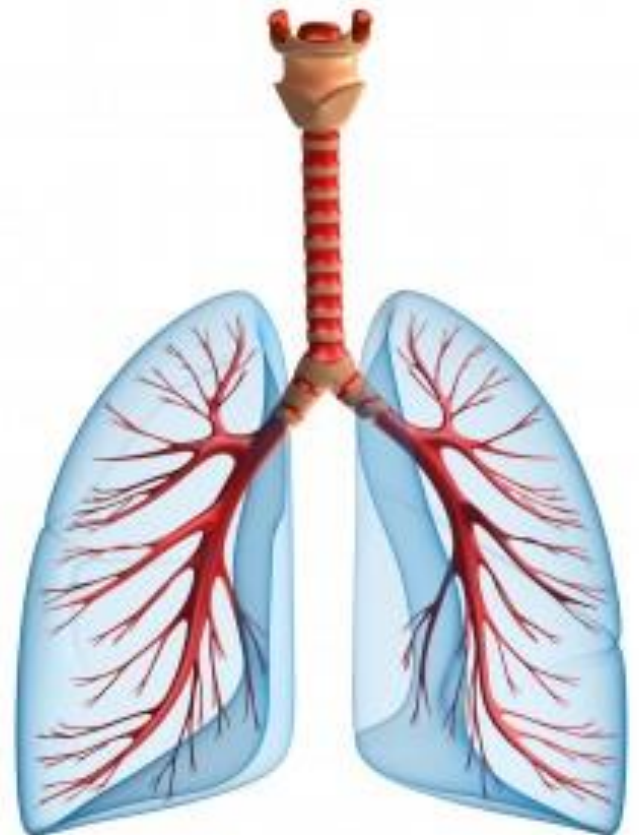


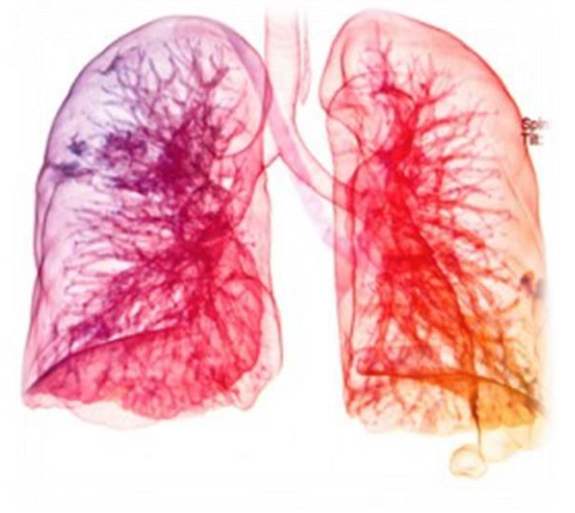
Drugs affecting respiratory system

Department of pharmacology and Toxicology



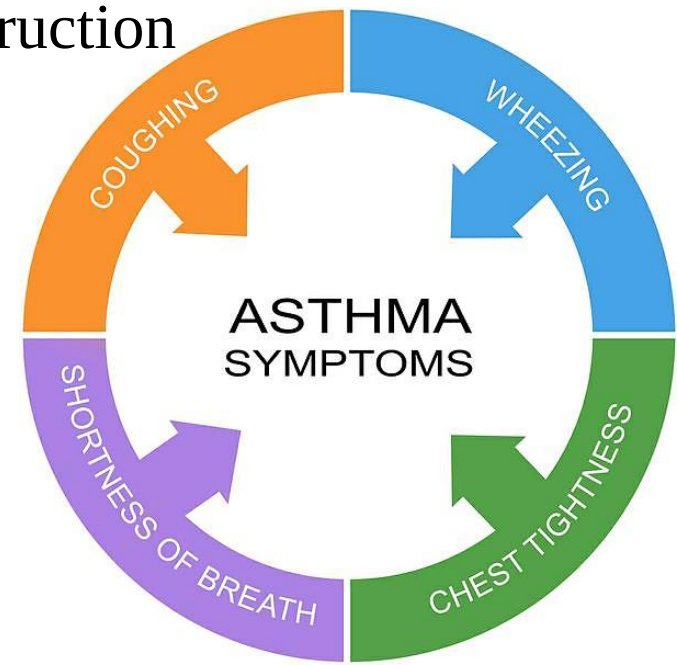
Respiratory diseases

- Common cold
- Asthma
- Chronic obstructive pulmonary disease (COPD)
- Bacterial pneumonia
- Tuberculosis
- Pulmonary embolism
- Lung cancer



