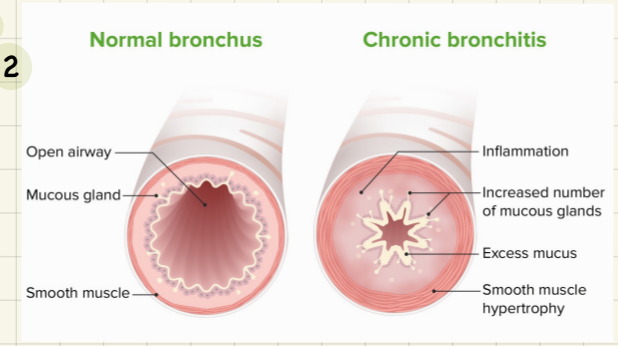
Obstructive lung diseases 2

(airway)

② CHRONIC BRONCHITIS

defined by the presence of a persistent productive cough for at least 3 consecutive months in at least 2 years.

- Mainly occur in the 40- to 65-year-old age group, mainly smokers.



PATHOGENESIS

environmental irritants
•cigarette smoking.
• sulfur dioxide
•nitrogen dioxide

•cigarette smoking.
• sulfur dioxide
•nitrogen dioxide

the airflow obstruction in chronic bronchitis results from:
(1) small airway disease, induced by mucous plugging of the bronchiolar lumen.
(2) coexistent emphysema

emphysema + chronic bronchitis → COPD

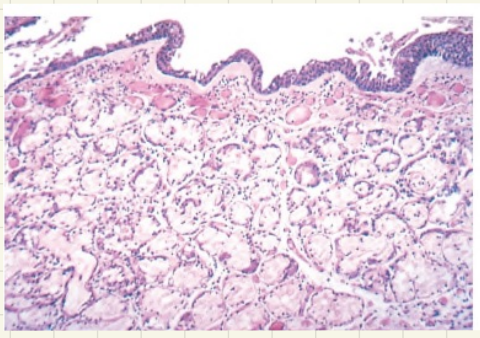
MORPHOLOGY

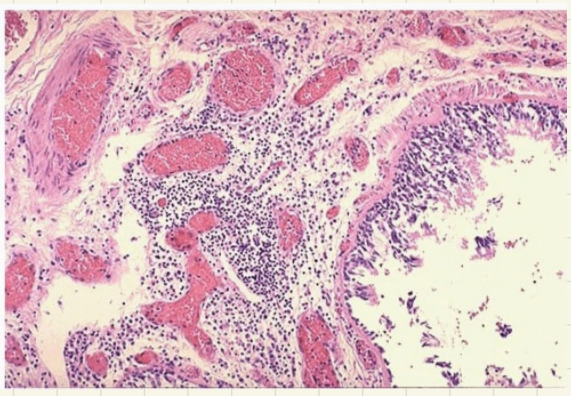
Gross:

the mucosal lining of the larger airways usually is hyperemic and swollen

Histopathology:

➢ enlargement of the mucus-secreting glands.
➢ Variable numbers of inflammatory cells largely lymphocytes and macrophages.
➢ bronchiolitis obliterans: complete obliteration of the lumen as a consequence of fibrosis





CLINICAL FEATURES

The course of chronic bronchitis is quite variable, range from:
➢ cough and sputum production persist indefinitely without ventilatory dysfunction.
➢ or presented with significant outflow obstruction marked by hypercapnia, hypoxemia, and cyanosis.
(No wash out of CO_2 → CO_2 retention)
➢ Or frequent exacerbations with more rapid disease progression and poorer outcomes.

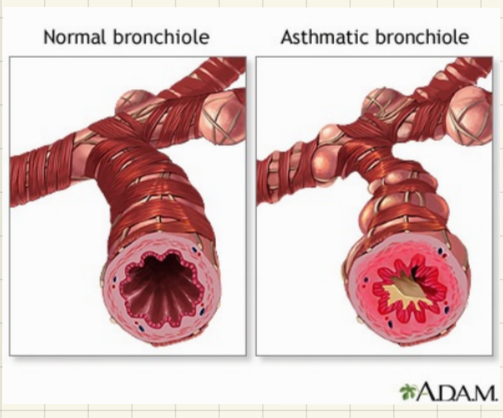
•Complication:
•pulmonary hypertension.
•cardiac failure .
•recurrent infections.
•respiratory failure

✳ With pronounced chronic bronchitis and a history of recurrent infections. Dyspnea usually is less prominent, and in the absence of increased respiratory drive the patient retains carbon dioxide, becoming hypoxic and often cyanotic "blue bloaters."

