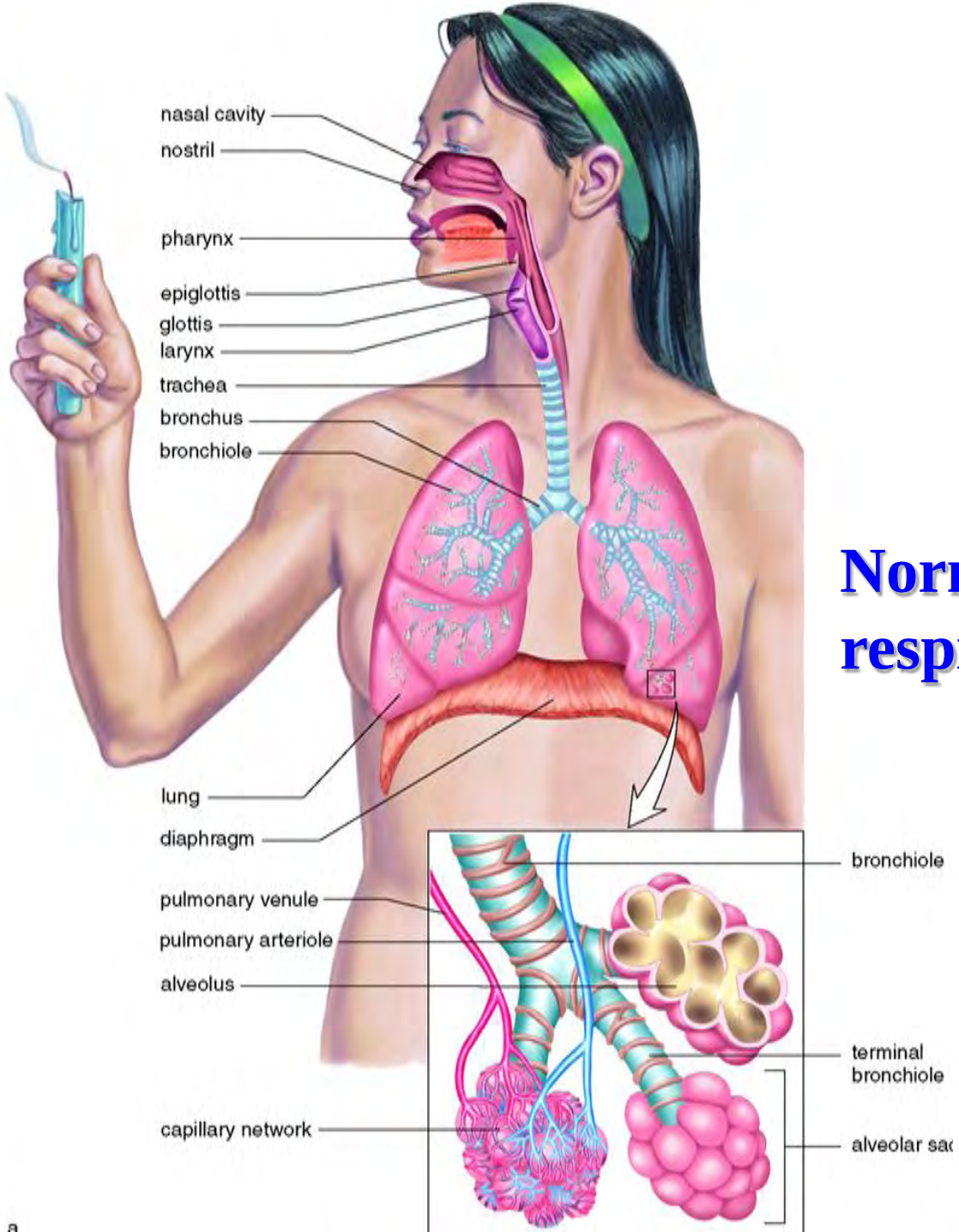
Section IV

Respiratory systems

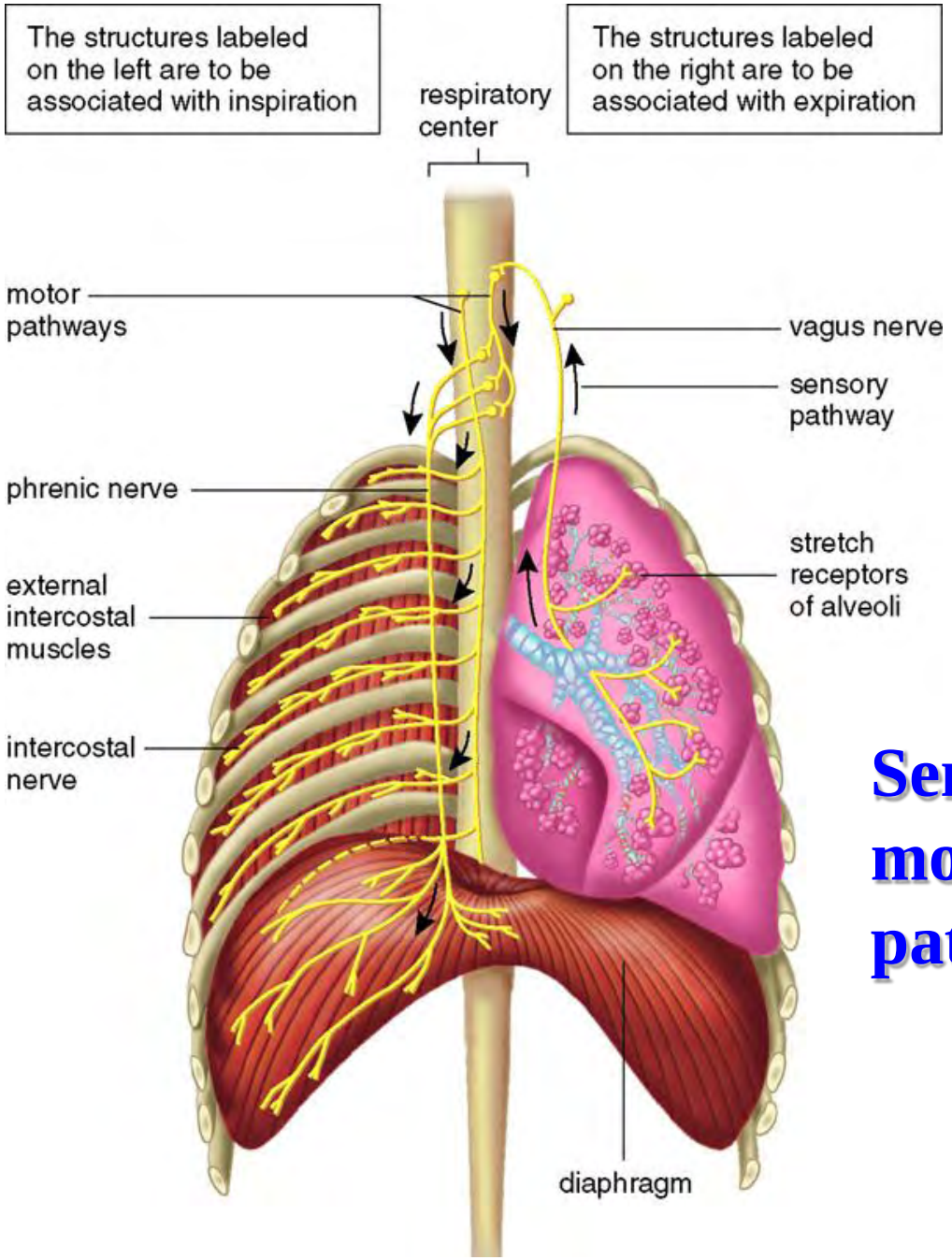
Chapter 6

