

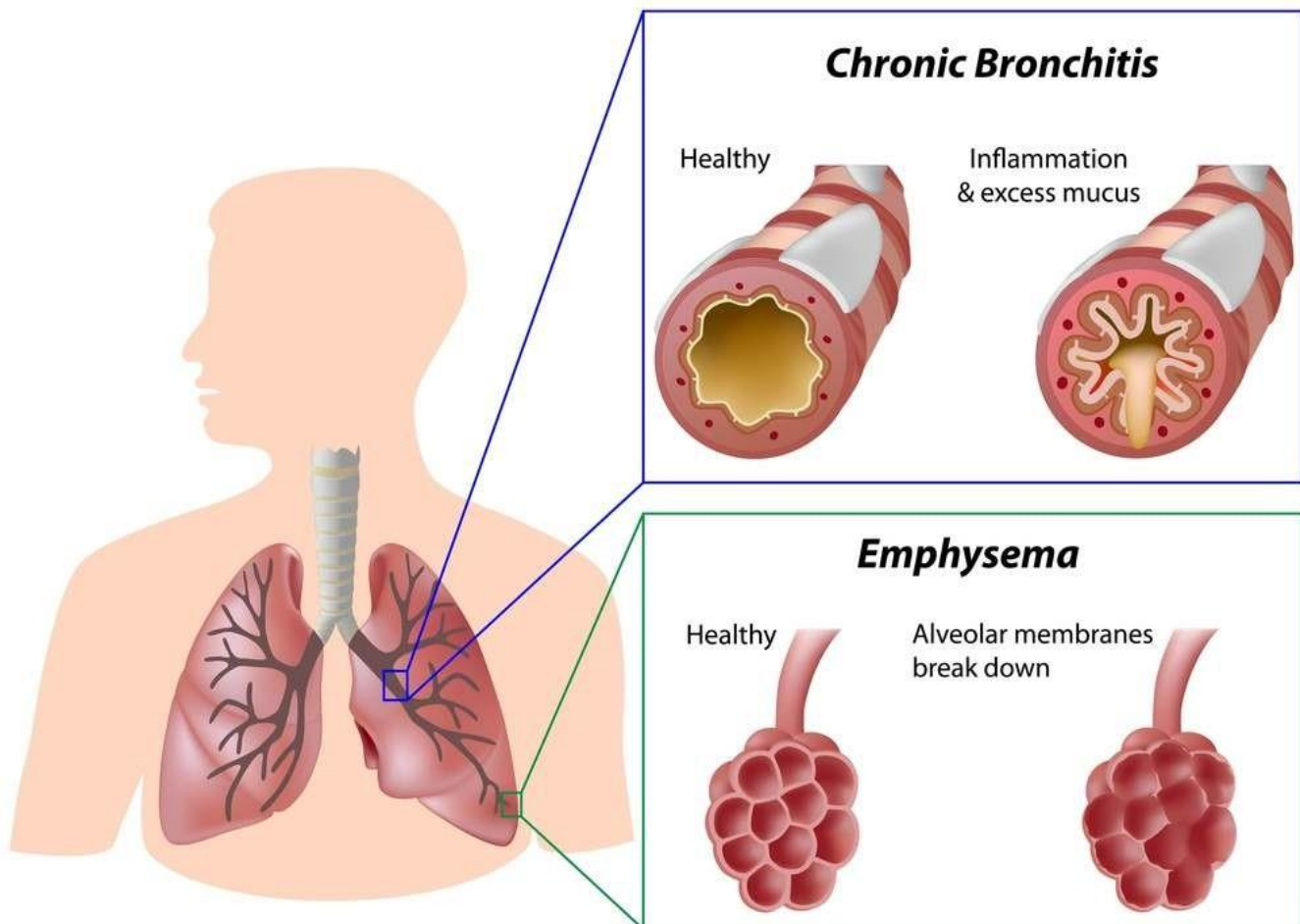
# Chronic Obstructive Pulmonary Disease (COPD)