③ ASTHMA

Asthma is a chronic inflammatory disorder of the airways that causes recurrent episodes of wheezing, breathlessness, chest tightness, and cough, particularly at night and/or early in the morning. why? low plasmac cortisol levels occuring during the day as part of the normal circulation variation

•The hallmarks of asthma are:
➢ intermittent, reversible airway obstruction.
➢ chronic bronchial inflammation with eosinophils.
➢ bronchial smooth muscle cell hypertrophy and hyperreactivity.
➢ increased mucus secretion



Hygiene hypothesis

•One explanation for increased in incidence of asthma, according to which a lack of exposure to infectious organisms (and possibly nonpathogenic microorganisms as well) in early childhood results in defects in immune tolerance and subsequent hyperreactivity to immune stimuli later in life.

Asthma tends to "run" in families, but the role of genetics in asthma is complex. Genome-wide association studies have identified a number of genetic variants associated with asthma risk, some in genes enocding factors like the IL-4 receptor

PATHOGENESIS

Major factors contributing to the development of asthma include:

➢ genetic predisposition to type I hypersensitivity (atopy).

➢acute and chronic airway inflammation.

➢bronchial hyperresponsiveness to a variety of stimuli.

major antibody in Type I Hypersensitivity? IgE

triggered by diverse exposures, such as :

➢respiratory infections (especially viral).

➢airborne irritants (e.g., smoke, fumes).

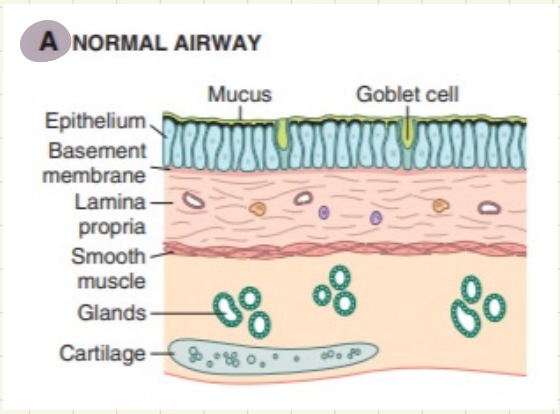
➢cold air, stress, and exercise '

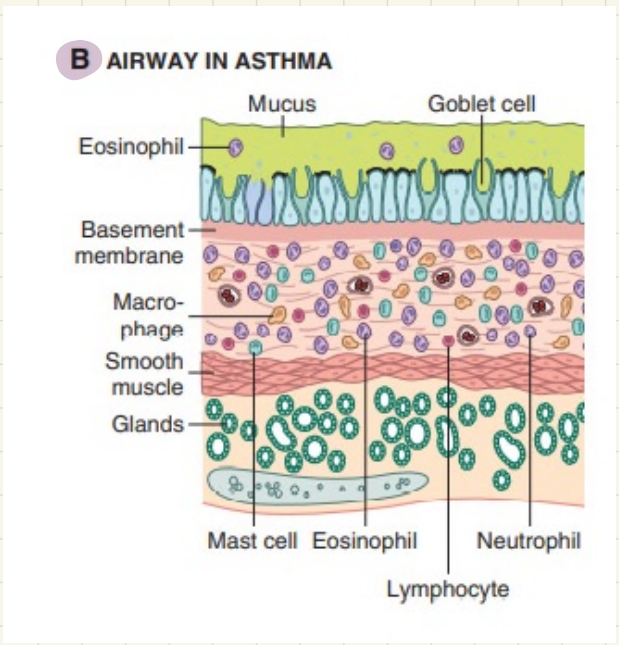
•Asthma may be subclassified as :

➢atopic (evidence of allergen sensitization).

➢nonatopic

NORMAL VS AIRWAY IN ASTHMA





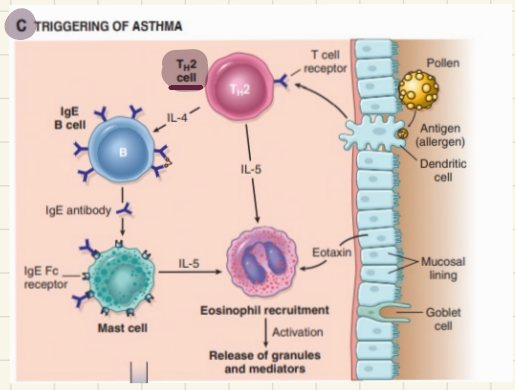
accumulation of mucus in the bronchial lumen secondary to an increase in the number of mucus-secreting goblet cells .

