



**SNS COLLEGE OF ALLIED HEALTH SCIENCES**  
SNS Kalvi Nagar, Coimbatore - 35  
Affiliated to Dr MGR Medical University, Chennai



**DEPARTMENT OF CARDIOPULMONARY PERFUSION CARE**  
**TECHNOLOGY**

**COURSE NAME: PATHOLOGY II**

**II YEAR**

**UNIT II : PATHOLOGY OF LUNG**

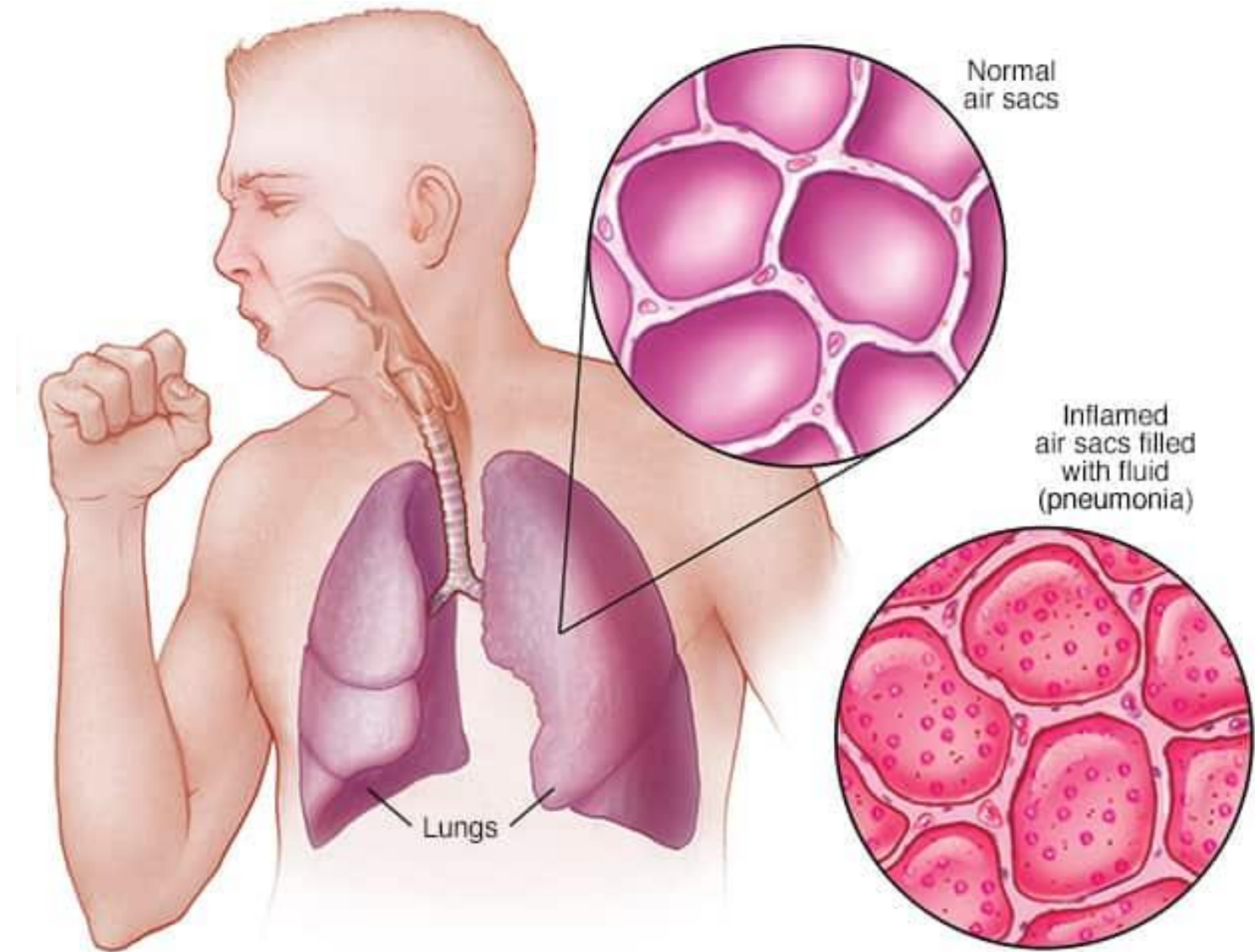
**TOPIC : PNEUMONIA – BACTERIAL & VIRAL**



## Definition



- Pneumonia is defined as **acute inflammation of the lung** parenchyma distal to the terminal bronchioles
- Terminal bronchioles consists of,  
**respiratory bronchiole**  
**alveolar ducts**  
**alveolar sacs and alveoli (fluid filled)**
- Pneumonia is the inflammation of lung with consolidation (meaning solidification) on gross and radiologic appearance of the lungs



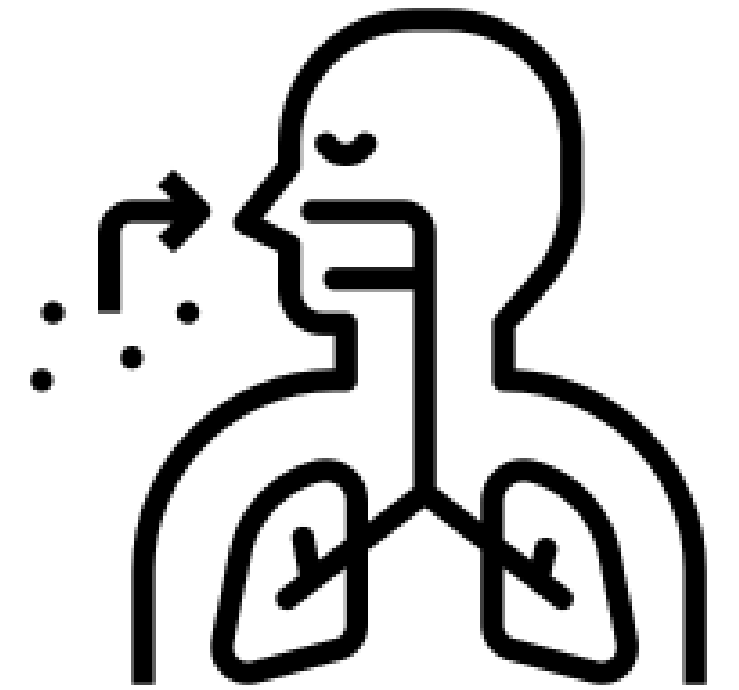
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# Pathogenesis



