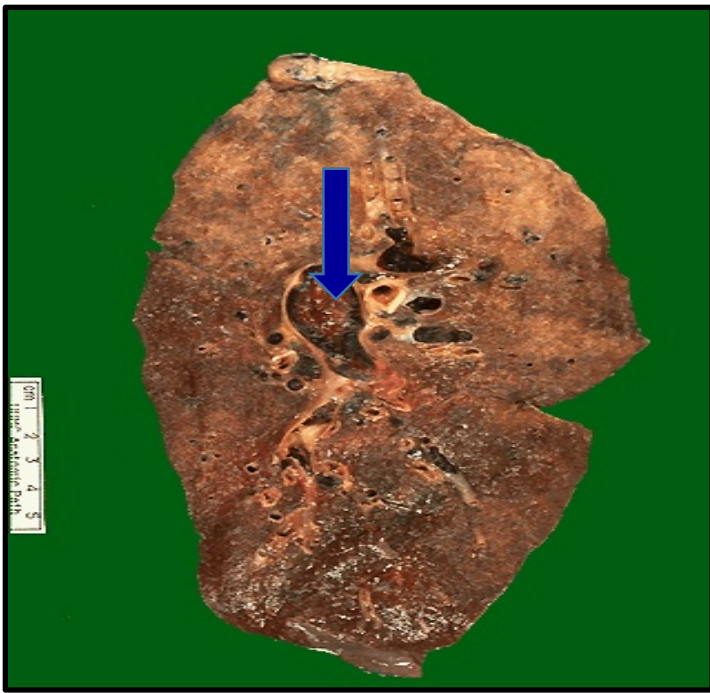
Bronchopneumonia – <u>Gross pathology</u>	Bronchopneumonia – <u>Cut section</u>	Bronchopneumonia – <u>X-Ray section</u>
 <p>- The consolidated areas here very closely match the pattern of lung lobules (hence the term "<b>lobular</b>" pneumonia). (not lobar)                      - Bronchopneumonia is classically a "hospital acquired" pneumonia seen in persons already ill from another diseases e.g. DM , old age , immune deficiency process.</p>	 <p>- This bronchopneumonia is more subtle, but there are areas of <u>lighter tan consolidation</u>. The <b>hilum</b> is seen at the lower left with radiating pulmonary arteries and bronchi</p>	 <p>This radiograph demonstrates <u>patchy infiltrates</u> consistent with a bronchopneumonia from a <u>bacterial</u> infection.</p>

Bronchopneumonia – <u>Histopathology</u>	Bronchopneumonia – <u>LPF</u>	Bronchopneumonia – <u>MPF</u>
 <p>Bronchopneumonia (<b>Lobular pneumonia</b>) is an acute exudative inflammation of the lungs .                      Usually, bronchopneumonia affects one or more lobes and is bilateral.                      1- characterized by Foci of <b>consolidation</b> surrounded by normal parenchyma .                      2- Vascular congestion                      3- Acute bronchiolitis                      4-Leukocytes alveolitis</p>	 <p>-Section of the lung shows <b>foci of inflammatory consolidation</b> surrounding bronchioles:                      -Bronchioles are filled with an inflammatory <b>purulent exudate</b> and show <b>ulceration</b> of mucosa, focal inflammation and <b>necrosis</b> of walls                      -Surrounding lung parenchyma shows <b>congestion</b> and <b>edema</b></p>	 <p>At high magnification, the alveolar exudate of mainly <b>neutrophils</b> is seen. The surrounding alveolar walls have capillaries that are <u>dilated</u> and filled with RBC's. Such an exudative process is typical for bacterial infection. This exudate gives rise to the productive cough of purulent <b>yellow</b> sputum seen with bacterial pneumonias</p>



