

Bronchodilators

Definition

- Bronchodilators are medications that **relax bronchial smooth muscle**, leading to **airway dilation**, which improves airflow.
- They are primarily used in the treatment of **asthma**, **chronic obstructive pulmonary disease (COPD)**, and other conditions causing bronchospasm.

Classification

1. Beta-2 Adrenergic Agonists

- **Short-acting (SABA):** Salbutamol (Albuterol), Terbutaline
- **Long-acting (LABA):** Salmeterol, Formoterol
- **Ultra-long-acting:** Indacaterol, Vilanterol

2. Anticholinergics (Muscarinic Antagonists)

- **Short-acting (SAMA):** Ipratropium bromide
- **Long-acting (LAMA):** Tiotropium, Aclidinium

3. Methylxanthines

- Theophylline, Aminophylline

4. Others

- **Leukotriene receptor antagonists:** Montelukast (mild bronchodilation + anti-inflammatory)
- **Biologics (monoclonal antibodies):** Omalizumab (for allergic asthma)

Pharmacological Actions

Class	Mechanism of Action
Beta-2 agonists	Stimulate β_2 receptors $\rightarrow$ $\uparrow$ cAMP $\rightarrow$ smooth muscle relaxation
Anticholinergics	Block M3 receptors $\rightarrow$ $\downarrow$ vagal tone $\rightarrow$ bronchodilation
Methylxanthines	Inhibit phosphodiesterase $\rightarrow$ $\uparrow$ cAMP $\rightarrow$ bronchodilation
Montelukast	Blocks leukotriene D4 $\rightarrow$ $\downarrow$ bronchoconstriction & inflammation

Dose (examples)

Drug	Route & Typical Dose
Salbutamol	Inhalation: 100 mcg/puff, 1–2 puffs every 4–6 hours
Salmeterol	Inhalation: 50 mcg twice daily
Ipratropium	Inhalation: 20 mcg/puff, 2–4 times daily
Tiotropium	Inhalation: 18 mcg once daily
Theophylline	Oral: 200–400 mg/day (adjusted by blood levels)

Indications

- Bronchial asthma
- COPD
- Exercise-induced bronchospasm
- **Acute severe asthma** (SABA + steroids)
- Anaphylaxis (adjuvant with epinephrine)

Contraindications

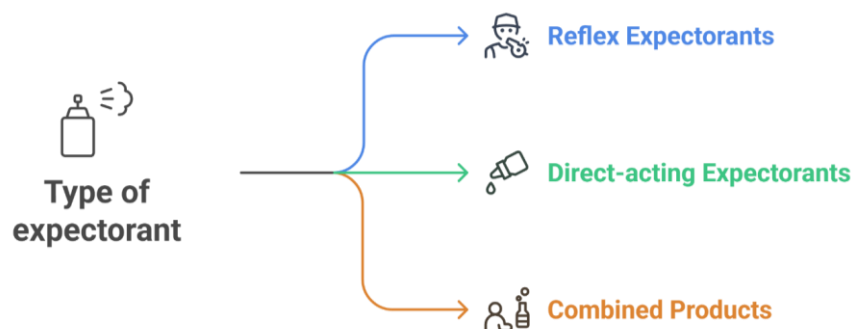
- **Beta-2 agonists:** Cardiac arrhythmias, hyperthyroidism, caution in heart disease
- **Anticholinergics:** Glaucoma, prostatic hypertrophy, bladder obstruction
- **Methylxanthines:** Seizure disorders, cardiac arrhythmias, liver disease
- **Montelukast:** Known hypersensitivity, not for acute attacks

Expectorants

Definition

- Expectorants are agents that **increase bronchial secretion or reduce mucus viscosity**, facilitating **mucus expulsion** from the respiratory tract.
- They are commonly used in **productive cough**.