- *Inhalation* of the microbes present in the air
- *Aspiration* of organisms from the naso-pharynx or oropharynx.
- *Haematogenous spread* from a distant focus of infection
- *Direct spread* from an adjoining site of infection





# Pathogenesis



- *Altered consciousness* - coma, cranial trauma, seizures, cerebrovascular accidents, drug overdose, alcoholism etc.
- *Depressed cough and glottic reflexes* - old age, pain from trauma or thoraco- abdominal surgery
- *Impaired mucociliary transport & Impaired alveolar macrophage function* - cigarette smoking, viral respiratory infections, immotile cilia syndrome, inhalation of hot or corrosive gases and old age.
- *Endobronchial obstruction* - tumour, foreign body, cystic fibrosis and chronic bronchitis
- *Leucocyte dysfunctions* - AIDS, immunosuppressive therapy



# Classification of Pneumonia



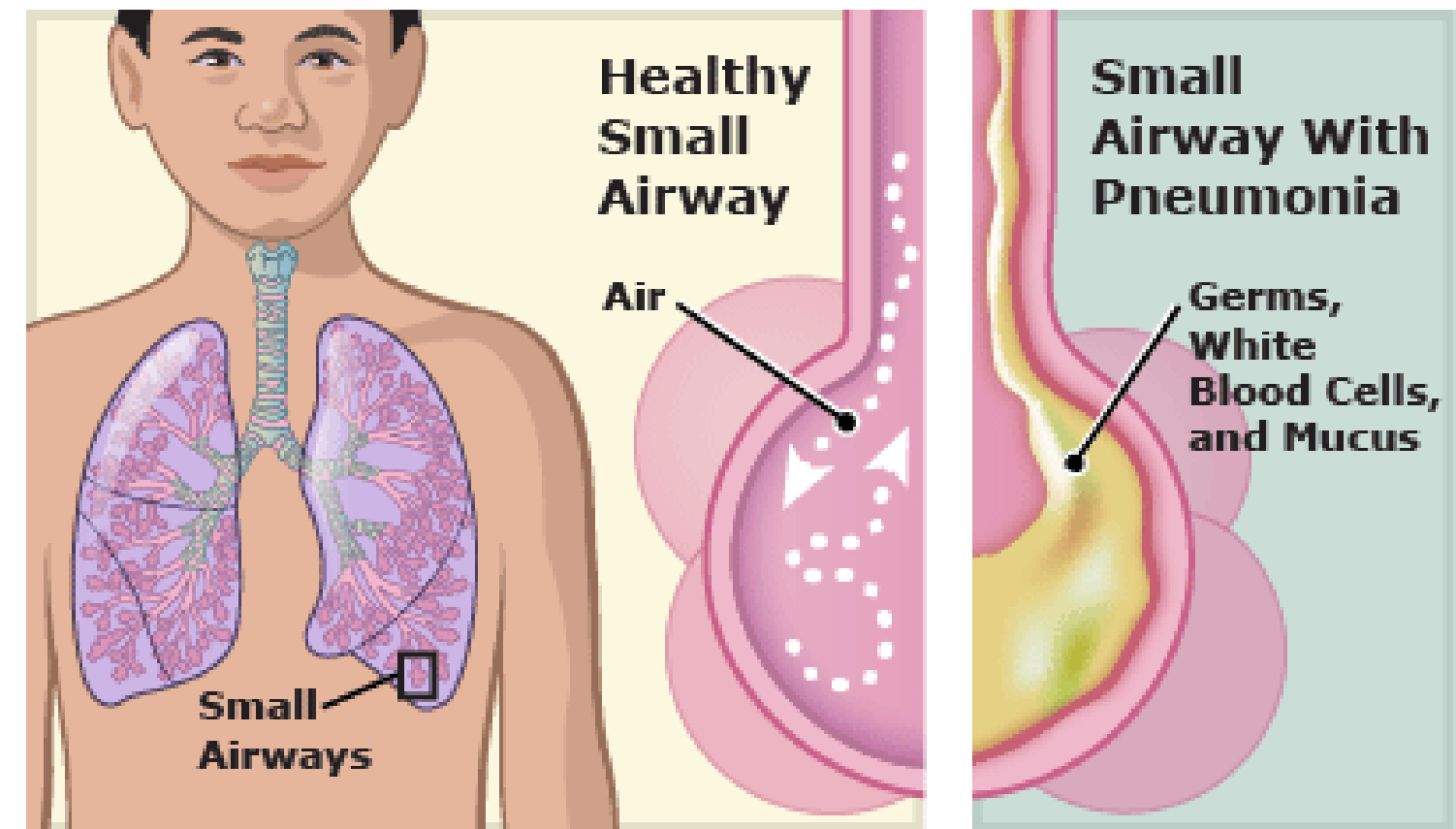
- *Bacterial pneumonia* - Lobar pneumonia & Bronchopneumonia (Lobular pneumonia)
- *Viral and mycoplasmal pneumonia* - (Primary atypical pneumonia)
- *Other types of pneumonias*
  - I. *Pneumocystis carinii* pneumonia
  - II. *Legionella* pneumonia (Legionnaire's disease)
  - III. Aspiration (inhalation) pneumonia
  - IV. Hypostatic pneumonia
  - V. Lipid pneumonia