## Pulmonary embolus and infraction – case #7

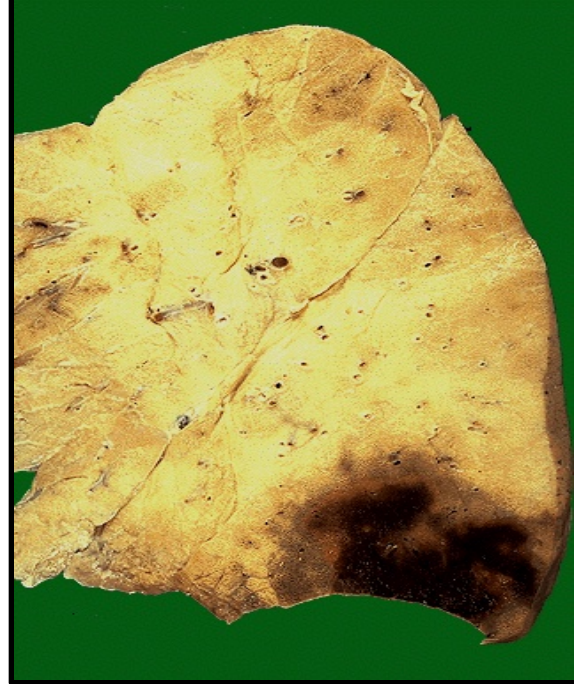
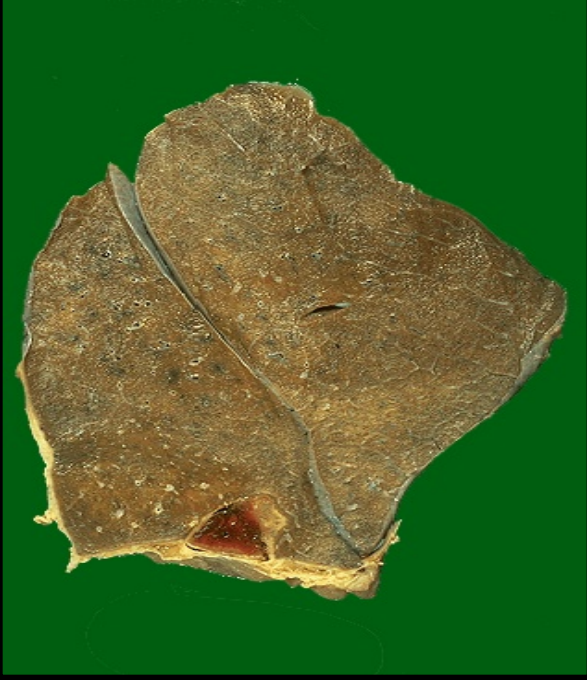
### Thromboembolism in the Lung – Gross



***A large pulmonary thromboembolus is seen in the pulmonary artery to the left lung. Such thromboemboli typically originate in the leg veins or pelvic veins of persons who are immobilized***

- Embolus comes from different parts such as fibular artery. It can be thrombus or fat.
- there is red congestion because the blood can not be able to go back.
- large thrombi causes death, medium thrombi causes lesion (the one mentioned in the picture)
  - Why the pulmonary artery is causing this congestion ?
- Because the blood fundus is going to the heart, so if it is blocked, the blood supply wont able to go back to the heart and it can finally do infraction.
  - It's a beautiful picture isn't it?

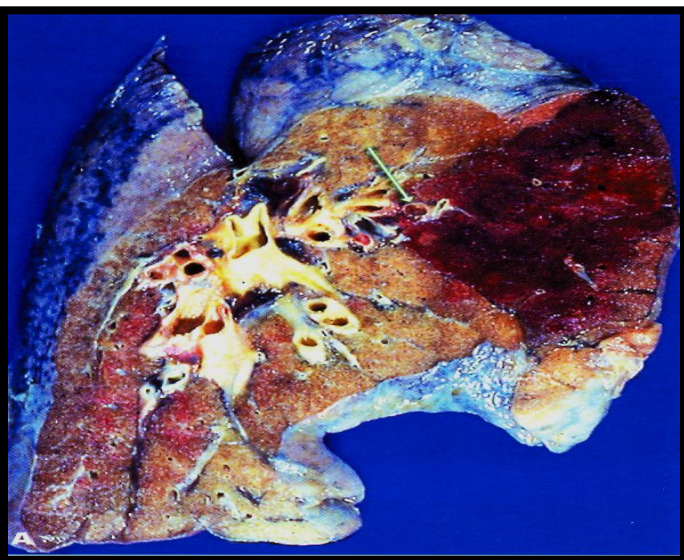




***Large thromboemboli can cause death.***

***Medium sized thromboemboli***

***(blocking a pulmonary artery to a lobule or set of lobules) can produce the lesion seen here -a hemorrhagic pulmonary infarction which is a wedge-shaped and based on the pleura.***