Classification



1. Reflex Expectorants

- Act by gastric irritation → reflexly ↑ bronchial secretion
- *Examples:* Guaifenesin, Ipecacuanha

2. Direct-acting Expectorants

- Stimulate bronchial glands directly
- *Examples:* Potassium iodide, Sodium citrate

3. Combined Products

- Expectorants + bronchodilators + antihistamines (e.g., cough syrups)

Pharmacological Actions

- **Guaifenesin:** Enhances output of respiratory tract fluid → facilitates ciliary action and mucus clearance
- **Ipecac:** Low doses stimulate bronchial secretion via vagal reflex
- **Potassium iodide:** Increases fluidity of mucus

Dose (examples)

Drug	Typical Dose
Guaifenesin (oral)	200–400 mg every 4 hours (max 2.4 g/day)
Potassium iodide (oral)	300–600 mg/day in divided doses
Ipecacuanha syrup (low dose)	5–10 drops with caution (rarely used now)

Indications

- **Productive cough** due to:
 - Acute bronchitis
 - Chronic bronchitis
 - Respiratory infections
 - Mild asthma/COPD with mucus buildup
- **Adjunct in sputum induction** for diagnostic tests

Contraindications

- **Guaifenesin:** Hypersensitivity (rare), not recommended for children under 2 years
- **Potassium iodide:** Thyroid disorders, pregnancy, iodism
- **Ipecacuanha:** Not for long-term use; has emetic effects at higher doses

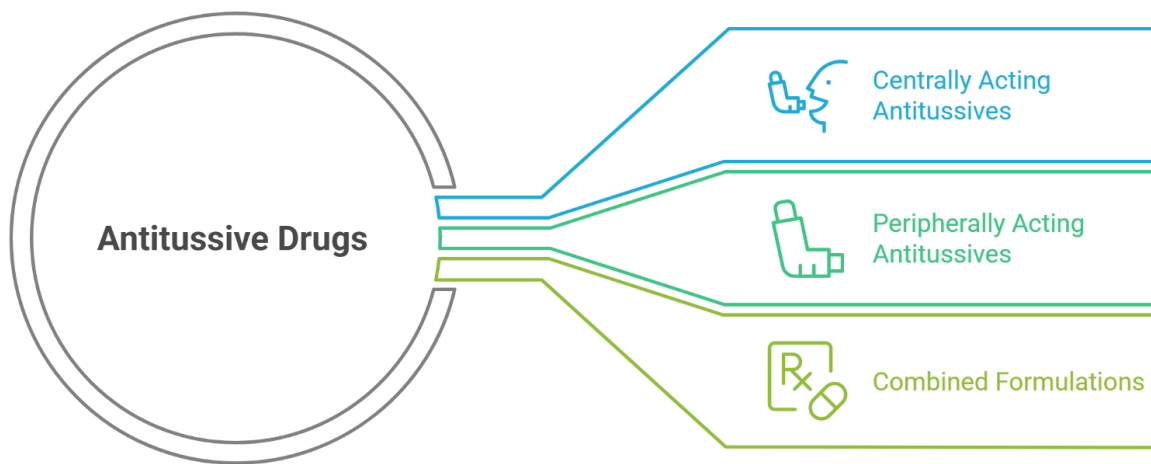
- **All expectorants:** Non-productive (dry) cough, as they may worsen discomfort

Anti-Tussive Agents (Cough Suppressants)

Definition

- Anti-tussives are drugs that suppress the cough reflex, either by acting centrally on the cough center in the medulla or peripherally on the respiratory tract receptors.
- They are mainly used for **dry, irritating, or non-productive cough**.

Classification



1. Centrally Acting Anti-Tussives

- **Opioid derivatives:**
 - Codeine, Pholcodine, Hydrocodone
- **Non-opioids:**
 - Dextromethorphan, Noscapine, Butamirate

2. Peripherally Acting Anti-Tussives

- Benzonatate, Menthol, Local anesthetics (e.g., lidocaine sprays)

3. Combined Formulations

- Antitussives + antihistamines + decongestants in cough syrups

Pharmacological Actions

Class	Action
Opioids	Depress the cough center in medulla (highly effective, potential for dependence)
Non-opioids	Act centrally but without opioid side effects



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