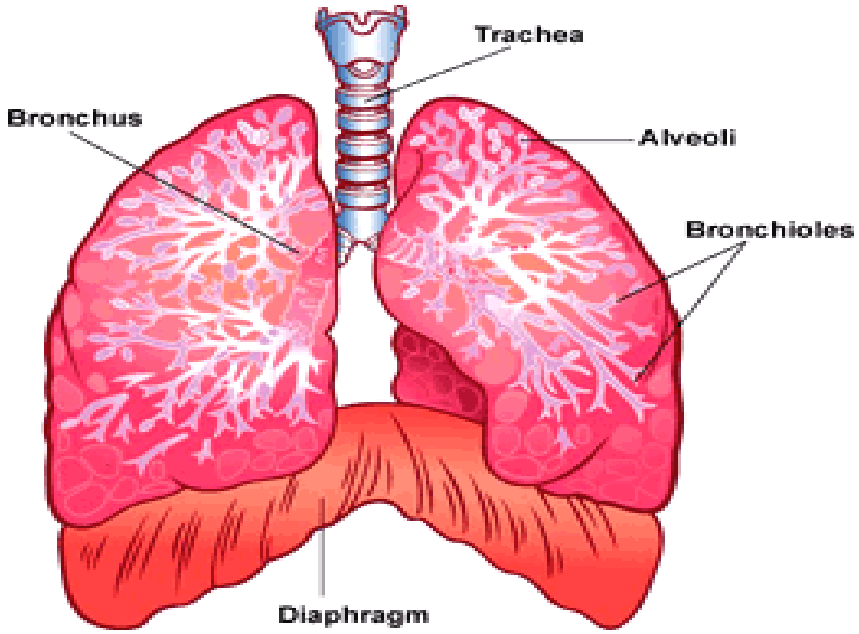
Lab 6

Respiratory System



Pulmonary Infection

- **It includes :**

1. **Upper respiratory tract infection (URTI)**

a. **Common cold**

b. **Flu**

c. **Sinusitis**

d. **Laryngitis**

2. **Lower respiratory tract infection (LRTI)**

a. **Infection of airways from trachea and below**

b. **Infection of lung parenchyma (pneumonia)**

Lower respiratory tract infections

- **Acute lung infections:**
  - **Pneumonias**
  - **Lung abscess**
  - **Fungal infections**
- **Chronic lung infection:**
  - **Pulmonary tuberculosis**

Pneumonia:

- **It is one of the major causes of death in the world**
- **It is acute inflammation of LRT distal to the terminal bronchioles**
- **The major feature for the gross and radiological examination of pneumonia is Consolidation (solidification)**

Routs of transmission of the infection:

- **Inhalation**
- **Aspiration**
- **Haematogenous spread**
- **Direct spread**

Classification of Pneumonia:

- **Bacterial pneumonia (community acquired)**
- **Viral and atypical pneumonia**
- **Other etiologies ex: aspiration pneumonia**

Bacterial pneumonia:

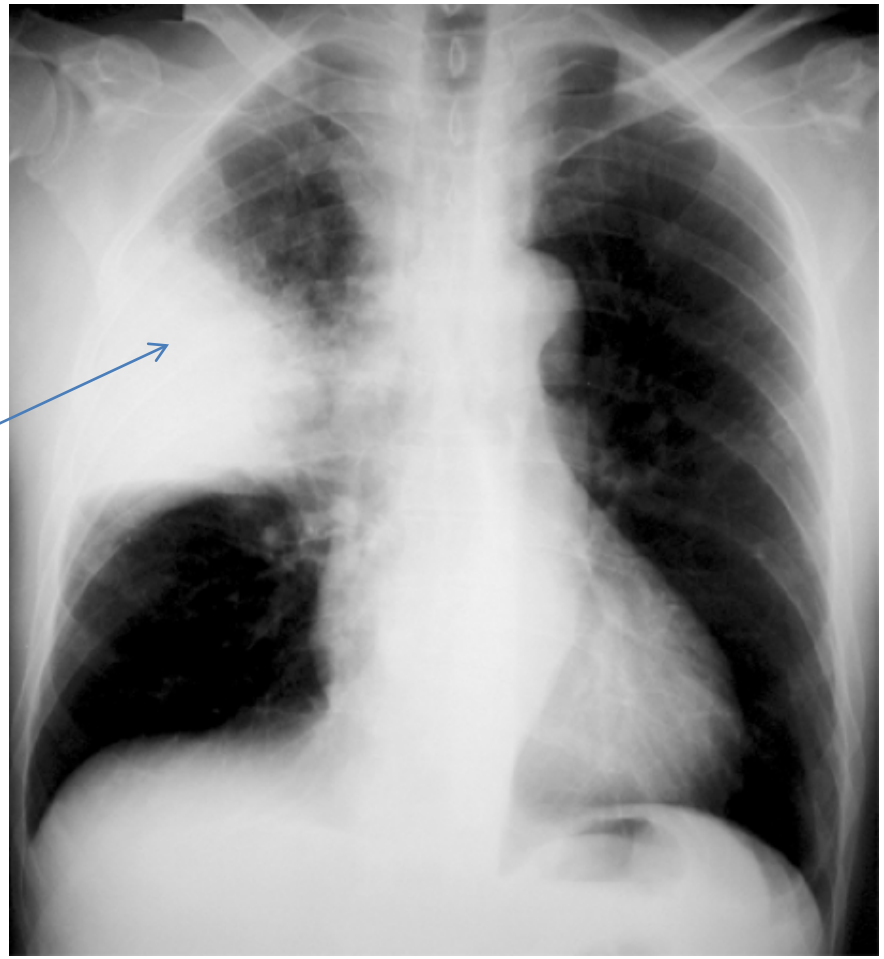
I. Lobar pneumonia (community acquired)
II. Bronchopneumonia (lobular pneumonia)

I. Lobar pneumonia (community acquired)

- Consolidation involves a part of the lobe or the whole lobe
- Etiology:

a. Pneumococcal pneumonia (*pneumococcus pneumonae)*

consolidation



Lobar pneumonia due to Streptococcus pneumoniae. Chest radiograph shows non segmental right upper lobe consolidation.

b. Staphylococcal pneumonia (*Staphylococcus aureus*)

c. Streptococcal pneumonia (β-haemolytic streptococci)

d. Pneumonia by gram-negative aerobic bacteria ex: *Haemophilus influenzae*

Morphology:

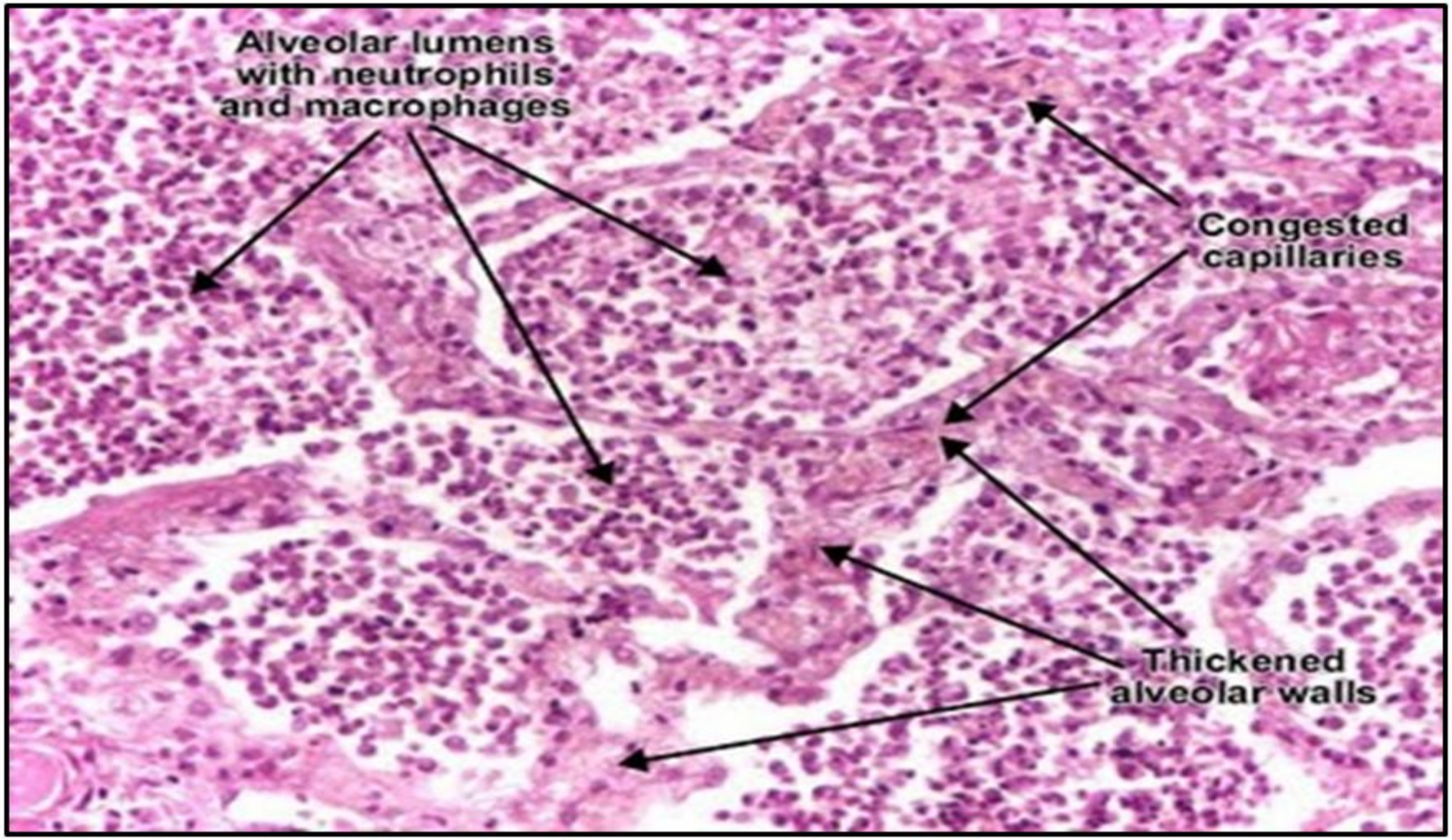
i. Stage of congestion

ii. Stage of red hepatization

iii. Stage of grey hepatization

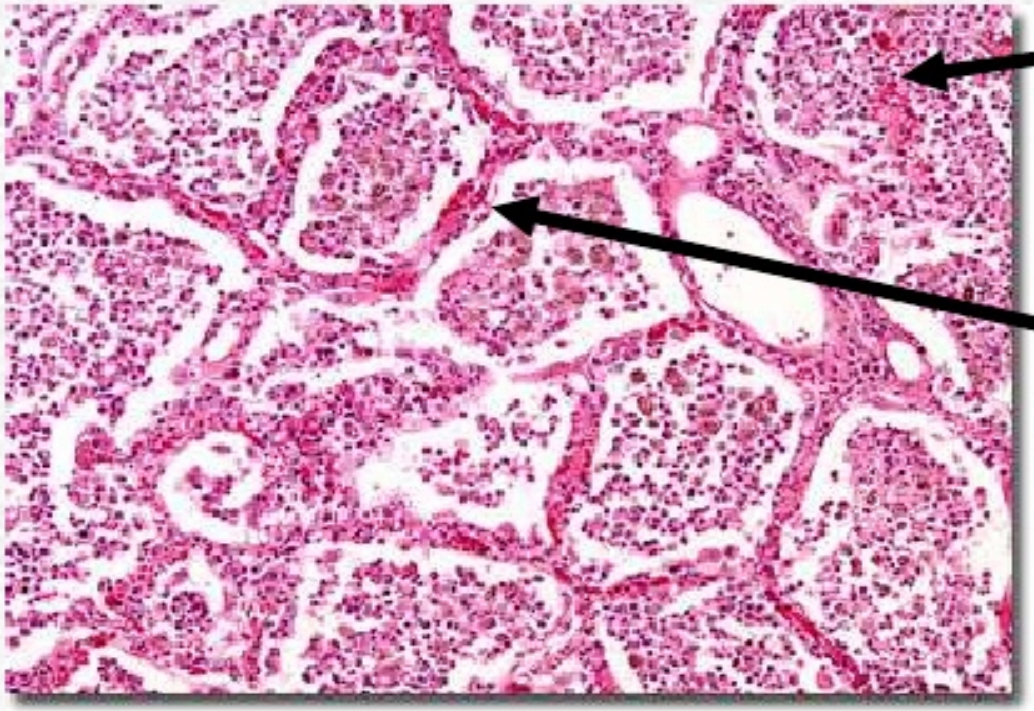
iv. Stage of resolution

Lobar Pneumonia - Histopathology



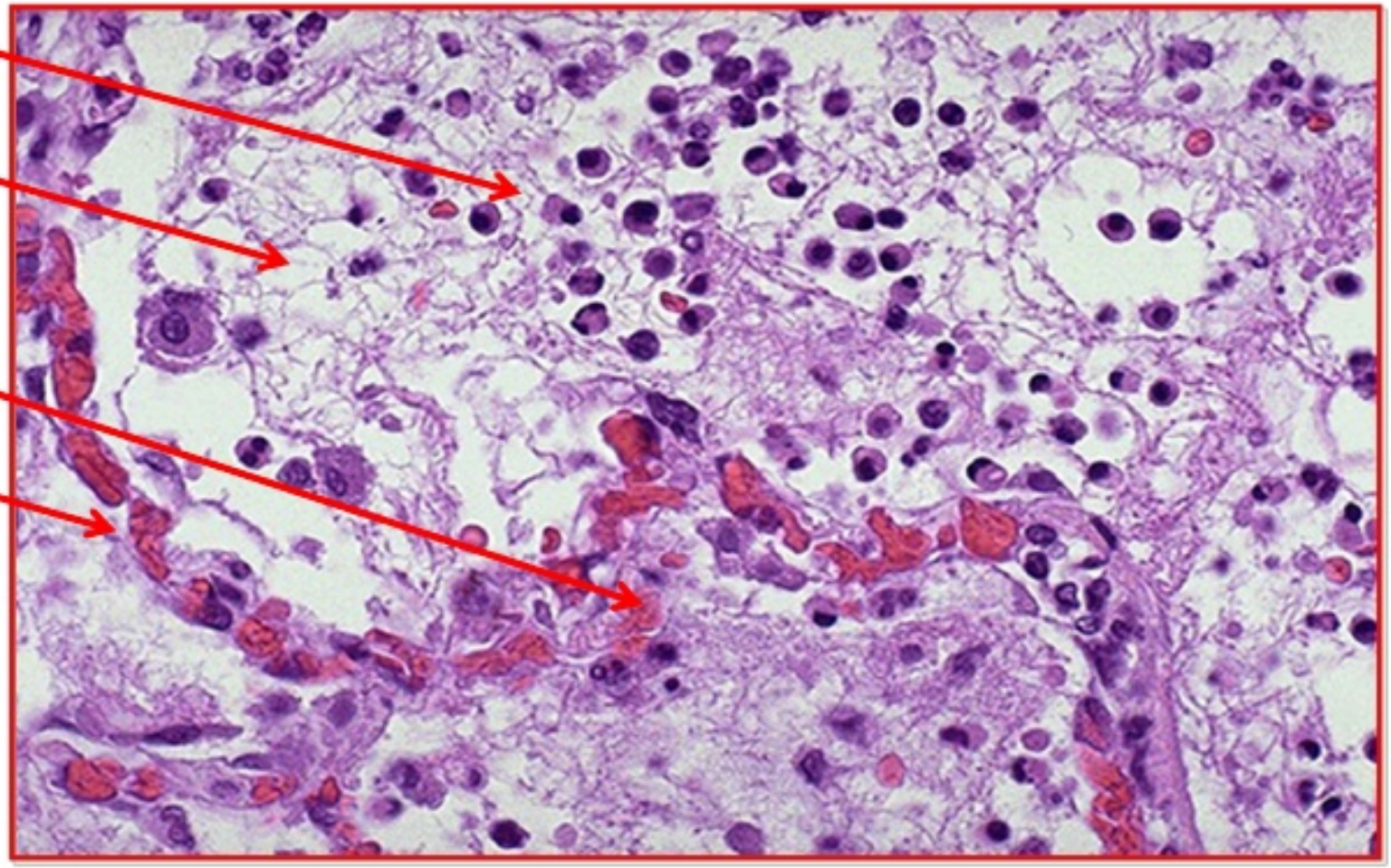
* Congestion (first 2 days)
* Red hepatisation (fibrinous alveolitis) (2nd to 4th day)
* Grey hepatisation (leukocytic alveolitis) (4th to 8th day)
* Resolution (after 8th day)

Lobar Pneumonia: Red hepatization.



- Acute inflammatory cells & RBC Filling alveolar spaces Uniformly.
- Congested capillaries in the alveolar septa

Lobar Pneumonia, Grey Hepatization