***A Longitudinal transection of a lung showing a wedge shaped peripheral hemorrhagic infarction.***

***A thrombus is seen in a major branch of pulmonary artery ( arrow head ).***

***CT scan - white arrows show pulmonary embolus with lung infarction***

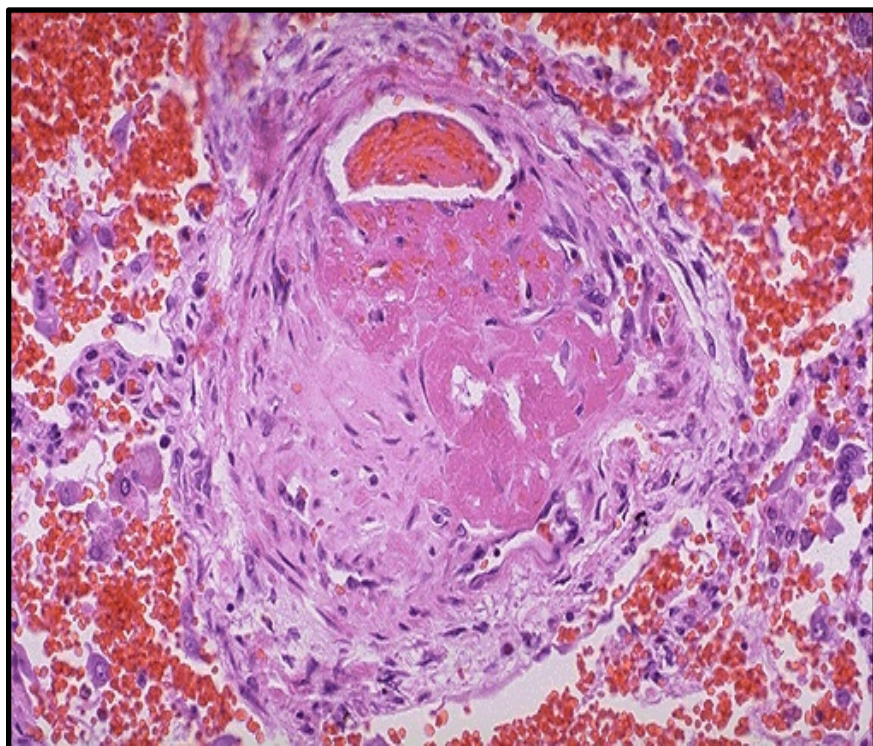


## Pulmonary artery thromboembolus – LPF:



*Microscopic appearance of a pulmonary thromboembolus in a large pulmonary artery. There are interdigitating areas of pale pink and red that form the "lines of Zahn" characteristic for a thrombus.*

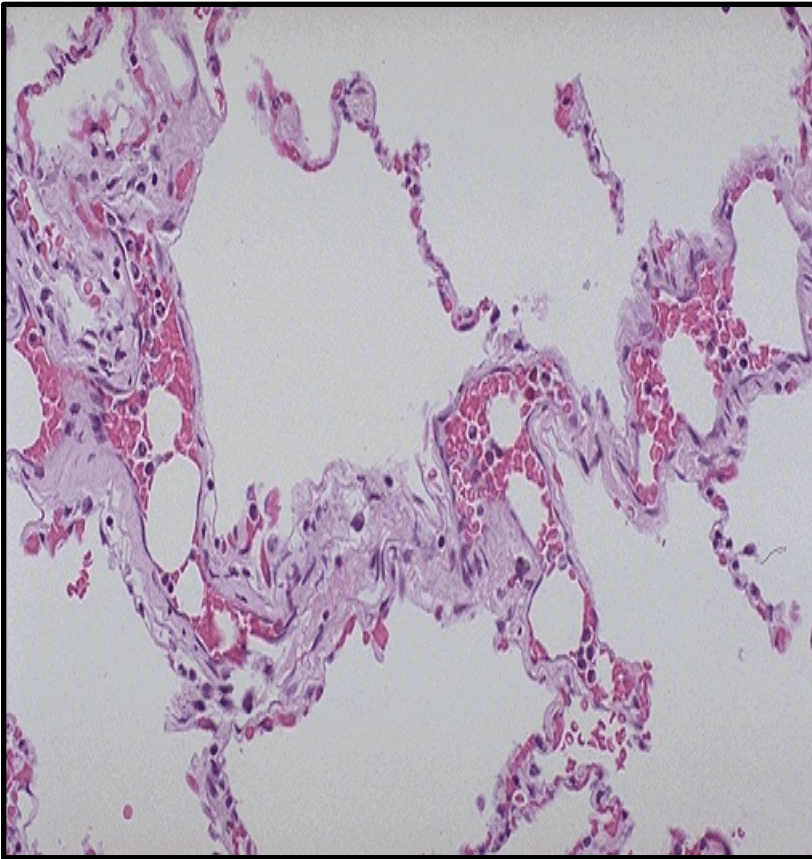
## Small pulmonary artery thromboembolus – HPF:



A small peripheral pulmonary artery thromboembolus. If these small PE are showered into the pulmonary circulation at once or over a period of time will lead to pulmonary hypertension.



## Fat Embolism in the Lung - HPF



The rounded holes that appear in the vascular spaces here in the lung are fat emboli.

Fat embolization syndrome occurs most often following trauma with fracture of long bones that releases fat globules into the circulation which are trapped in pulmonary capillaries

You need to know the case to distinguish the picture: The patient had road traffic accident and the bone marrow entered into the blood vessel reached to the lung and that's why you are having air spaces in the blood vessels because of the fat cells or fat embolous

*THANK YOU !*

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