SAWA UNIVERSITY

Drugs for Disorders of the Respiratory System

جامعة ساوة
كلية التقنيات الصحية والطبية
قسم تقنيات التخدير
المرحلة الثانية

المحاضرة الخامسة

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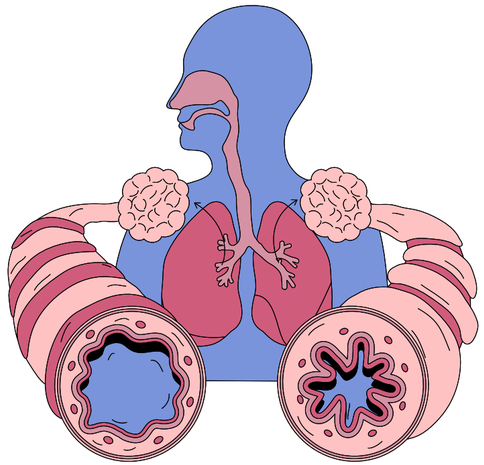
Introduction

The respiratory system is responsible for **gas exchange** — the supply of oxygen and removal of carbon dioxide.

Common respiratory disorders include:

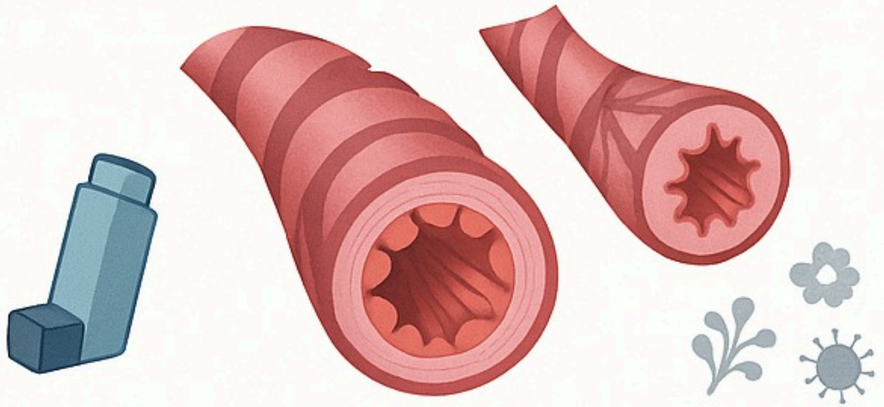
- Asthma
- Chronic Obstructive Pulmonary Disease (COPD)
- Allergic rhinitis
- Cough

Drugs used to treat these disorders are known as **bronchodilators, anti-inflammatory agents, antitussives, and expectorants.**



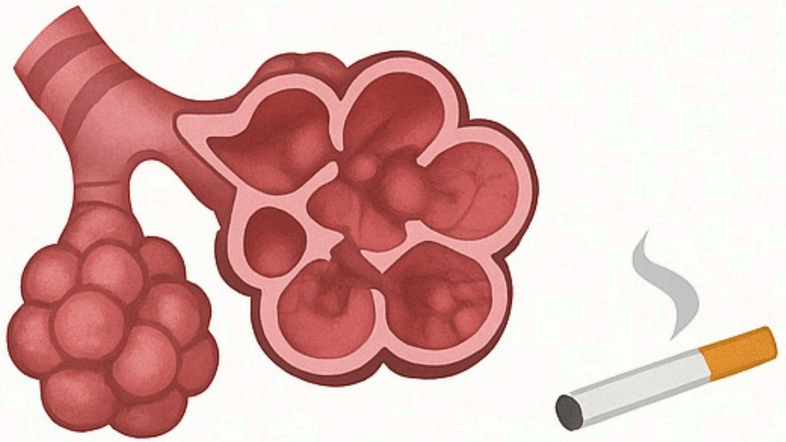
Difference Between Asthma and COPD

ASTHMA



- Reversible airway obstruction
- Triggered by allergens, exercise, stress
- Usually develops in childhood
- Intermittent symptoms
- Responds well to bronchodilators

COPD



- Progressive, irreversible damage
- Primarily caused by smoking
- Onset usually in adulthood
- Chronic symptoms
- Poor or limited response to bronchodilators