# Lobar Bacterial Pneumonia – Etiology



- *Pneumococcal pneumonia* - *Streptococcus pneumoniae* (a lancet-shaped diplococcus)
- *Staphylococcal pneumonia* - *Staphylococcus aureus* by haematogenous spread of infection
- *Streptococcal pneumonia* -  $\beta$ -haemolytic streptococci causes pneumonia rarely
- *Gram-negative aerobic bacteria* - *Haemophilus influenzae*, *Klebsiella pneumoniae*, *Escherichia coli*,





# Lobar Bacterial Pneumonia – Morphology



## 4 sequential pathologic phases

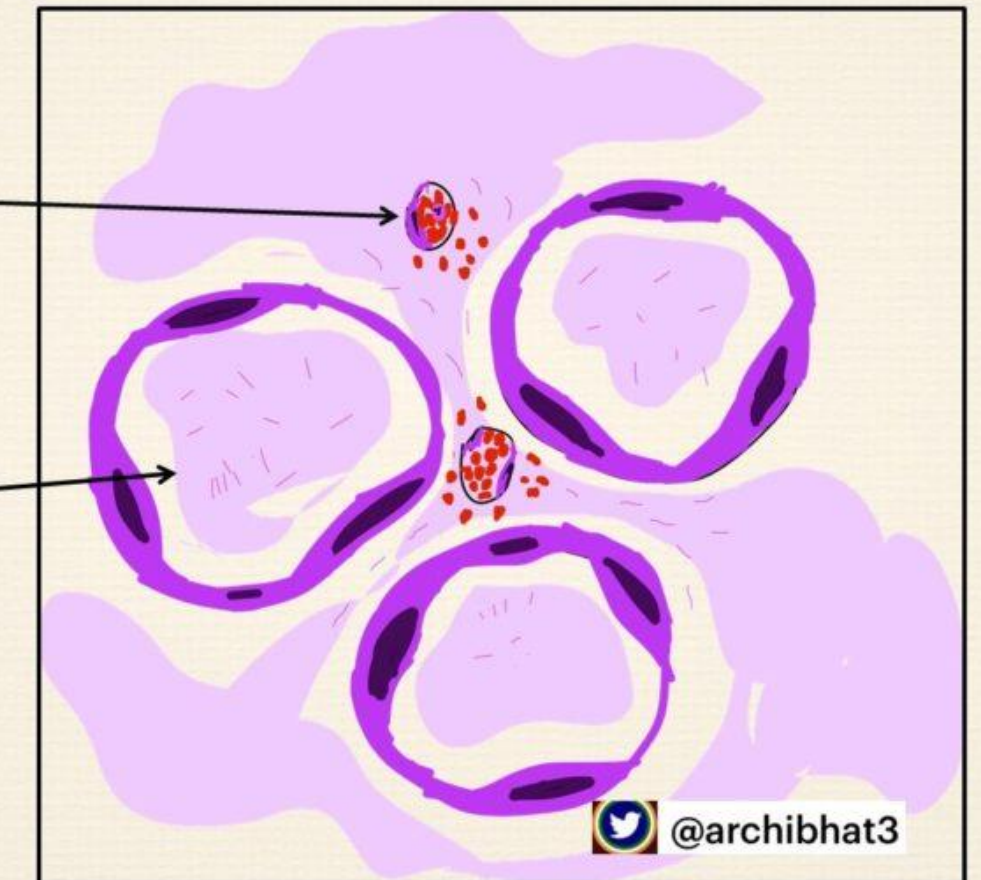
### *Stage of congestion (initial phase)*

- Lasts for 1 – 2 days
- Affected lobe is enlarged, heavy, dark red and congested.
- Cut surface exudes blood-stained frothy fluid.