1) Inflammatory cells
2) Clumps of fibrin and edema
3) Fragmented RBCs
4) Congested alveolar capillaries

i. Stage of congestion:

Gross: the lung is heavy and red

Microscopic: Alveolar vascular congestion & Intra-alveolar fluid with neutrophil + bacteria.

ii. Stage of red hepatization:

Gross: red, firm, airless, look like a liver

Microscopic: The inflammatory exudate composed of RBC+ neutrophil+ fibrin.

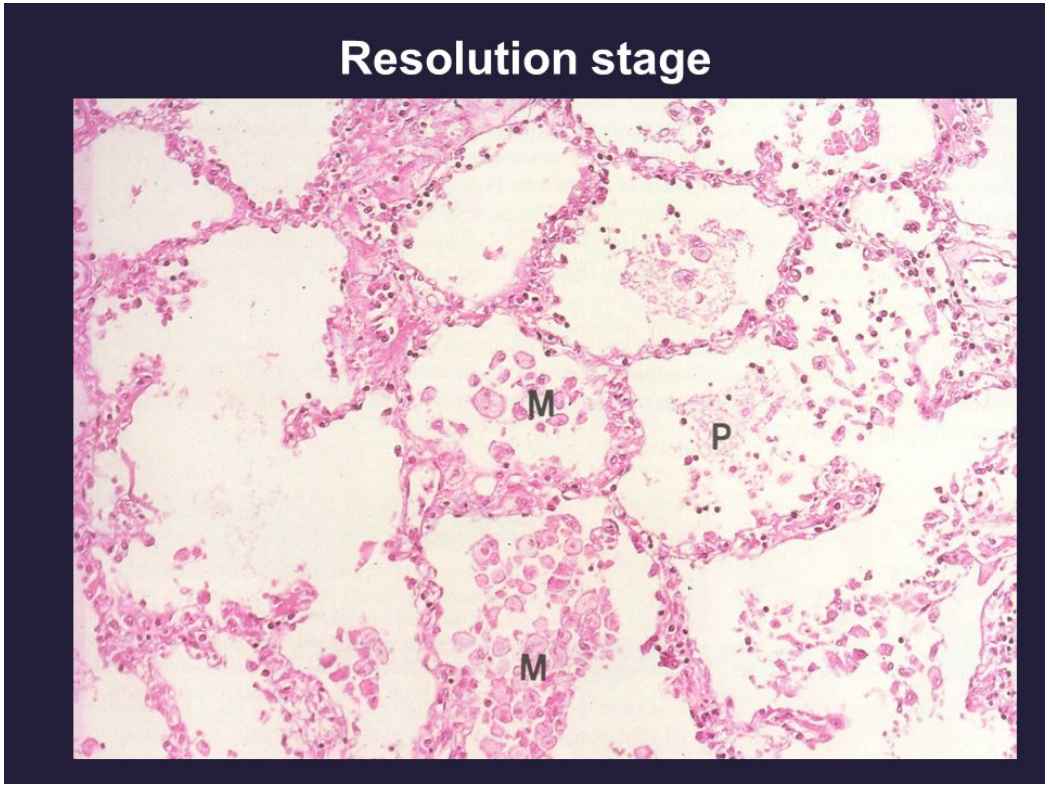
iii. Stage of grey hepatization:

Gross: grey –brownish, dry surface

Microscopic: The exudate is composed of fibrin+ WBC which is called (fibrino-suppurative) exudate.