Bronchodilators

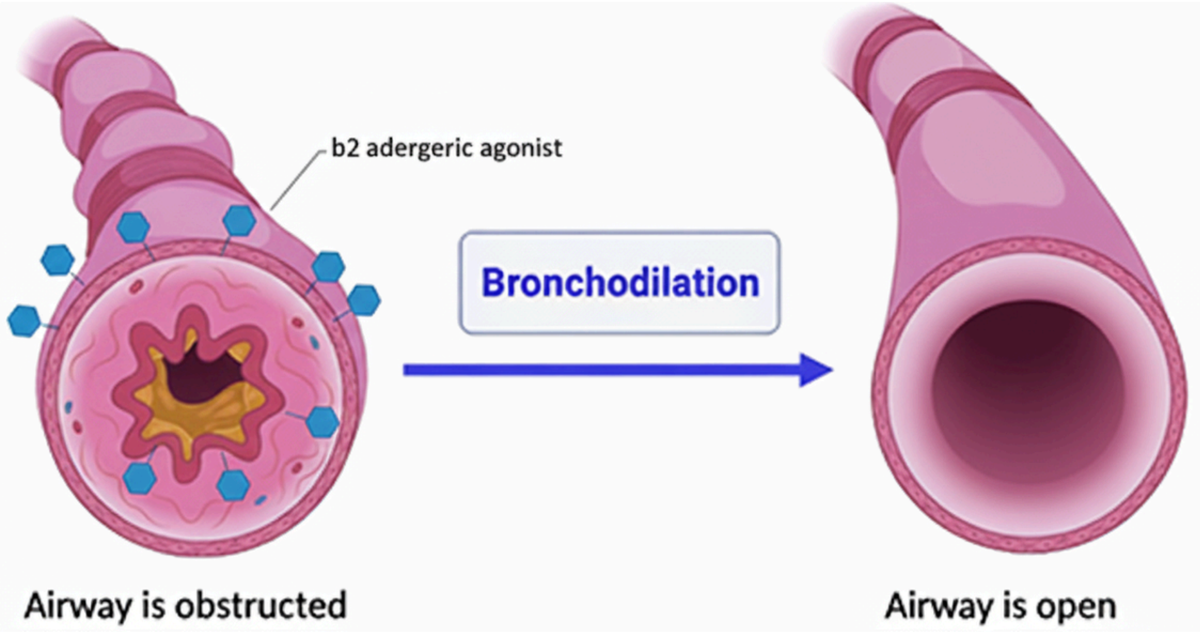
Bronchodilators are drugs that relax bronchial smooth muscles, helping to open the airways and improve airflow.

1. **β_2-Adrenergic Agonists**

These are the most effective and widely used bronchodilators.

Mechanism of Action:

They stimulate β_2 receptors in bronchial smooth muscles → relaxation of bronchial muscles → bronchodilation.