Asthma

- Long term inflammatory disease of the airways
- Respiratory problems (Chronic & Episodic)
 - Inflammation of the airways
 - Bronchial hyper-reactivity
 - Reversible bronchospasm & airways obstruction



Asthma



Pets



Exercise



Pollen



Bugs in the home



Stress

Anger



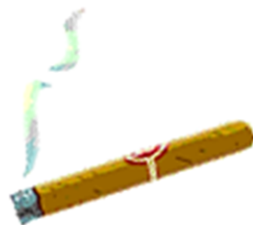
Pollution



Chemical fumes



Strong odors



Smoke



Dust



Fungus spores



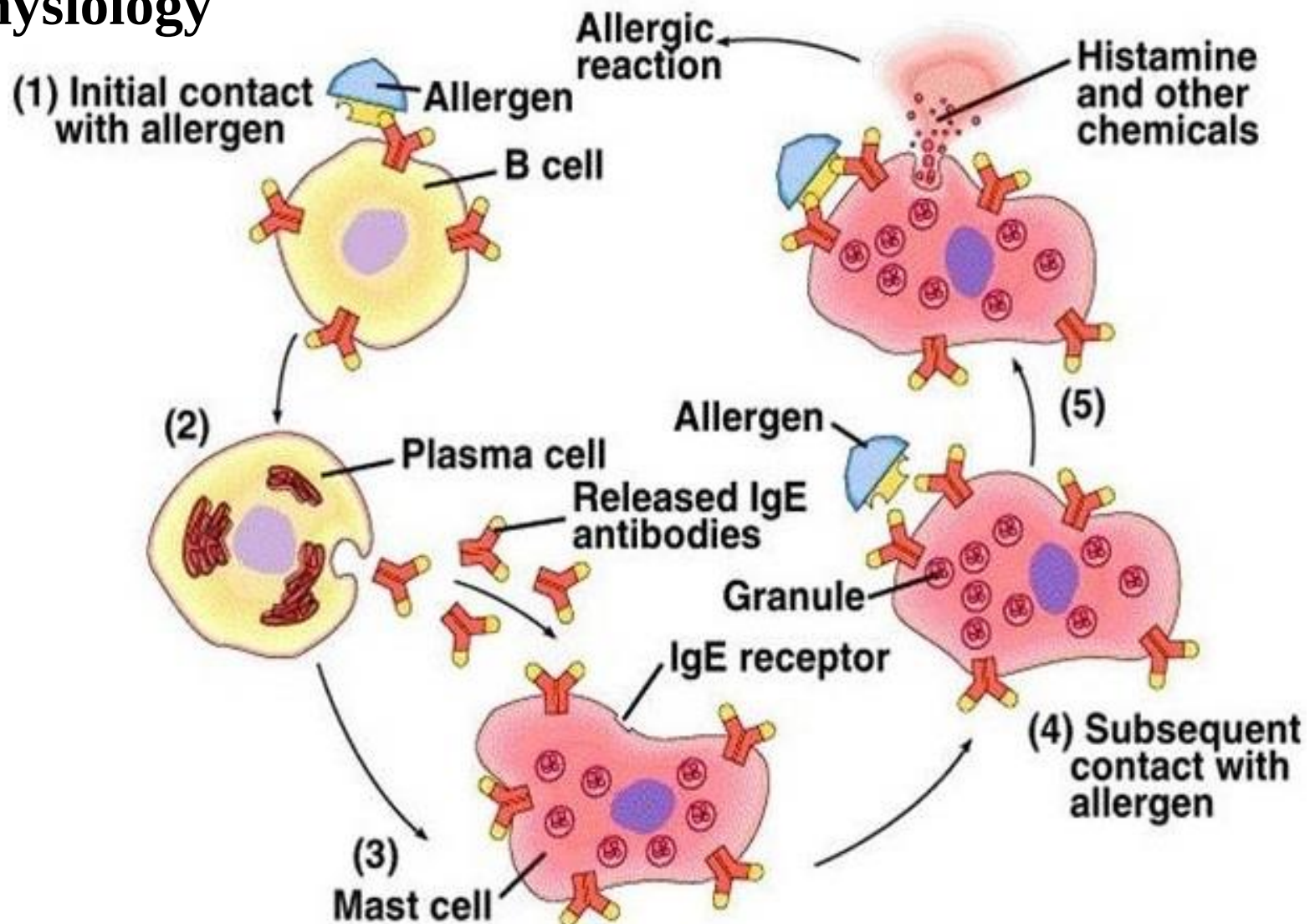
Cold air

Asthma

- **Normal lung**
 - Reversible narrowing of the bronchial airways
- **Hyper-reactive lung**
 - Bronchospasm & airways obstruction
 - Thickening of the bronchial mucosa from edema
 - Viscid mucus plugs in the airway lumen