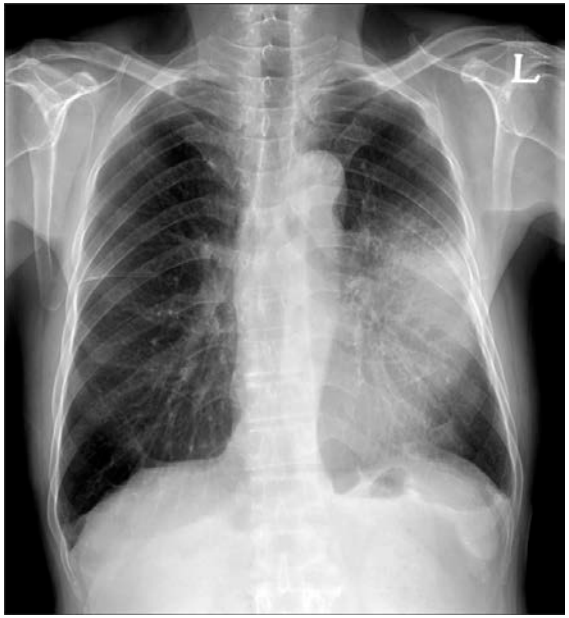
iv. Stage of resolution:

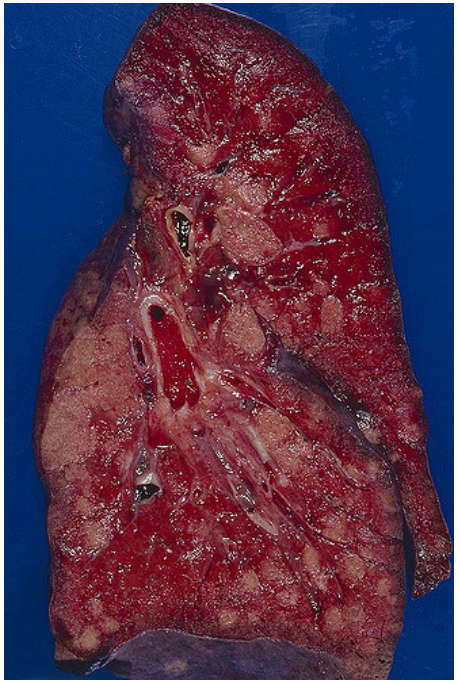
The exudate undergoes enzymatic digestion→ formation of granular debris that is either resorbed & ingested by the macrophages or expectorated and coughed up.



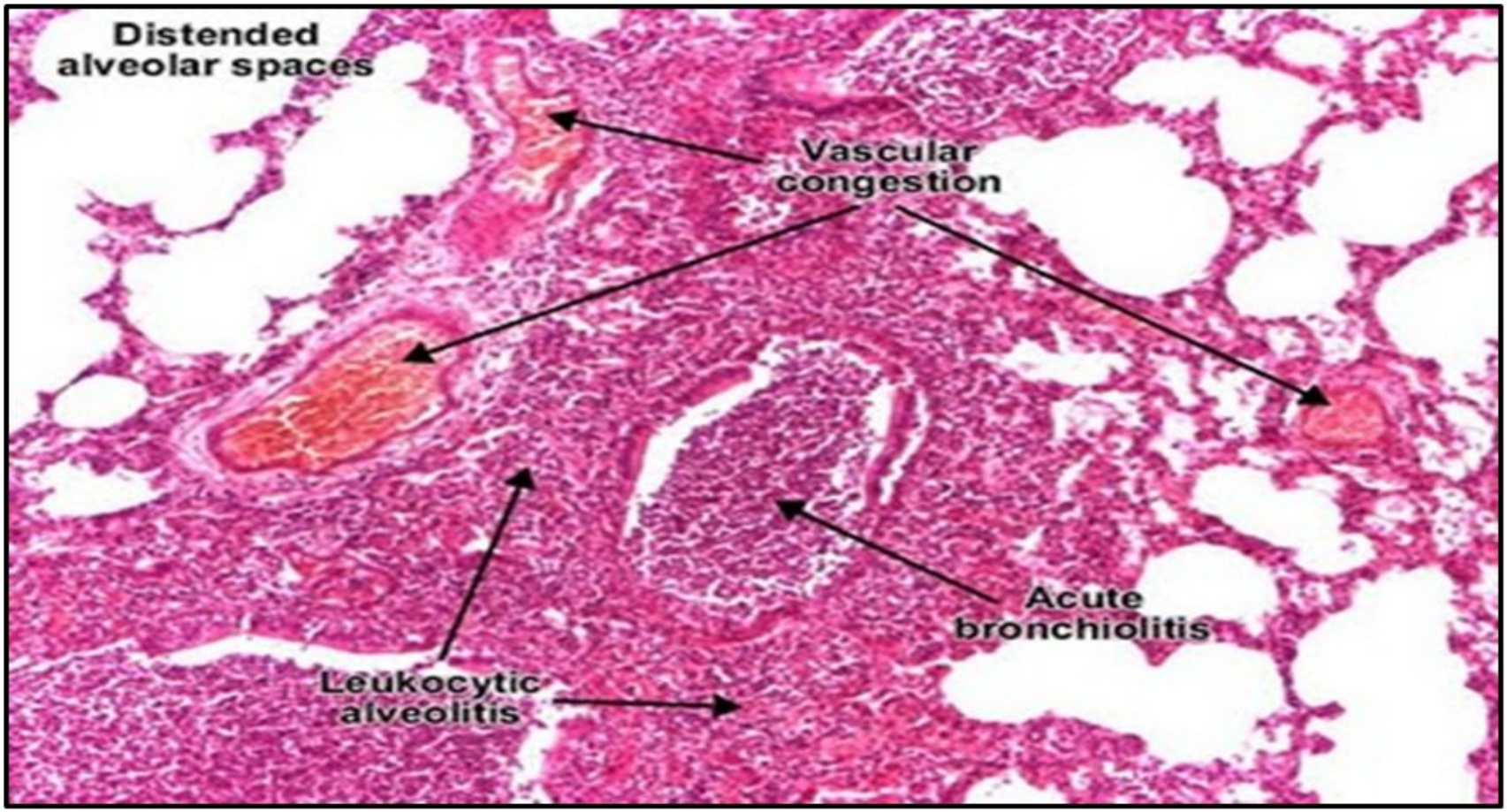
II. Bronchopneumonia (lobular)