## Stage of congestion

Congested capillaries in the interstitium

Alveoli filled with fluid, lined by pneumocytes





# Lobar Bacterial Pneumonia – Morphology

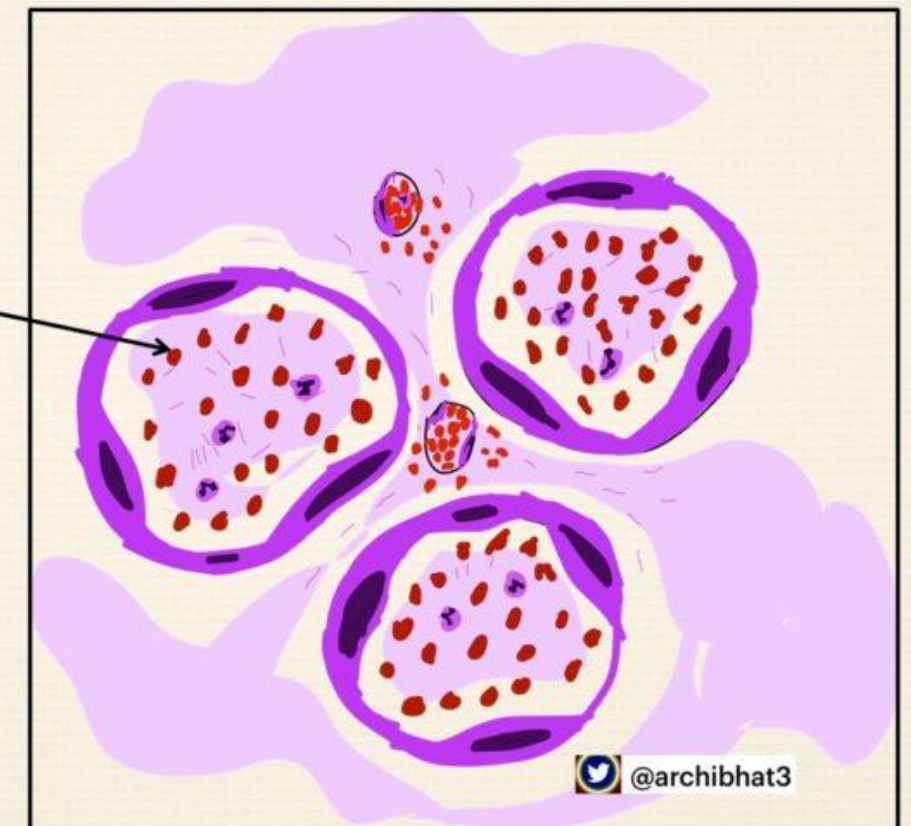


## *Red hepatisation (early consolidation)*

- lasts for 2 to 4 days
- *hepatisation* - liver-like consistency of the affected lobe on cut section.
- The cut surface of the involved lobe is airless, red-pink, dry, granular

## Stage of Red hepatisation

RBCs, bacteria and few neutrophils in alveolar spaces







# Lobar Bacterial Pneumonia – Morphology



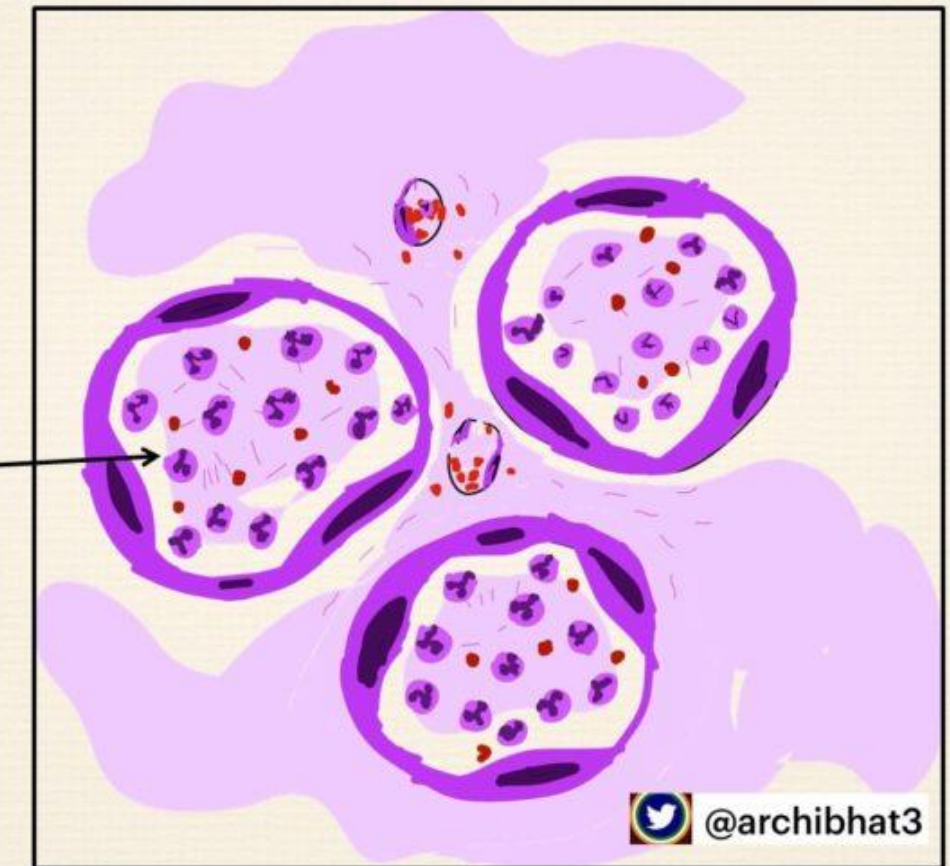
## *Grey hepatisation: late consolidation*

- Lasts for 4 to 8 days
- Affected lobe is firm and heavy
- The cut surface is dry, granular and grey in appearance with liver like consistency

## Stage of Grey hepatisation

Predominantly neutrophils in alveolar spaces

The RBCs undergo disintegration .