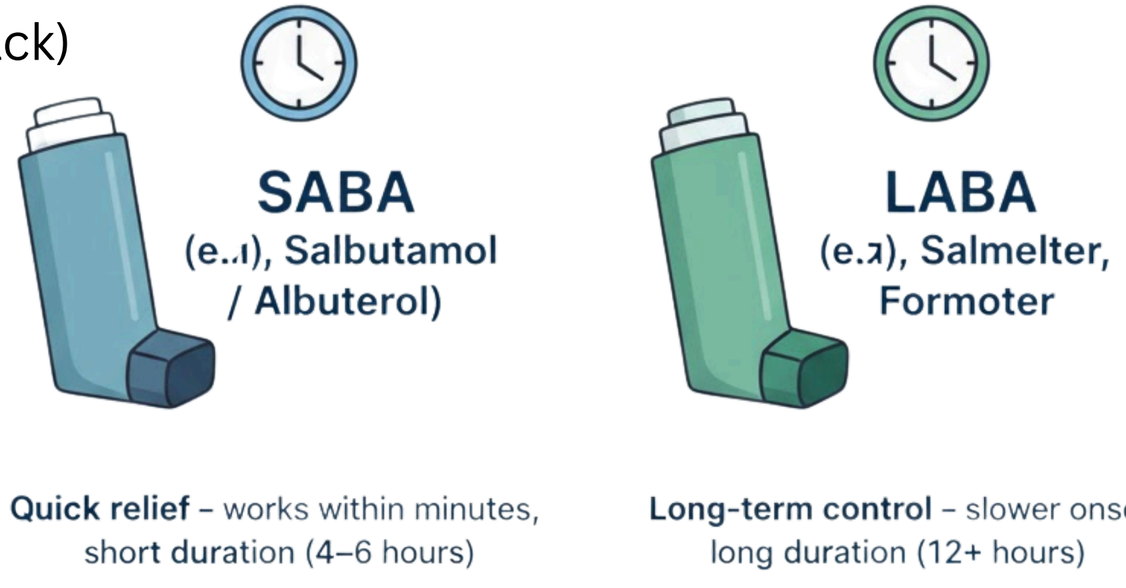


Classification of Bronchodilators

1. **Short-acting β_2 agonists (SABA): for quick relief**
   - Examples: Salbutamol (Albuterol), Terbutaline
   - Onset: Within minutes
   - Duration: 4–6 hours
   - Use: Acute asthma attack
2. **Long-acting β_2 agonists (LABA): for maintenance therapy**
   - Examples: Salmeterol, Formoterol
   - Onset: Slow
   - Duration: 12 hours
   - Use: Chronic asthma and COPD (not for acute attack)

Adverse Effects:

- Tremor
- Tachycardia
- Palpitations
- Nervousness



Anticholinergic Drugs

These drugs **block muscarinic receptors (M_3)** → prevent acetylcholine-induced bronchoconstriction.

Examples:

- Ipratropium bromide (short-acting)
- Tiotropium bromide (long-acting)

Uses:

- COPD
- Asthma (as add-on therapy)

Side Effects:

- Dry mouth
- Throat irritation

Methylxanthines

Example:

Theophylline

Mechanism:

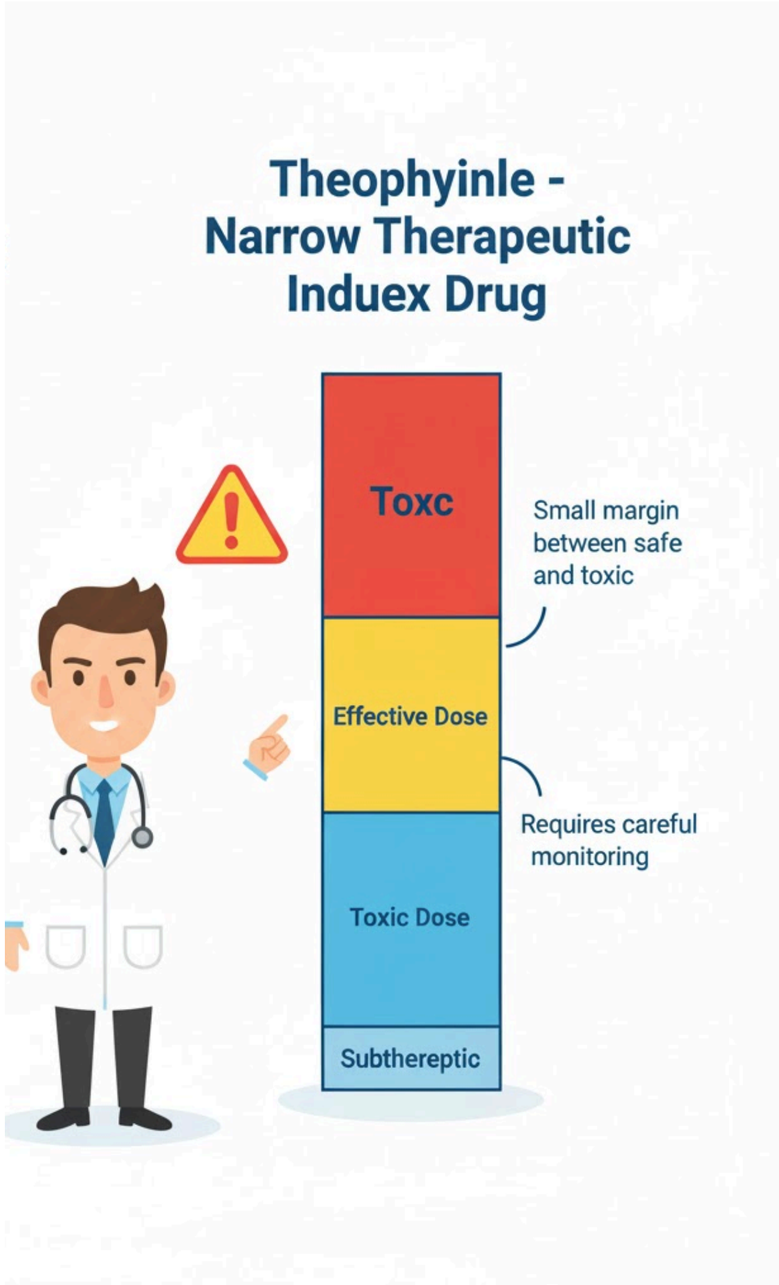
- Inhibits the enzyme phosphodiesterase (PDE) → increases cAMP → bronchodilation
- Also has mild anti-inflammatory effects.