- **Infection of the terminal bronchioles that extends into the surrounding alveoli**
- **Caused by staphylococcus, streptococcus, pneumococcus, hemophilus influenzae.**





Bronchopneumonia – Histopathology

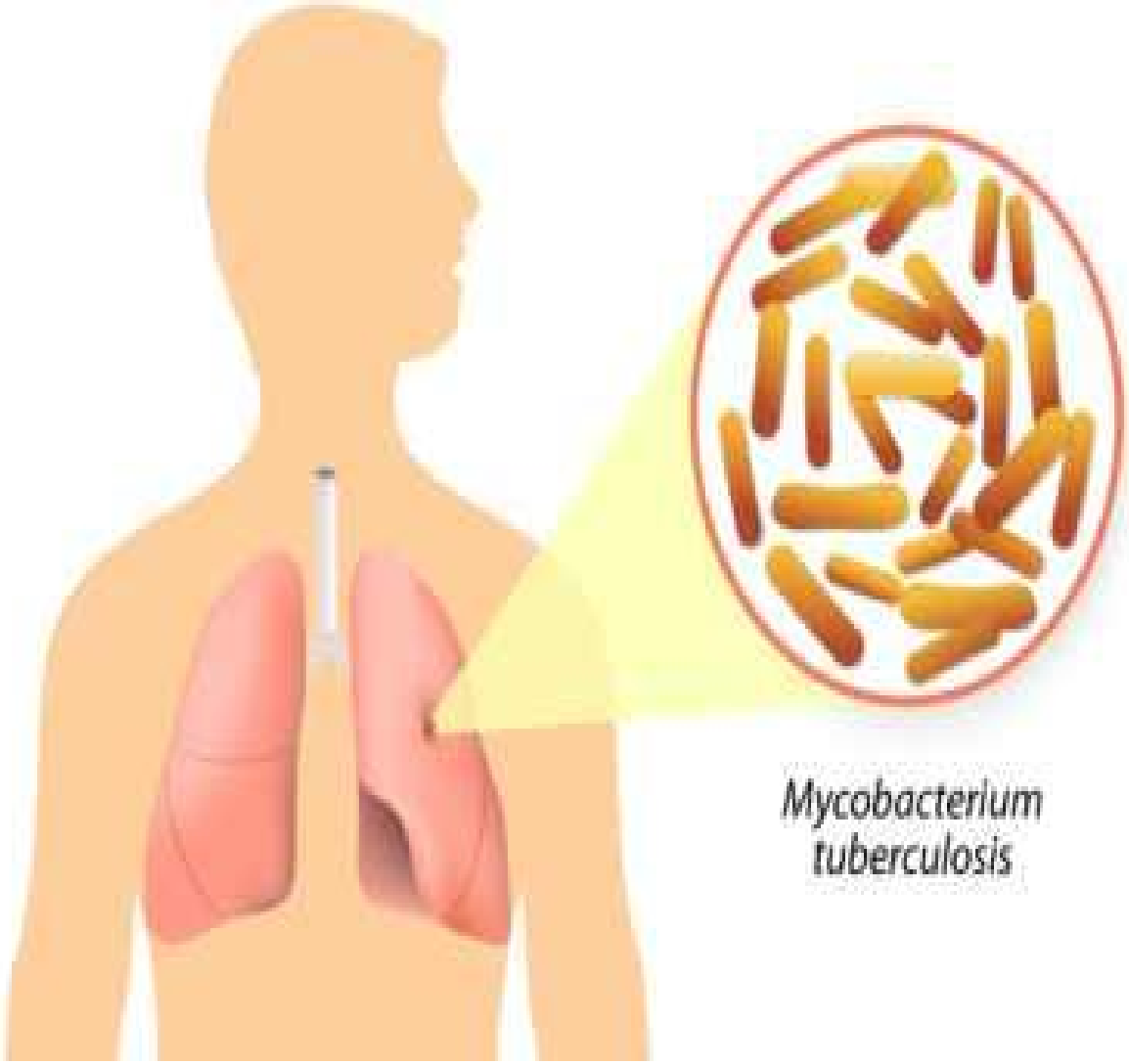


Bronchopneumonia (Lobular pneumonia) is an acute exudative inflammation of the lungs characterized by foci of consolidation surrounded by normal parenchyma. Usually, bronchopneumonia affects one or more lobes and is bilateral.

Morphology of bronchopneumonia:

- **Gross: the well-developed lesion is 3-4 cm, red /yellow, slightly elevated.**
- **Microscopic: The consolidating area shows acute *suppurative* inflammation rich in neutrophils, filling the bronchi, bronchioles, & adjacent alveolar spaces.**

TUBERCULOSIS



Tuberculosis

- **Tuberculosis is chronic infectious disease caused by *Mycobacterium tuberculosis*, a rod-shaped aerobic bacteria.**

Types of TB:

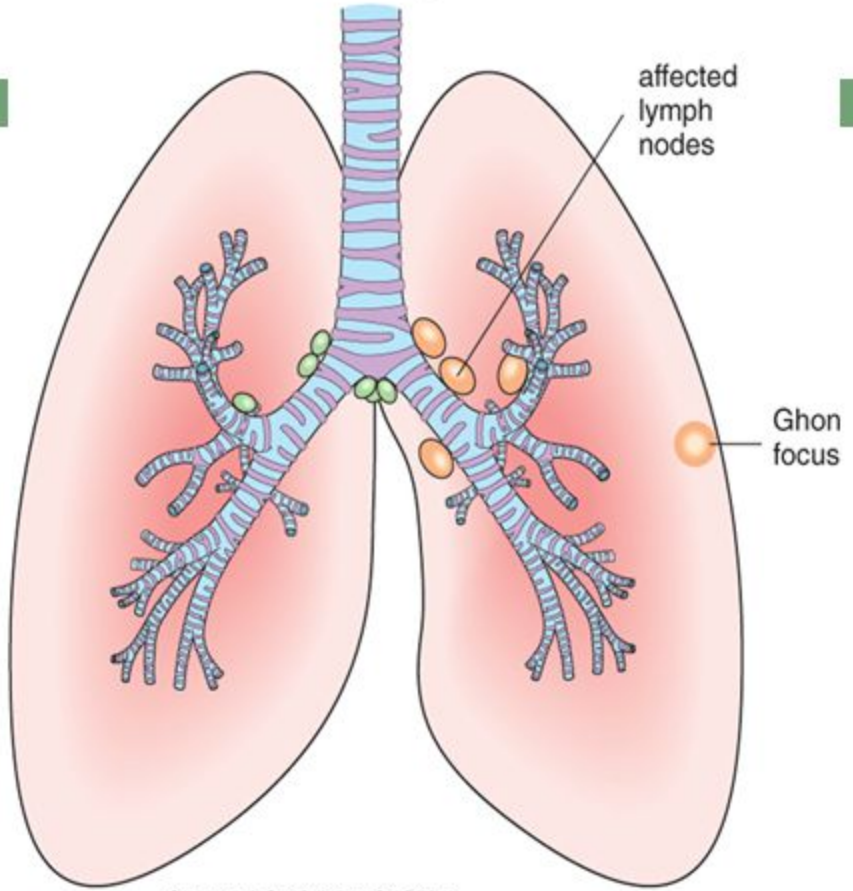
1. Primary TB:

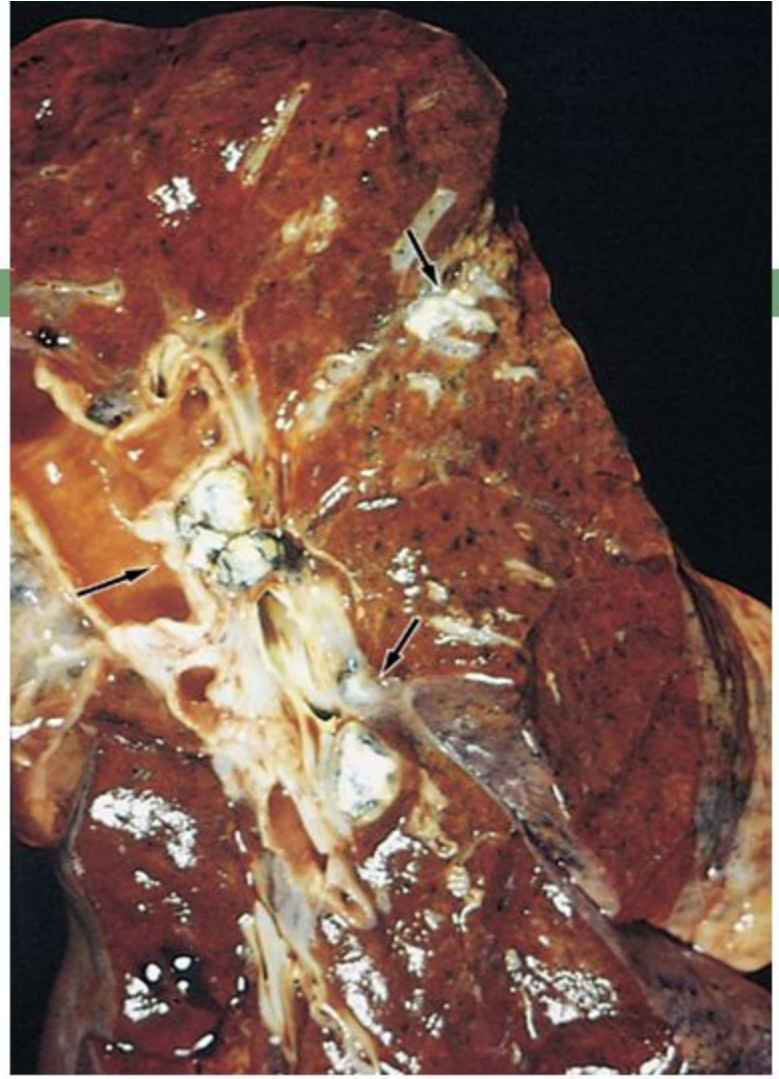
- **It occurs in a person infected with tubercle bacilli for the first time**
- **It affects the lower lobes**

What is Ghon's focus?

- **It is a grey-white circumscribed granuloma that is composed of tubercle bacilli engulfed by macrophages (epitheloid and multinucleated giant cells) in addition to other immune cells.**
- **The combination of the primary lung lesion and lymph node granulomas is called *Ghon's complex* .**

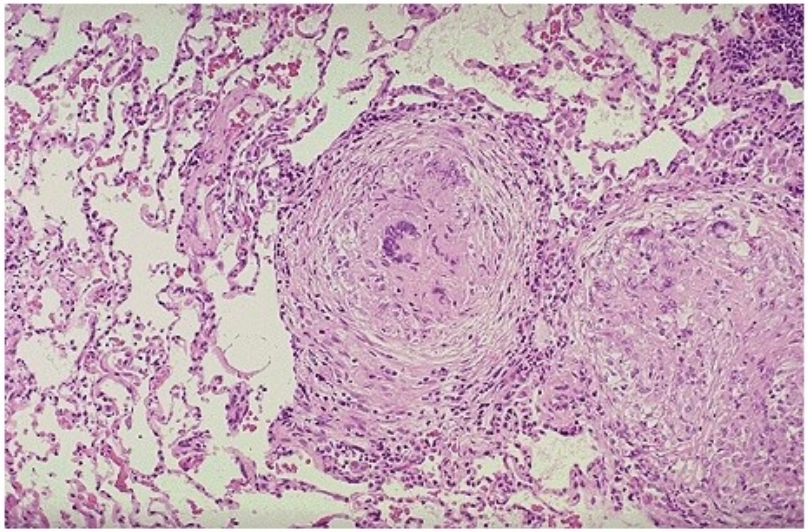
PRIMARY TUBERCULOSIS: Ghon Focus & Ghon complex