• hypertrophy of submucosal glands.

•intense chronic inflammation due to recruitment of eosinophils, macrophages, and other inflammatory cells.

• thickened basement membrane.

• hypertrophy and hyperplasia of smooth muscle cells.



major inflammatory mediators in Asthma?

- IL-4 } → help B-cell to produce IgE
- IL-13 }
- IL-5

Early-phase reaction

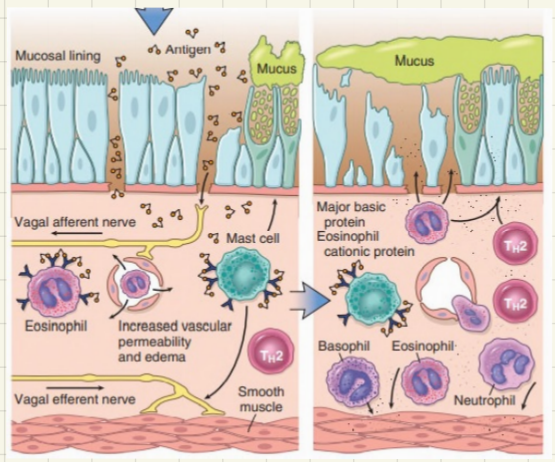
The early-phase reaction is dominated by :

*Bronchoconstriction.

increased mucus production.

vasodilation.

Bronchoconstriction is triggered by 1. mediators released from mast cells, including histamine, prostaglandin D2, and leukotrienes LTC4, D4, and E4, and also by 2. reflex neural pathways.



late-phase reaction

The late-phase reaction is *inflammatory in nature.

Inflammatory mediators stimulate epithelial cells to produce chemokines (including eotaxin, a potent chemoattractant and activator of eosinophils) that promote the recruitment of TH2 cells, eosinophils, and other leukocytes, thus amplifying an inflammatory reaction .

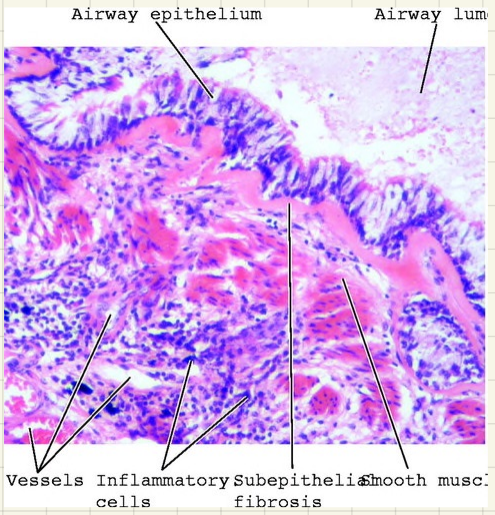
Repeated bouts of inflammation lead to structural changes in the bronchial wall that are collectively referred to as airway remodeling.

• These changes include :

➢hypertrophy of bronchial smooth muscle and mucus glands.

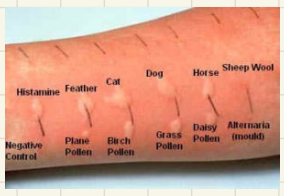
➢increased vascularity.

➢ deposition of subepithelial collagen, which may occur as early as several years before initiation of symptoms.



SUBTYPES

1. ATOPIC ASTHMA



This is the most common type of asthma and is a classic example of type I IgE-mediated hypersensitivity reaction.

- It usually begins in childhood.
- A positive family history of atopy and/or asthma is common, and the onset of asthmatic attacks is often preceded by allergic rhinitis, urticaria, or eczema.
- A skin test with the offending antigen results in an immediate wheal-and-flare reaction.