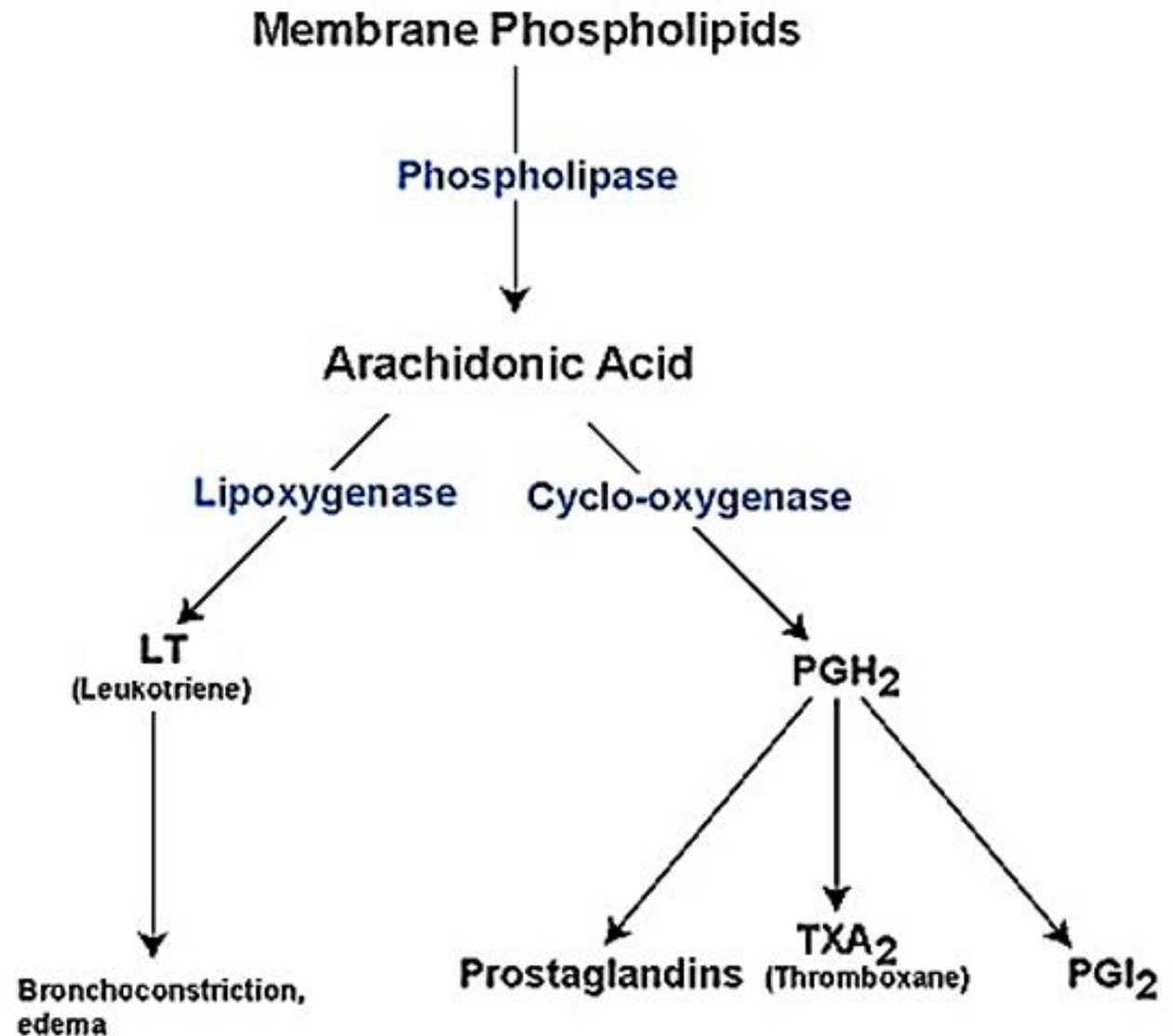
Asthma

Pathophysiology



Asthma

Pathophysiology



Drugs used to treat and prevent Asthma

1) **Bronchodilators**

- β 2-Adrenoceptor agonists
- Muscarinic receptor antagonists

2) **Leukotriene receptor antagonists**

3) **Methylxanthines**

4) **Anti-inflammatory agents**

- Glucocorticoids

5) **Mast cell membrane stabilizer**

Cough suppressants

Expectorants





Bronchodilators



β_2 -Adrenoceptor agonists

1. Short acting: Salbutamol, Terbutaline
 2. Long acting: Salmeterol, Formoterol
- Indication
 - Treatment of asthma/ acute asthmatic attacks
 - Prevention of exercise induced asthma
 - Nocturnal asthma (long acting)
 - Add on therapy to prevent asthmatic attacks



β_2 -Adrenoceptor agonists

Side effects

- Systemic absorption
 - Tachycardia
 - Palpitation
 - Cardiac dysrhythmia
 - Hypertension
 - Tremor
- Headache, Nervousness, Anxiety, Dizziness
- Nausea & vomiting



Muscarinic receptor antagonists

Ipratropium, Tiotropium

- Indication
 - Less effective than sympathomimetic agents
 - Alternative for β_2 adrenergic receptor agonists
- Side effect
 - Anticholinergic effects (systemic absorption)
 - Dry mouth
 - Blurred vision
 - Constipation
 - Drowsiness
 - Sedation
 - Confusion
 - Difficulty urinating
 - Decreased sweating



Methylxanthines