Drugs for treatment of respiratory diseases

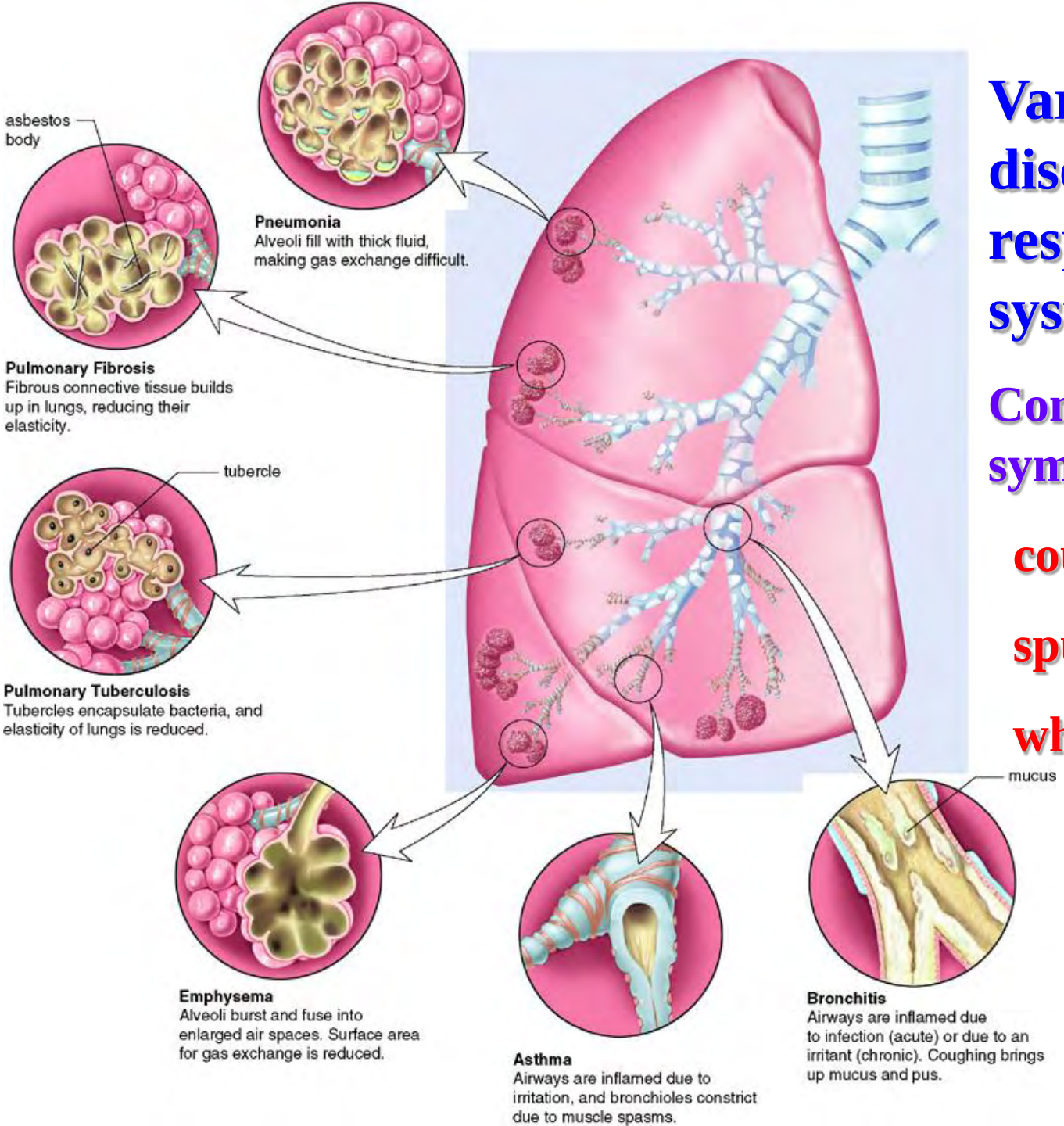
Antitussives
Expectorants
Antiasthmatic drugs



Normal structures of respiratory system



Sensory and motor nervous pathways



Various diseases of respiratory system

Common symptoms:

- cough
- sputum
- wheezing

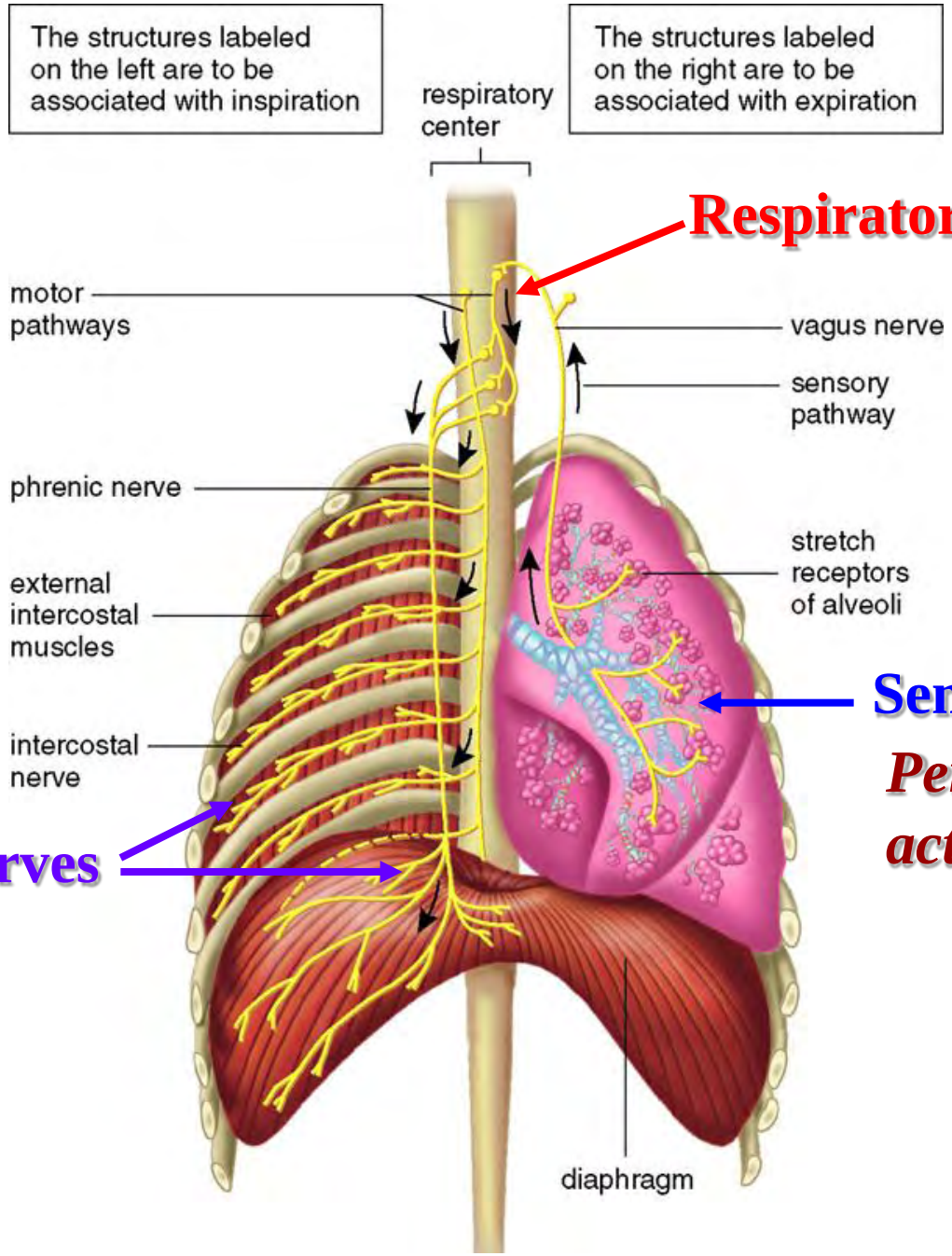
Drugs acting on respiratory system

- Cough — antitussive drugs
  - centrally acting
  - peripherally acting
- Sputum — expectorant drugs
  - sputum-diluting drugs
  - mucolytic drugs
- Asthma — antiasthmatic drugs
  - bronchodilators
    - β receptor agonists
    - theophyllines
    - muscarinic antagonists
  - anti-inflammatory drugs
    - glucocorticosteroids
    - mediator release inhibitors

A. Antitussives

- **Centrally acting**
- **Addictive drugs:**
- **codeine** 可待因
- **Non-addictive drugs:**
- **dextromethorphan** 右美沙芬
- **pentoxyverine** 喷托维林(咳必清)