# Lobar Bacterial Pneumonia – Morphology

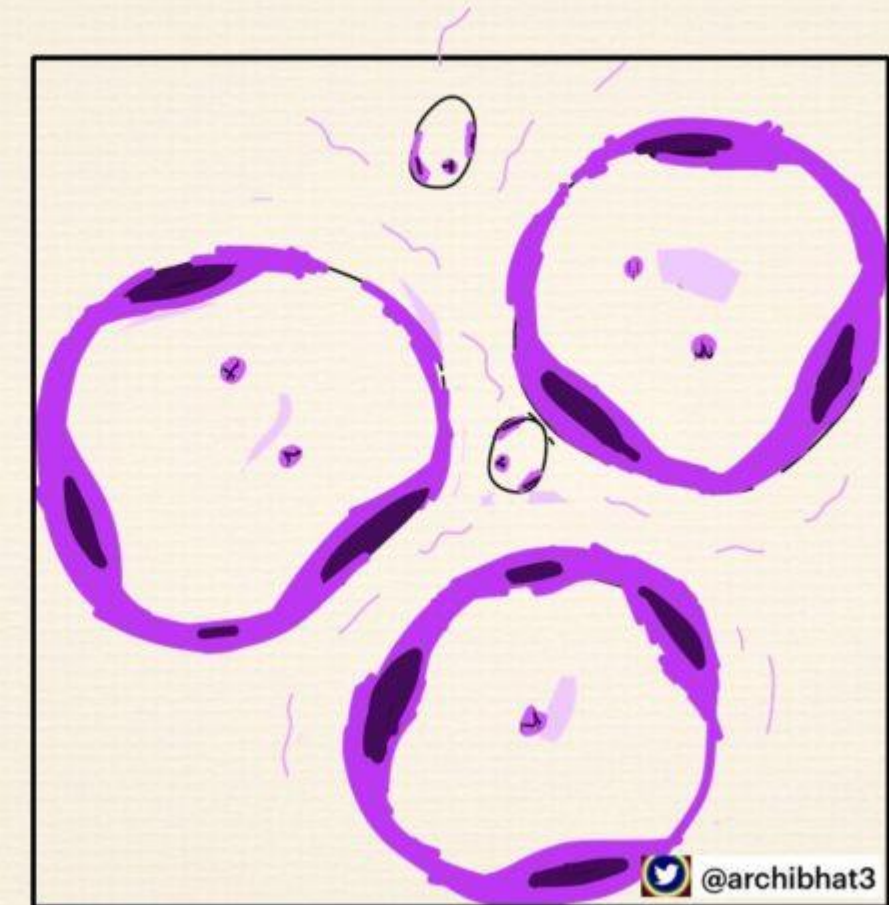


## *Resolution*

- Stage begins by 8<sup>th</sup> to 9<sup>th</sup> day
- Infected exudate coughed out, ingested by macrophages or organised by fibrosis

## Stage of Resolution

The alveolar spaces look nearly normal now!

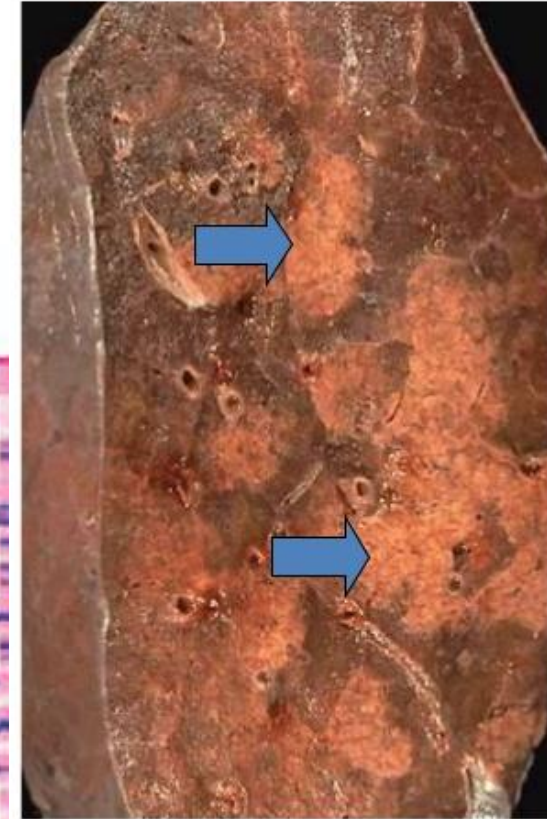
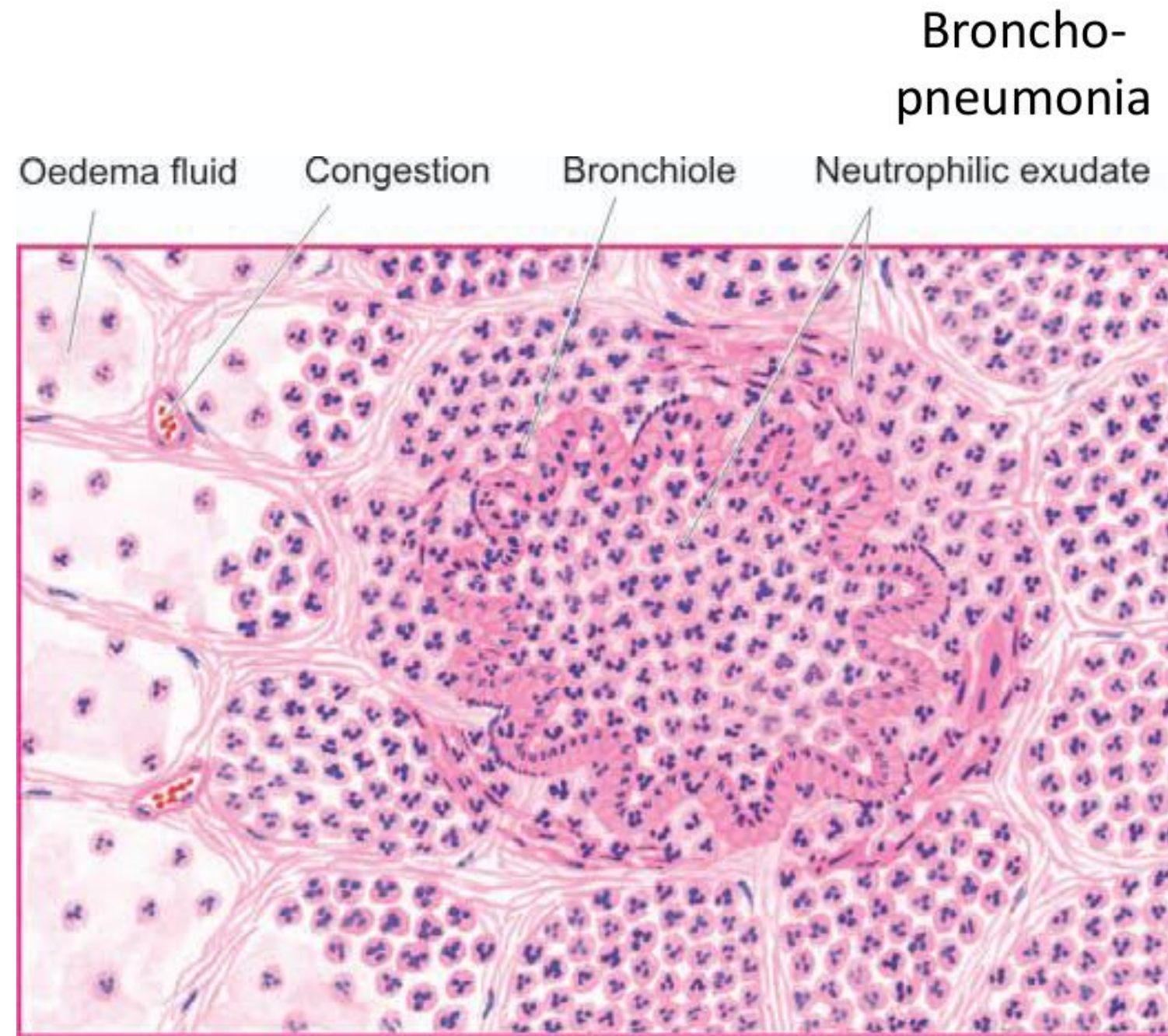