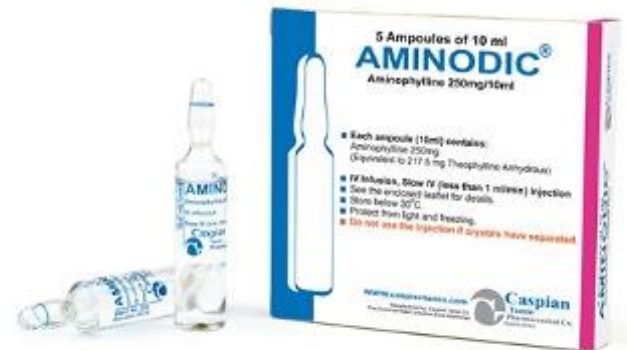
- A Chemical group of substances
 - Theophylline (tea)
 - Theobromine (cocoa)
 - Caffeine (coffee)
- Pharmacodynamics
 - CNS: ↑ alertness and deferral of fatigue
 - Heart: positive chronotropic and inotropic effects
 - GI system: ↑ secretion gastric acid and digestive enzymes
 - Kidney: weak diuresis
 - Lung: broncodilation



Methylxanthines

Theophylline, Aminophylline

- Several mechanisms
 - General smooth muscle relaxant
- Indication
 - Acute asthmatic attack
 - Reduce symptoms in chronic asthma



Methylxanthines

Theophylline, Aminophylline

Side effects

- Narrow TI
 - CNS stimulant, Seizures (high dose)
 - Dysrhythmia, tachycardia, palpitations
 - Abdominal discomfort, Nausea, vomiting, anorexia
 - Rapid i.v injection: syncope and sudden death



Leukotriene

- Leukotriene (LT) involvement in many inflammatory diseases and anaphylaxis
 - LTB₄: potent neutrophil chemoattractant
 - LTC₄ and LTD₄: bronchoconstriction, edema, mucus hypersecretion, increased bronchial reactivity



Leukotriene receptor antagonists

Montelukast, Zafirlukast

- Indication
 - Mild asthma
 - Moderate to severe asthma with glucocorticoids
 - Aspirin induced asthma
- Side effects
 - GI disturbance, headache





A • Adrenergics (Beta 2 Agonists)
(Albuterol)

S • Steroids

T • Theophylline

H • Hydration (IV)