Uses:

- Asthma
- COPD (less commonly used today)

Adverse Effects:

- Nausea, vomiting
- Insomnia
- Arrhythmia (in toxic doses)
- Narrow therapeutic index — requires blood level monitoring



Anti-inflammatory Drugs

Inflammation plays a key role in asthma and chronic airway diseases.
These drugs reduce airway swelling, mucus production, and hyperreactivity.

1. Corticosteroids

Examples:
Beclomethasone, Budesonide, Fluticasone (inhaled); Prednisolone (oral)

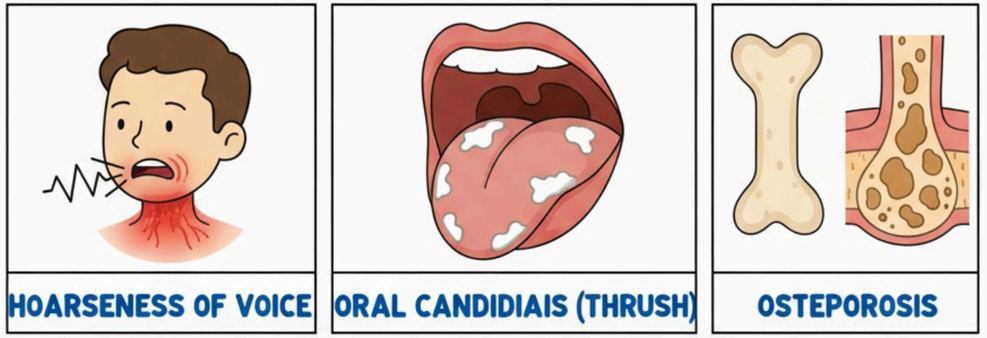
Mechanism:
Suppress inflammatory mediators and cytokines → decrease airway inflammation.

Uses:

- Asthma (maintenance therapy)
- COPD (in severe cases)

Adverse Effects:

- Hoarseness of voice
- Oral candidiasis (thrush) — prevented by mouth rinsing after inhalation
- Systemic effects with long-term use (osteoporosis, adrenal suppression)



Combination Inhalers

Many patients use inhalers combining two or more drugs for better control.

Examples:

- Salmeterol + Fluticasone
- Formoterol + Budesonide
- Ipratropium + Salbutamol

Anti-inflammatory Drugs

2. Leukotriene Modifiers

Leukotrienes cause bronchoconstriction and inflammation.

Examples:

Montelukast, Zafirlukast

Mechanism:

Block leukotriene receptors → prevent airway narrowing and inflammation.

Uses:

- Mild persistent asthma
- Allergic rhinitis

Adverse Effects:

- Headache
- Liver enzyme elevation (rare)

Drugs for Allergic Rhinitis

Allergic rhinitis is caused by inflammation of the nasal mucosa due to allergens like dust or pollen.

1. **Antihistamines (H_1 blockers):**
   - **Examples:** Cetirizine, Loratadine, Diphenhydramine
   - **Action:** Block histamine H_1 receptors → relieve sneezing, itching, and runny nose.

2. **Nasal Corticosteroids:**
   - **Examples:** Fluticasone, Mometasone
   - **Action:** Reduce nasal inflammation and congestion.

Antitussives (Cough Suppressants)

Used to suppress dry, nonproductive cough.

Examples:

- Central Acting: Codeine, Dextromethorphan (act on cough center in the medulla)
- Peripheral Acting: Benzonatate (reduce irritation of the respiratory mucosa)

Side Effects:

- Drowsiness
- Constipation (especially with codeine)

Expectorants and Mucolytics

Used to remove thick mucus from the airways.

1. Expectorants

Increase bronchial secretion and make sputum easier to cough out.

Example: Guaifenesin

2. Mucolytics

Break down mucus structure and reduce its viscosity.

Examples: Acetylcysteine, Bromhexine

Uses:

- Productive cough
- COPD and bronchitis