# Bronchopneumonia (Lobular Pneumonia)



- Infection of the terminal bronchioles that extends into the surrounding alveoli resulting in patchy consolidation of the lung.
- Patchy areas of red or grey consolidation affecting one or more lobes

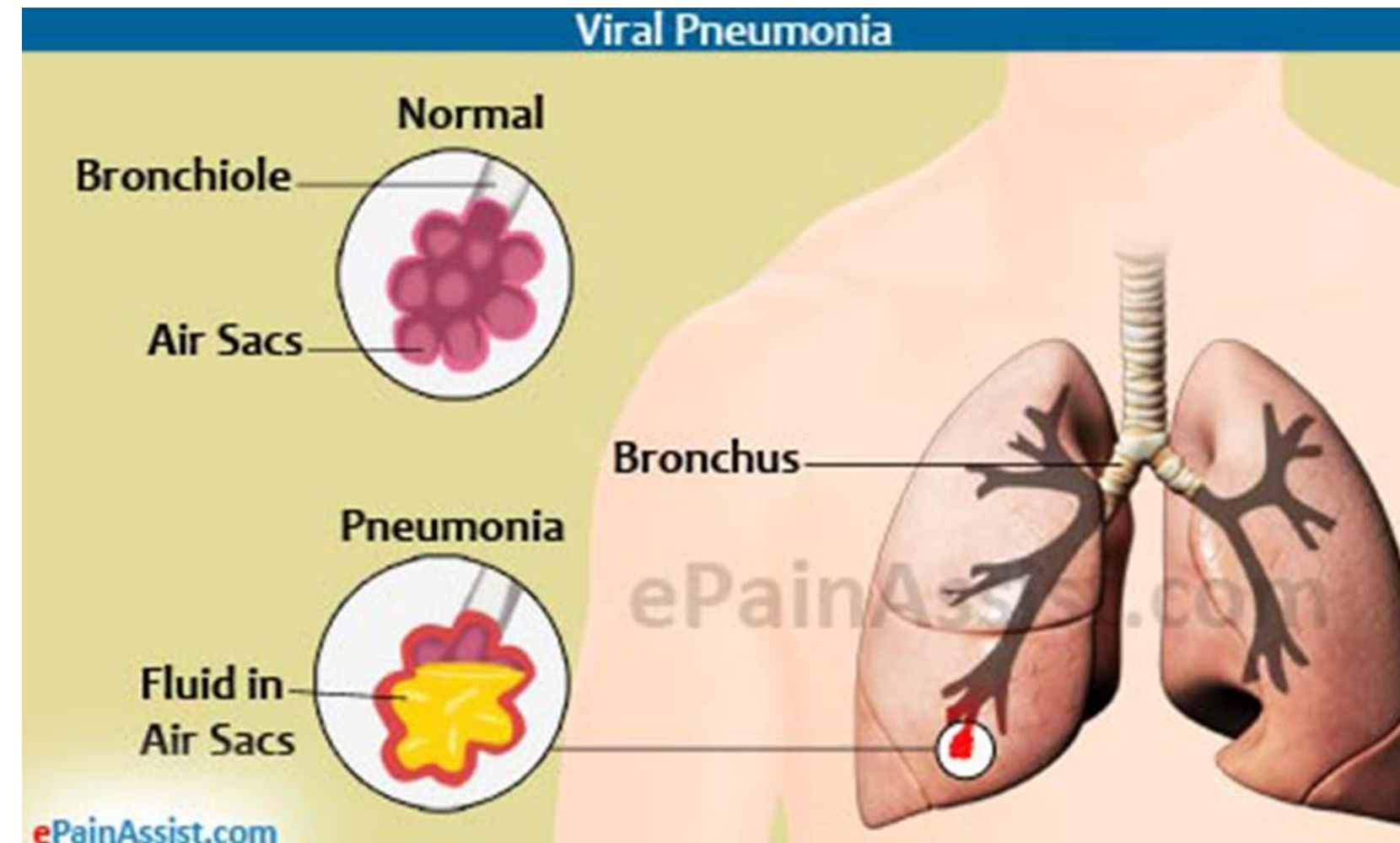




# Viral Pneumonia



- Patchy inflammatory changes, largely confined to interstitial tissue of the lungs, without any alveolar exudate
- **Etiology** are *respiratory syncytial virus (RSV)*, influenza virus, cytomegaloviruses (CMV), etc.,
- The circumstances favouring such extension of infection are malnutrition, chronic debilitating diseases and alcoholism.