2. NON-ATOPIC ASTHMA

- Patients with nonatopic forms of asthma do not have evidence of allergen sensitization, and skin test results usually are negative.
- A positive family history of asthma is less common.
- Respiratory infections due to viruses (e.g., rhinovirus, parainfluenza virus) and inhaled air pollutants are common triggers.
- It is thought that virus-induced inflammation of the respiratory mucosa lowers the threshold of the subepithelial vagal receptors to irritants

3. DRUG-INDUCED ASTHMA

- Several pharmacologic agents provoke asthma, aspirin being the most striking example.
- Patients with aspirin sensitivity present with recurrent rhinitis, nasal polyps, urticaria, and bronchospasm.
- The precise pathogenesis is unknown but is likely to involve some abnormality in prostaglandin . -

4. OCCUPATIONAL ASTHMA

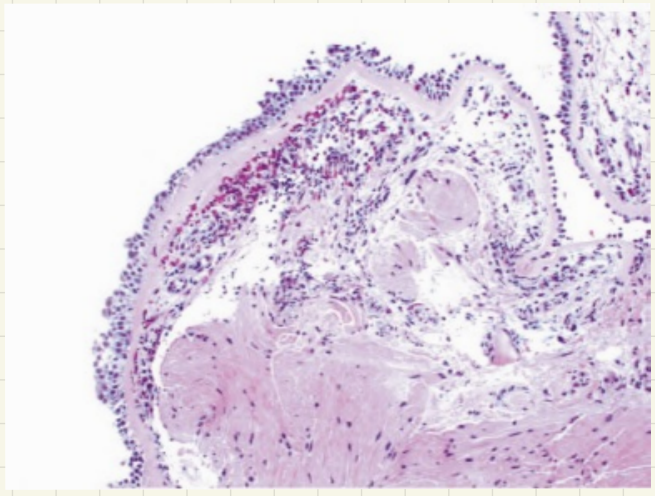
- Occupational asthma may be triggered by fumes (epoxy resins, plastics), organic and chemical dusts (wood, cotton, platinum), gases (toluene), and other chemicals

MORPHOLOGY.

- In fatal cases, the lungs are distended due to air trapping and there may be small areas of atelectasis.
- The most striking finding is occlusion of bronchi and bronchioles by thick, tenacious mucous plugs containing whorls of shed epithelium (Curschmann spirals).

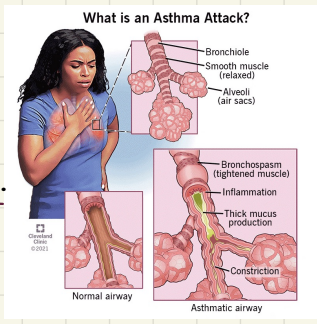
HISTOLOGY

- ➢ Thickening of airway wall .
- ➢ Sub-basement membrane fibrosis .
- ➢ Increased submucosal vascularity.
- ➢ An increase in size of the submucosal glands and goblet cell metaplasia of the airway epithelium.
- ➢ Hypertrophy and/or hyperplasia of the bronchial muscle



CLINICAL FEATURES

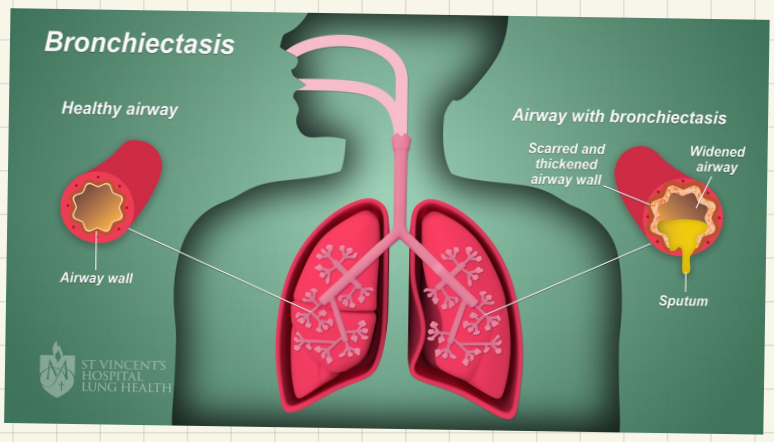
- An attack of asthma is characterized by severe dyspnea and wheezing due to bronchoconstriction and mucus plugging.
- In the usual case, attacks last from 1 to several hours and subside either spontaneously or with therapy.
- intervals between attacks are characteristically free from overt respiratory difficulties, but persistent, subtle deficits.