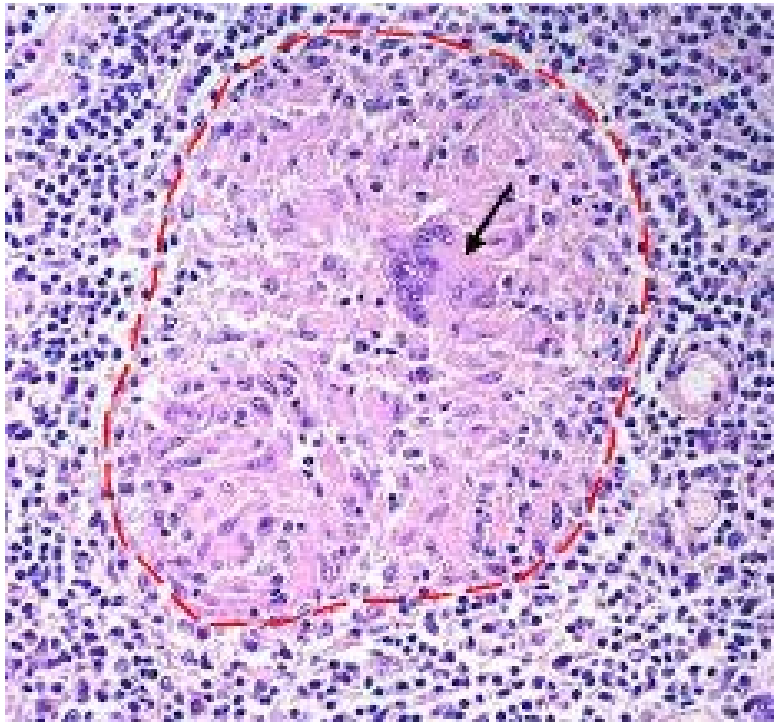


- Ghon Focus: lung lesion of primary TB, involves upper segments of the lower lobes or lower segment of the upper lobe.
- Ghon complex: combination of a peripheral ghon focus and involved mediastinal or hilar lymphnode.
- Microscopically the classic lesion of TB is a caseous granuloma

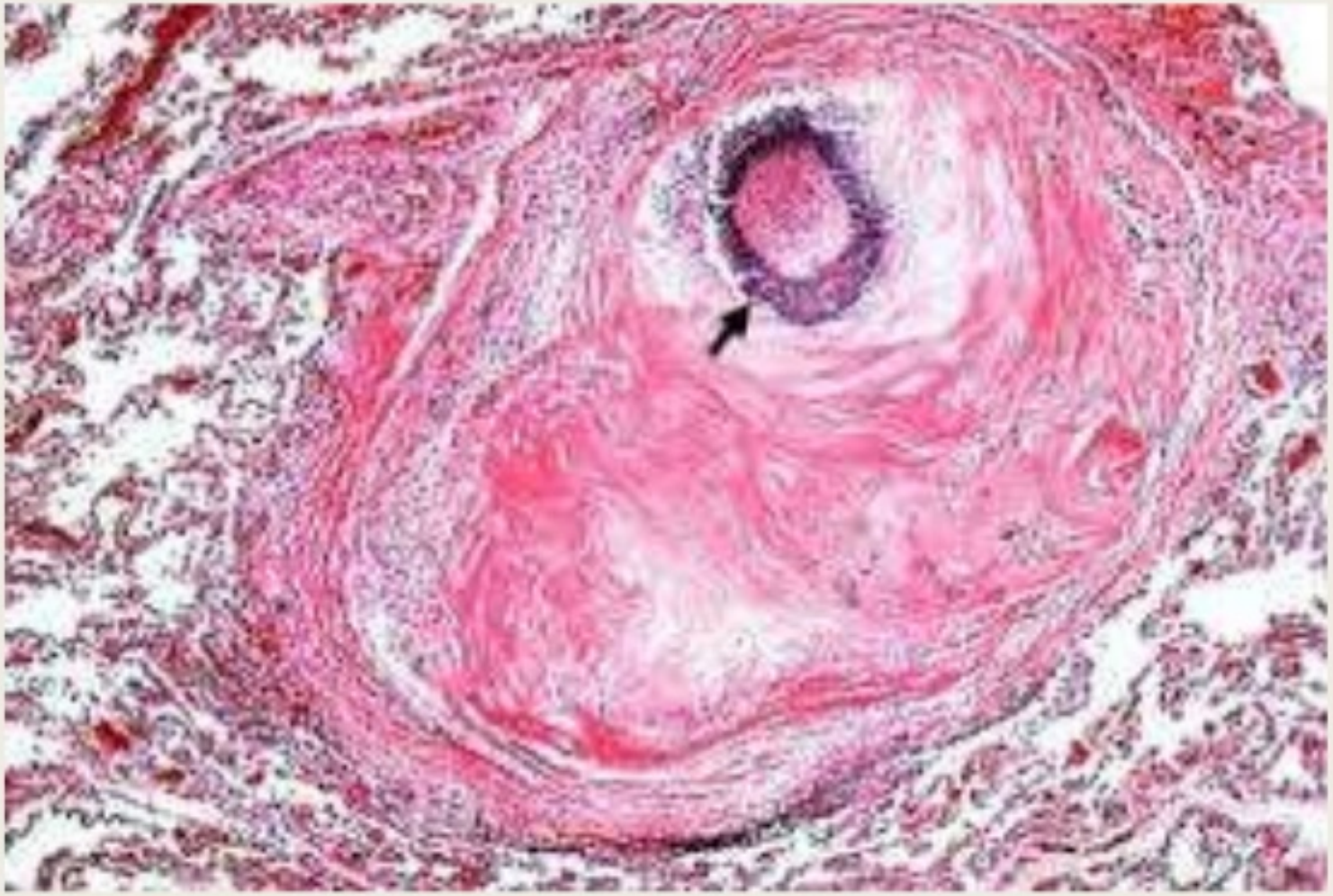
Primary Tuberculosis – Microscopic Morphology



Well-defined non-caseating granulomas . Granulomas are composed of transformed macrophages called epithelioid cells along with lymphocytes, occasional PMN's, plasma cells, and fibroblasts.