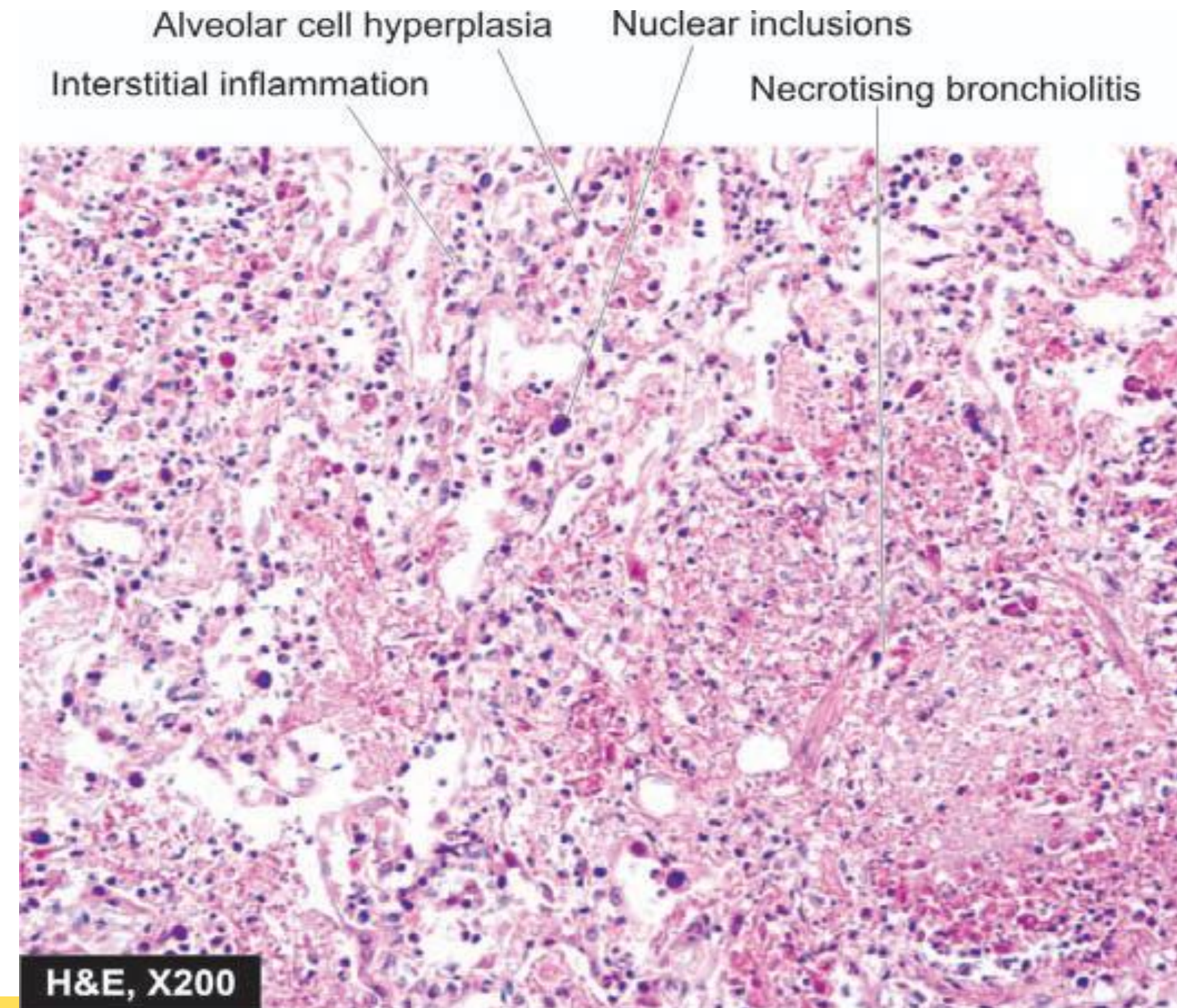




# Viral Pneumonia - Morphology



- **Interstitial inflammation** - There is thickening of alveolar walls due to congestion
- **Necrotising bronchiolitis** - foci of necrosis of the bronchiolar epithelium
- **Reactive changes** - multinucleate giant cells
- **Alveolar changes** - fibrin formation