- **Peripherally acting**
- **benzonatate** 苯佐那酯



Respiratory center

Centrally acting antitussives

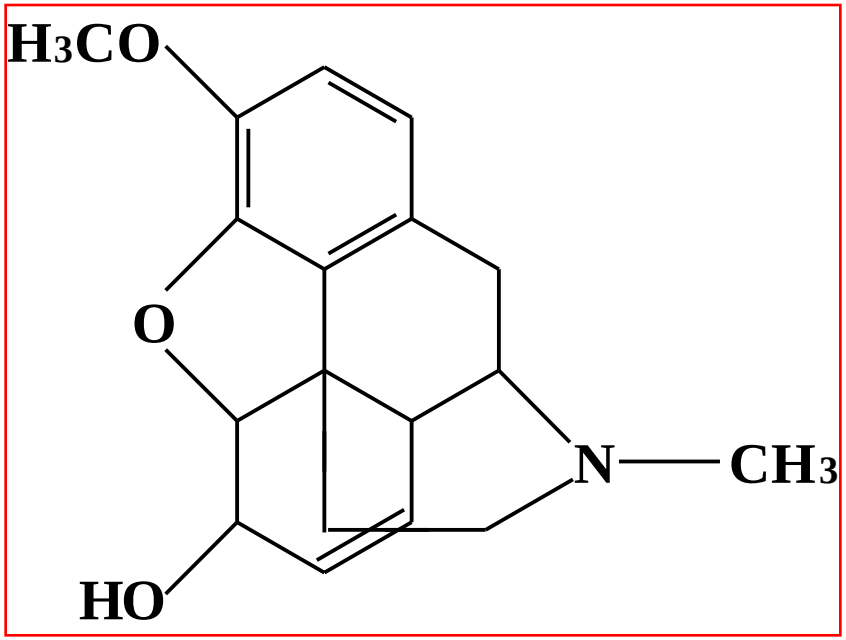
Sensory nerves

Peripherally acting antitussives

Motor nerves

A. Antitussives

Codeine 可待因



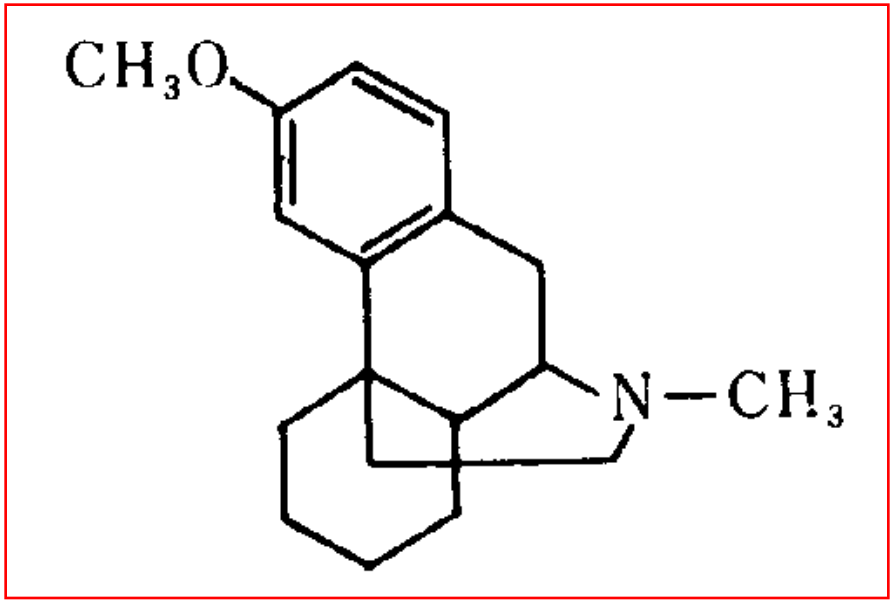
***Other additive antitussives*: Dihydrocodeine（双氢可待因）; Drotebanol（羟蒂巴酚）; Pholcodine（福尔可定）**

A. *Antitussives*

- 1. *Pharmacological effects*
- suppression of cough (1/4 of morphine)
- analgesia (1/7~1/10 of morphine)
- 2. *Clinical uses*
- Cough without sputum
- 3. *Adverse effects*
- Respiratory depression (at larger doses)
- Addiction
- Contraindicated in patients with thick sputum

A. Antitussives

Dextromethorphan 右美沙芬



A. *Antitussives*

- **Dextromethorphan** 右美沙芬

- **1. *Pharmacological effects***
- **suppression of cough**
- **muscarinic and NMDA receptor antagonism**
- **2. *Clinical uses***
- **cough without sputum, upper respiratory infection, acute or chronic bronchitis**
- **3. *Adverse effects***
- **Atropine-like side effects**

A. *Antitussives*

- **Pentoxyverine** 喷托维林 (咳必清)

- **Suppression of cough**
- **Muscarinic antagonism and local anesthetic effects**
- **Uses and adverse effects are similar to dextromethorphan**