- Standard therapies include :
  - ➢ anti-inflammatory drugs, particularly glucocorticoids.
  - ➢ bronchodilators such as beta-adrenergic drugs and leukotriene inhibitors

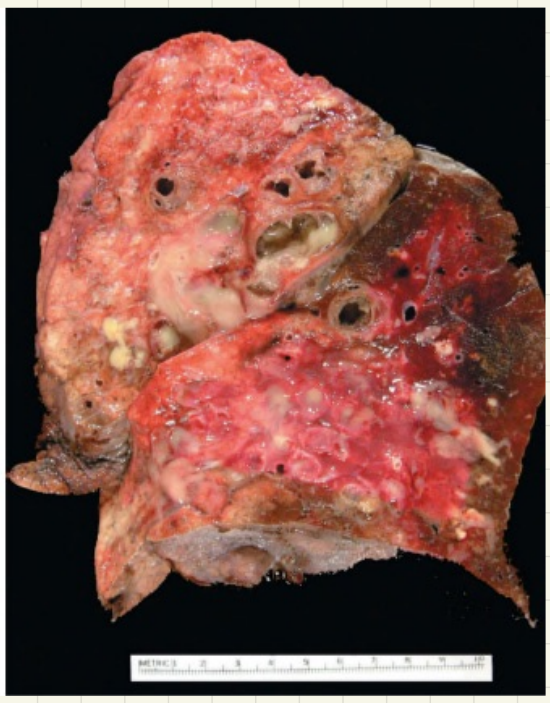
4

BRONCHIECTASIS



- Bronchiectasis is the permanent dilation of bronchi and bronchioles caused by destruction of smooth muscle and the supporting elastic tissue; it typically results from or is associated with chronic necrotizing infections.
- It is not a primary disorder, as it always occurs secondary to persistent infection or obstruction.
- Bronchiectasis gives rise to a characteristic symptom complex dominated by cough and expectoration of copious amounts of purulent sputum.

MORPHOLOGY



- Bronchiectasis usually affects the lower lobes bilaterally.
- The airways may be dilated to as much as four (x4) times their usual diameter.

The conditions that most commonly predispose to bronchiectasis include:

- Bronchial obstruction. Common causes are tumors, foreign bodies, and impaction of mucus.
- Congenital or hereditary conditions—for example: Cystic fibrosis. → thick secretions due to thickness of chloride channel.
- Immunodeficiency states, particularly immunoglobulin deficiencies.
- Primary ciliary dyskinesia: immobility of cilia → stagnation of fluids.
- Necrotizing, or suppurative, pneumonia, particularly with virulent organisms such as Staphylococcus aureus or Klebsiella spp.

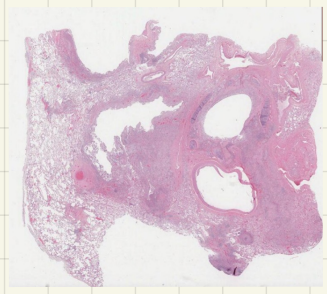
PATHOGENESIS

- Two intertwined processes contribute to bronchiectasis:

➢ obstruction: impairs clearance of secretions, providing a favorable substrate for superimposed infection.

➢ chronic infection: . The resultant inflammatory damage to the bronchial wall and the accumulating exudate further distend the airways, leading to irreversible dilation

HISTOLOGY



intense acute and chronic inflammatory exudate within the walls of the bronchi and bronchioles leads to desquamation of lining epithelium and extensive areas of ulceration.

- When healing occurs, the lining epithelium may regenerate completely; however, the injury usually cannot be repaired and abnormal dilation ,fibrosis and scarring persist.

CLINICAL FEATURES

Bronchiectasis is characterized by :

➢ severe, persistent cough associated with expectoration of mucopurulent sputum.

➢ dyspnea, rhinosinusitis, and hemoptysis.

➢ Severe, widespread bronchiectasis may lead to significant obstructive ventilatory defects, with hypoxemia, hypercapnia, pulmonary hypertension, and cor pulmonale

MCQs

1. A 63 year old man is diagnosed with Mycobacterium tuberculosis infection following bronchoscopy, with smears showing acid fast bacilli and culture growing M. tuberculosis. Which of the following statements is true?

-If alveolar macrophages fail to eradicate M. tuberculosis, the resultant inflammatory response is typically characterized by eosinophil infiltration
-M. tuberculosis cannot grow outside of the lung parenchyma
- M. tuberculosis first infects type 1 pneumocytes and replicates within the cytoplasm of the pneumocyte
-Resident macrophages within the lungs are the primary cell that is infected, upon initial infection by M. tuberculosis✅

2. Which of the following findings is most suggestive of acute respiratory distress syndrome (ARDS)/ diffuse alveolar damage (DAD)?

-Bacterial pneumonia
-Diffuse collagenous fibrosis
-Hyaline membranes✅
-Organizing pneumonia
-Proliferation of atypical pneumocytes

3. What is the most common etiology associated with this alveolar abnormality?

-Autoimmune disease
-Cigarette smoking✅
-Congenital defect
-Infection
-Malignancy