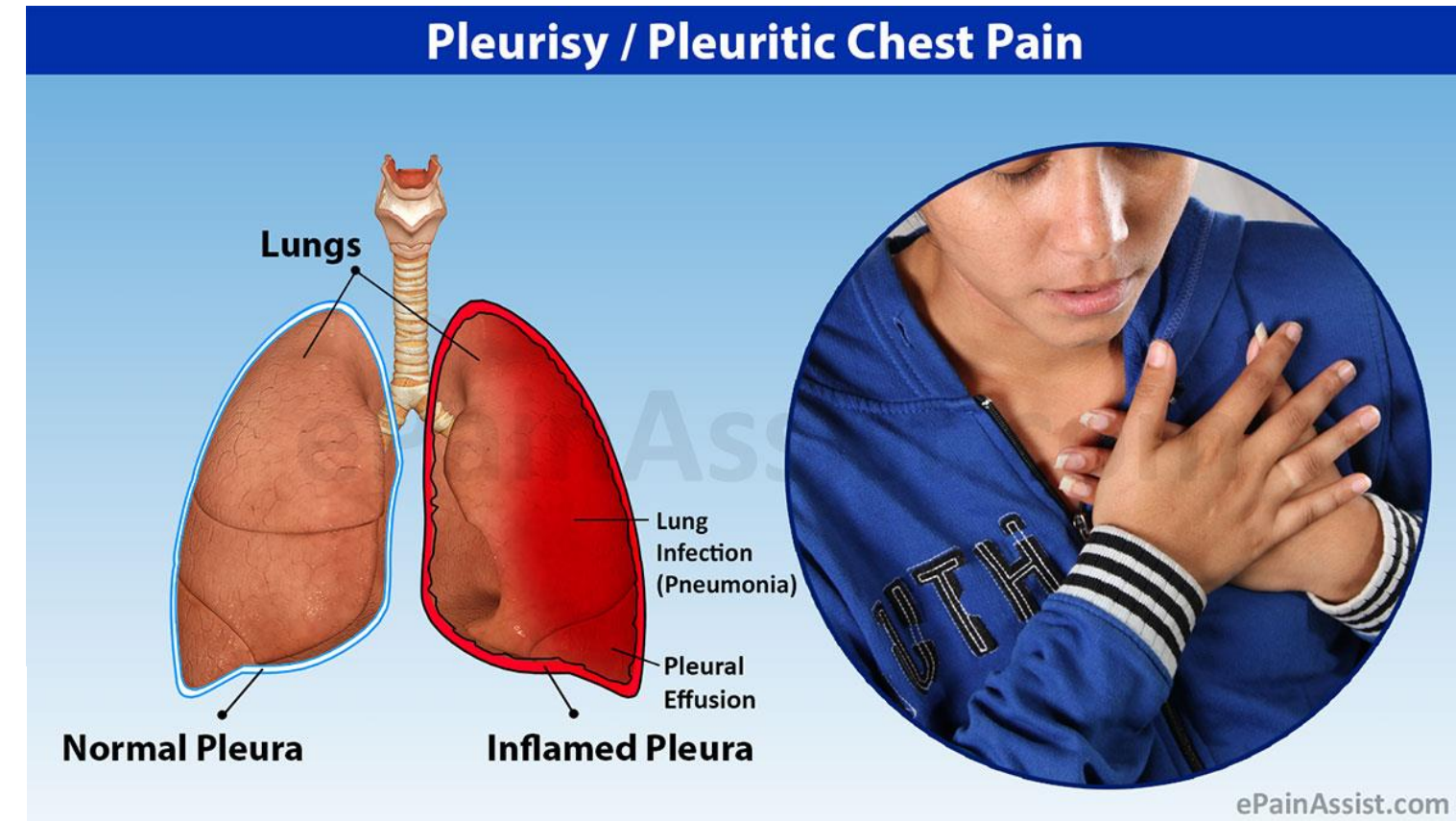
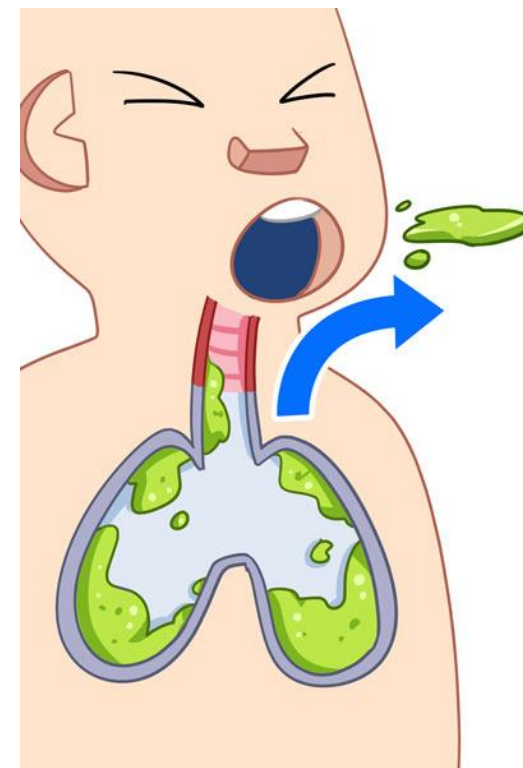




# Clinical Features



- Shaking
- Chills, fever, malaise with pleuritic chest pain
- Dyspnoea and cough with expectoration which may be mucoid
- Tachycardia, and tachypnoea

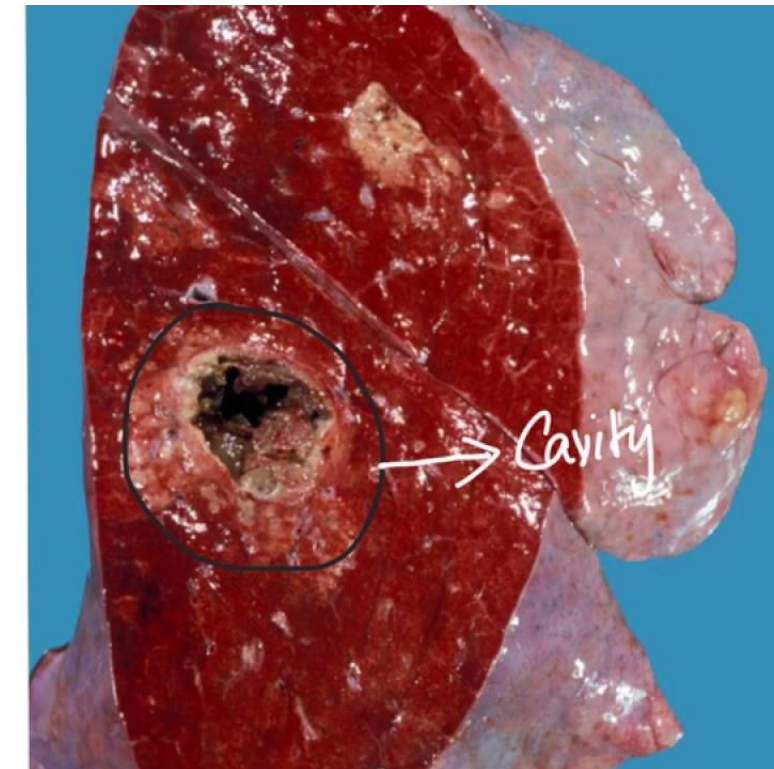




# Complications



- *Organisation* - resolution issues
- *Pleural effusion* - inflammation of the pleura with effusion
- *Empyema* - encysted pus in the pleural cavity
- *Lung abscess*
- *Metastatic infection*





# Assessment



- What is Pneumonia?
- What are the pathological phases occurs in Pneumonia?
- What are the clinical symptoms present in Pneumonia?





**THANK YOU**



**References:**

Text book of Pathology – Harsh Mohan

Concise text book of Pathology – Ganga S Pilli