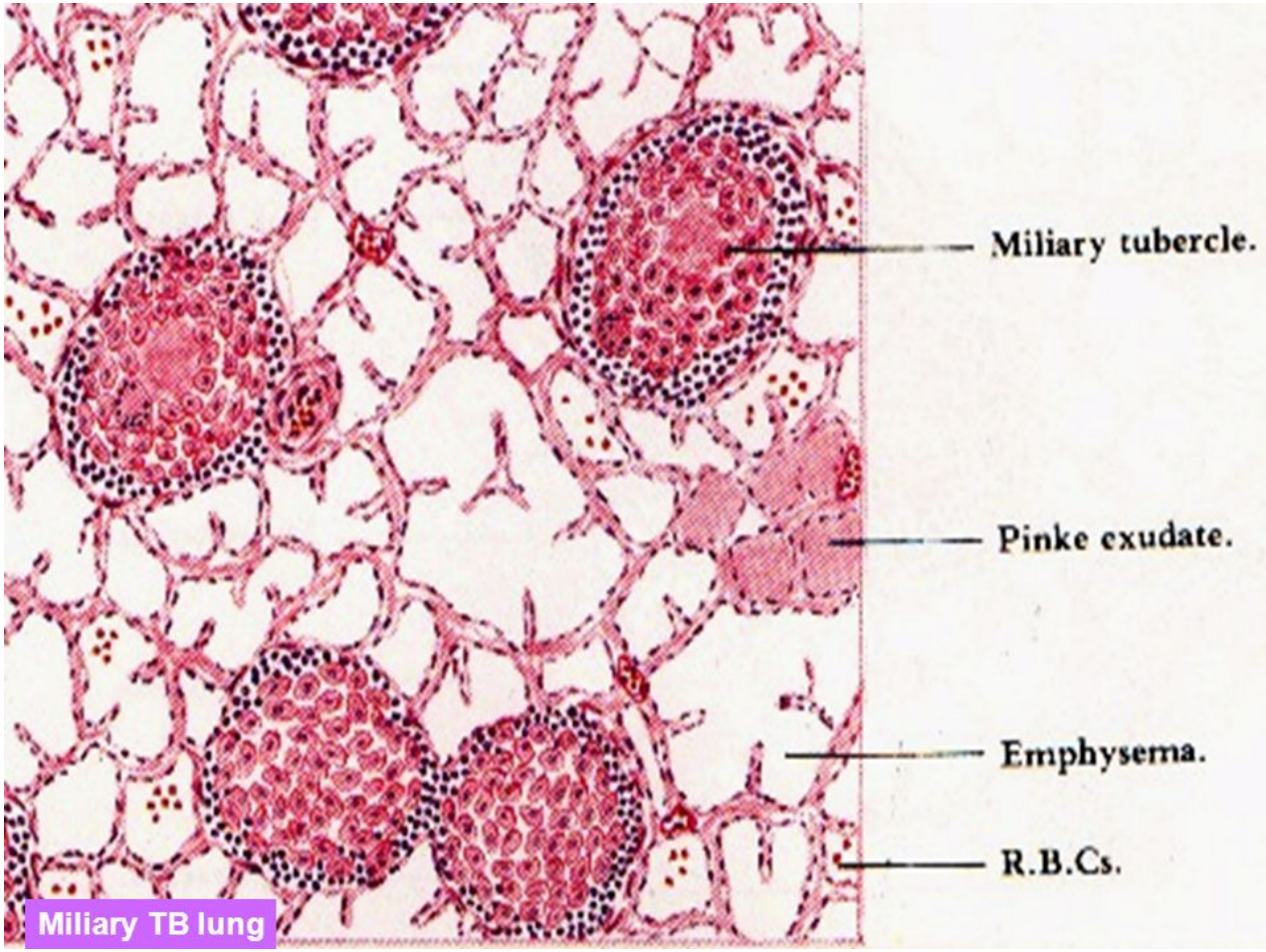
Microscopy- Ghon's focus



Outcomes of primary TB:

- **It is asymptomatic, with the only evidence of the disease being a positive tuberculin skin test result and calcified lesions seen on the chest radiograph.**
- **In immune compromised patients, primary tuberculosis may progress, causing more extensive destruction of lung tissue and spread within the lung or to the other body organs (miliary TB).**

Miliary TB



Miliary TB: millet seed-sized lesion (1 mm diameter)

2. Secondary TB:

- **It represents either re-infection from inhaled droplet as in endemic areas or reactivation of a previously healed primary lesion**
- **It is classically localized to the apex of one or both upper lobes.**
- **The regional Lymph nodes involvement is less than they are in primary TB**
- **Cavitation occurs which leads to erosion of airways**

Cavitation TB

Complications of secondary TB:

1. Progressive pulmonary TB:

The apical lesion enlarges with expansion of the caseation area

2. Miliary pulmonary disease:

Individual lesions which are microscopic or small (2 mm) named miliary means millet-seed like yellow-white foci

3. Endobronchial, endotracheal and laryngeal TB:

This occurs when infective material is spread through lymphatics or from expectorated infective material, the mucosal lining become studded with minute granulomatous lesions.

4. Systemic miliary TB:

This occurs when the infective foci in the lungs invade the pulmonary venous return to the heart. The most infected organs are liver, kidneys, spleen, bone marrow, meninges, adrenals, fallopian tubes and epididymis

5. Isolated-organ TB:

It may appear in anyone organ or tissue seeded hematogenously like in meninges (tuberculous meningitis), bone (tuberculous osteomyelitis), kidneys (renal tubeculosis)

6. Tuberculous lymphadenitis:

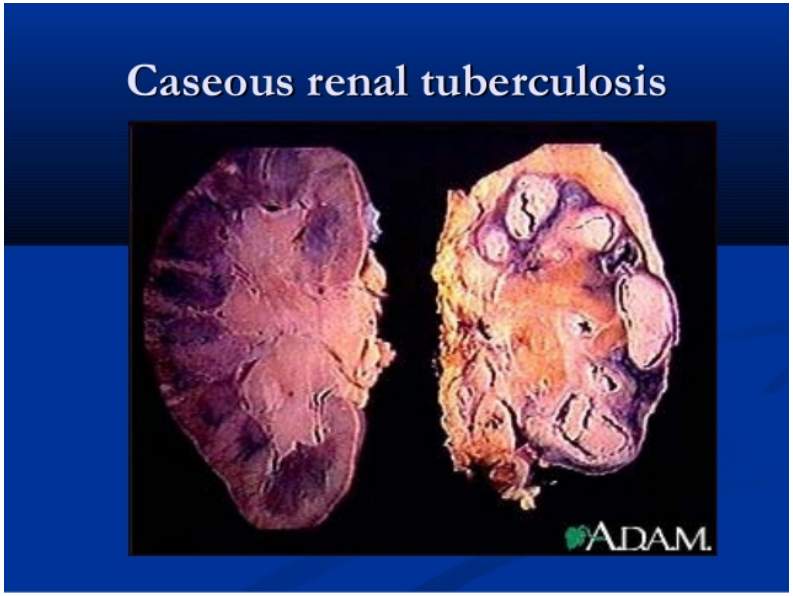
it is the most frequent form of extrapulmonary TB, occurs in the cervical region

7. Intestinal TB:

It comes from the ingestion of contaminated milk or swallowing of coughed-up infected material

Miliary TB of the liver

Cervical lymphadenitis




THANK YOU