

**Pathophysiology of Bronchial Asthma:** Bronchial asthma is a chronic inflammatory disease of the airways characterized by hyperresponsiveness, airflow obstruction, and recurrent episodes of wheezing, breathlessness, chest tightness, and coughing.

**Airway Remodeling:**

- o Chronic inflammation leads to structural changes in the airway over time:
- o Smooth muscle hypertrophy and hyperplasia
- o Subepithelial fibrosis (due to deposition of collagen and extracellular matrix)
- o Goblet cell hyperplasia and increased mucus production
- o Thickening of the basement membrane
- o These changes contribute to irreversible airflow limitation in severe or poorly controlled asthma.

**Airflow Obstruction:**

- o Obstruction is caused by a combination of:
- o Bronchial smooth muscle contraction
- o Airway edema
- o Mucus plugging
- o This results in reduced airflow, especially during expiration, causing air trapping and increased work of breathing.

**Summary:** Asthma is driven by chronic inflammation and immune dysregulation, leading to airway hyperresponsiveness, reversible obstruction, and structural remodeling over time.

**Airway Inflammation:**

- o Chronic inflammation is the hallmark of asthma and is triggered by exposure to allergens, irritants, or infections.
- o Inflammatory mediators (e.g., histamine, leukotrienes, prostaglandins) cause bronchoconstriction, vascular leakage, and mucus hypersecretion.
- o Chest tightness: Caused by airway narrowing and hyperinflation.

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