M • Mask O₂

A • Anticholinergics



Anti-inflammatory agents



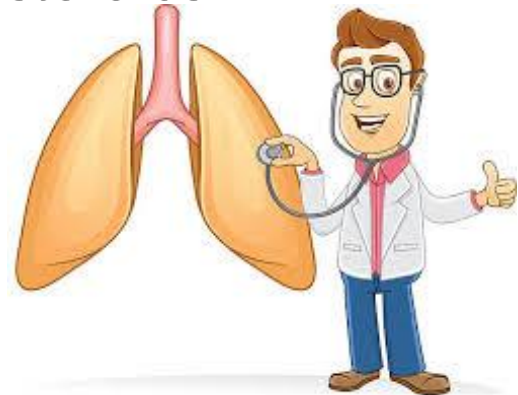
Glucocorticoids

- Mechanism

- Phospholipase inhibitor $\rightarrow$ $\downarrow$ LT, PG
- $\downarrow$ Infiltration of lymphocytes, eosinophils, and mast cells
- $\uparrow$ β 2-Adrenoceptors $\rightarrow$ $\uparrow$ reliever drugs effect

- Indication

- Inhaled glucocorticoids: **Chronic** asthma
 - Do not relieve symptoms of acute asthmatic attacks
- Systemic glucocorticoids: **Severe chronic** asthma
 - Not controlled by bronchodilator and inhaled steroids



Glucocorticoids

- **Dosage forms**

- Oral: Prednisolone
- Injection: Methylprednisolone, Hydrocortisone
- Inhalation: Beclomethasone, Fluticasone, Mometasone, Budesonide



Inhaled glucocorticoids

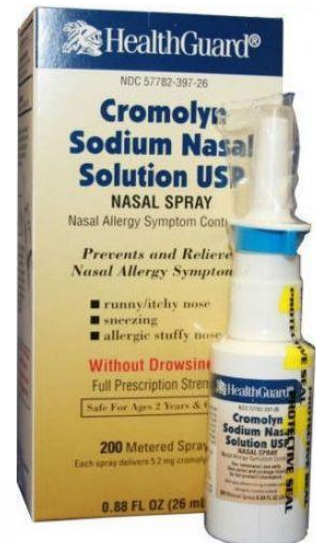
~~Side Effects~~

- **Side effects**
 - Oropharyngeal candidiasis
 - Pharyngeal irritation
 - Coughing
 - Dry mouth
- Systemic effects are rare because of the low doses used for inhalation therapy
 - Adrenal suppression
 - Loss of bone density
 - Cataracts

Mast cell membrane stabilizer

Cromolyn

- Mechanism
 - Stabilize the cell membranes of inflammatory cells (mast cells, monocytes, macrophages)
 - Prevent release of harmful cellular contents
 - Inhibit the early and the late response



Mast cell membrane stabilizer

Cromolyn

- Indication
 - Mild asthma
 - Alternative for inhaled glucocorticoids in mild to moderate asthma (in child)
 - Prophylaxis (in exercise)
- Side Effects
 - Taste changes
 - Throat irritation, cough, mouth dryness
 - Chest tightness and wheezing (rarely)

Cough suppressants (Antitussives)

- Cough is a protective reflex
→removes foreign material and secretions
1. Opioid: Codeine, Dextromethorphan
 2. Other: Clobutinol



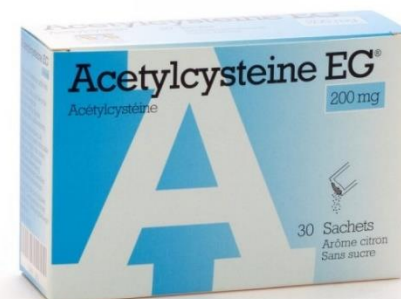
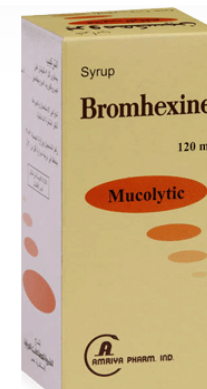
Side effects: Respiratory depression, Hypoxia



Expectorants (Mucolytics)

- An expectorant increases bronchial secretions
- Mucolytic helps loosen thick bronchial secretions

1. Guaifenesin
2. Acetylcysteine
3. Bromhexine



Antihistamine

- H1-receptor antagonists
 - Have no routine place in asthma
 - Effective in mild asthma
- Old generation:
Diphenhydramine, Chlorpheniramine, Clemastine,
Hydroxyzine, Cyproheptadine
- New generations:
Fexofenadine, Loratadine, Cetirizine, Ketotifen

A close-up photograph of several pink roses in various stages of bloom, attached to a dark brown branch. The background is a soft, out-of-focus light green and yellow. The roses have many layers of petals, some fully open and others as buds.

Good luck

Any question?