“A chronic slowly progressing disorder characterized by air flow obstruction leading to reduced pulmonary inspiratory & expiratory capacity”

- Disease may co-exist with asthma

Two major forms of COPD

- Chronic bronchitis
- Emphysema



## Chronic bronchitis

- Characterized by excessive mucus production by the tracheo-bronchial followed by edema & bronchial inflammation leading to airway obstruction
- It is associated with cigarette smoking & air pollution

## Pathogenesis of chronic bronchitis

Two pathological processes underlining the development of chronic bronchitis include

### 1. Hypersecretory disorder

- Characterized by expectoration with increased susceptibility to respiratory infections
- Normally, cilia & mucus in the bronchi protect against inhaled irritants which are trapped and expectorated

- Persistent irritation causes proliferation of mucus secreting glands & goblet cells in the bronchial epithelium leading to hypersecretion of thick & viscous mucus
- Accumulation of mucus in turn causes inflammation and recurrent viral & bacterial infections

## 2. Chronic inflammation & edema causes thickening of bronchio & alveolar walls

- Alveoli gets distorted, affects blood vessels closely associated with them, leading to vasoconstriction and pulmonary hypertension
- Reduction of gas exchange across alveolar epithelium – hypoxemia
- Sustained pulmonary hypertension – increased right ventricular pressure within heart, right ventricular hypertrophy and failure
- Pulmonary edema results followed by activation of renin angiotensin, aldosterone system, salt & water retention – reduction in renal blood flow

## **Emphysema**

- Condition of permanent destructive enlargement of respiratory bronchioles, alveolar ducts & alveolar sac
- Adjacent alveoli becomes indistinguishable from one another

## 2 main consequence of emphysema

- Loss of available gas space & impaired gas exchange
- Loss of elastic recoil in the small airways leading them to collapse during expiration

## **Pathogenesis of emphysema**

Arise as a consequence of 2 critical imbalances

1. Protease – antiprotease imbalance
2. Oxidant – antioxidant imbalance

### Protease – anti protease theory

- Emphysema results from gradual progressive loss of elastic tissue in lungs due to an imbalance between proteolytic enzymes & protective factors
- Macrophages & neutrophils releases lysosomal enzymes (elastase) – capable of destroying connective tissue in the lungs
- Normal condition – protective mechanism called  $\alpha_1$  – anti trypsin or  $\alpha_1$  – protease inhibitor inhibits proteolytic enzyme and prevent damage
- $\alpha_1$  – anti trypsin is present in serum, tissue fluids & macrophages
- Deficiency of  $\alpha_1$  – anti trypsin causes destruction of elastic tissue leading to emphysema

### Oxidant – antioxidant imbalance

- Normally lungs contains anti-oxidants like SOD, glutathione - reduces oxidative damage
- Tobacco smoke, activated neutrophils – increases oxygen free radicals – depletes antioxidant mechanism – tissue damage
- Inactivation of antiproteases, functional deficiency without enzyme deficiency

## PINK PUFFER

## BLUE BLOATER



### Symptoms

- Chronic cough ( after 20 or > cigarettes/day)
- Dyspnea (during physical activity and rest)
- Frequent respiratory infections
- Production of purulent sputum
- Bluish discoloration of lips and nail beds
- Morning headaches
- Wheezing
- Weight loss
- Pulmonary hypertension
- Peripheral oedema
- Hemoptysis

### Summary

- COPD is the most prevalent manifestation of obstructive lung disease, mainly comprises chronic bronchitis and emphysema
- Reduction of overall personal exposure to tobacco smoke, occupational dusts, chemicals and pollutants is an important goal to prevent the onset and progression of COPD
- Risk factors for COPD include host factors (a, -antitrypsin deficiency and airway hyperresponsiveness) and exposures (tobacco smoke, occupational dusts and chemicals, indoor and outdoor pollutants, infections) and socio-economic status