A. *Antitussives*

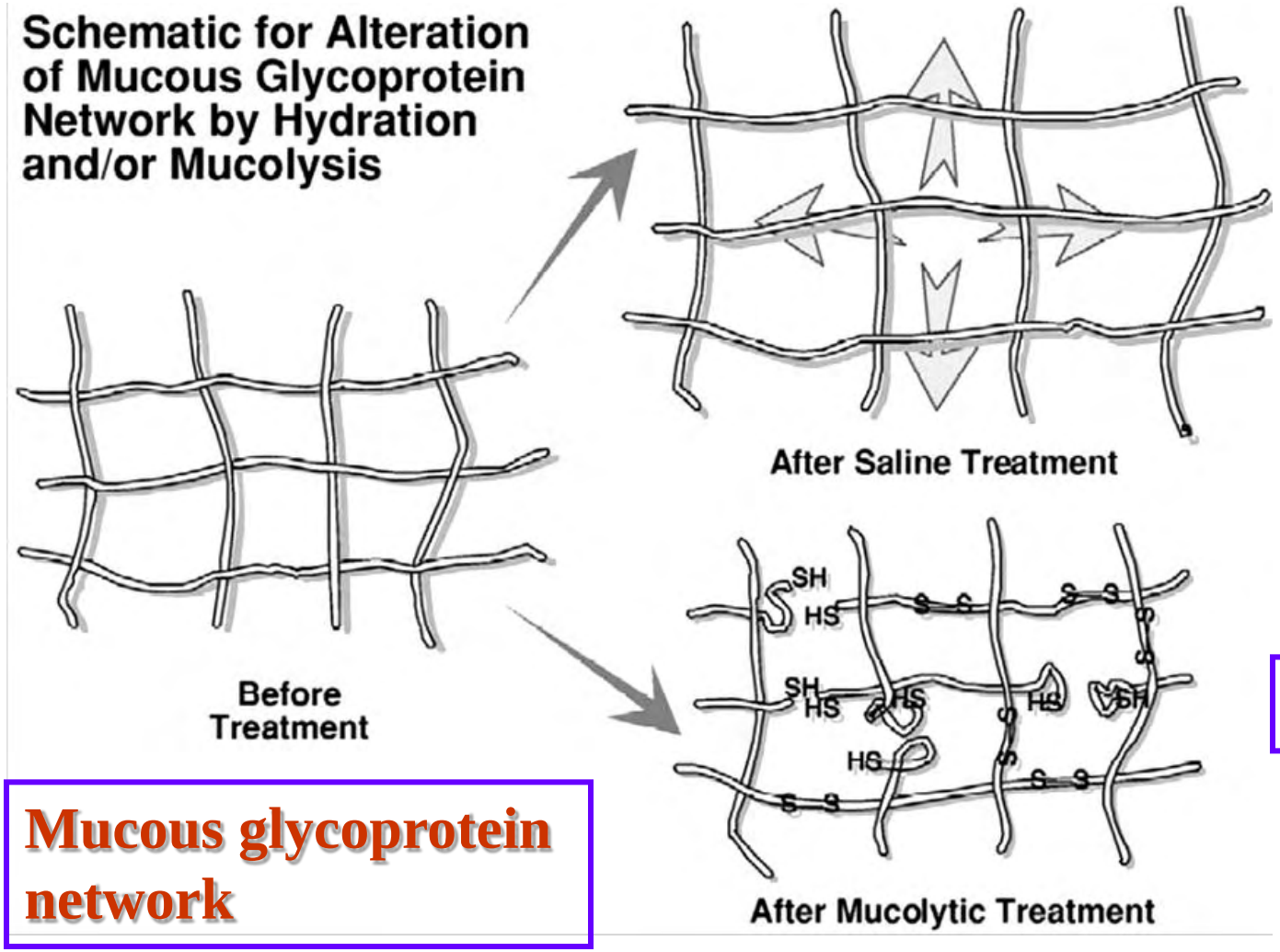
- **Benzonatate** 苯佐那酯 (退嗽)
  - **Peripherally acting**
- **Blocking cough reflex**
- **Local anesthetic effects**
- **CNS depression**
- **Others:** Noscapine (那可汀); moguisteine (莫吉司坦)

B. *Expectorants*

- **Sputum-diluting drugs**
- ***Stimulating bronchial secretion***
- **Amonium chloride** 氯化铵
- **Potassium iodide** 碘化钾

- **Mucolytic drugs**
- **Bromhexine** 溴己新
- **Ambroxol** 氨溴索
- **Acetylcysteine** 乙酰半胱氨酸
- **Methylcysteine** 美司坦
- **Carbocisteine** 羧甲司坦
- **Mesna** 美司钠

B. *Expectorants*



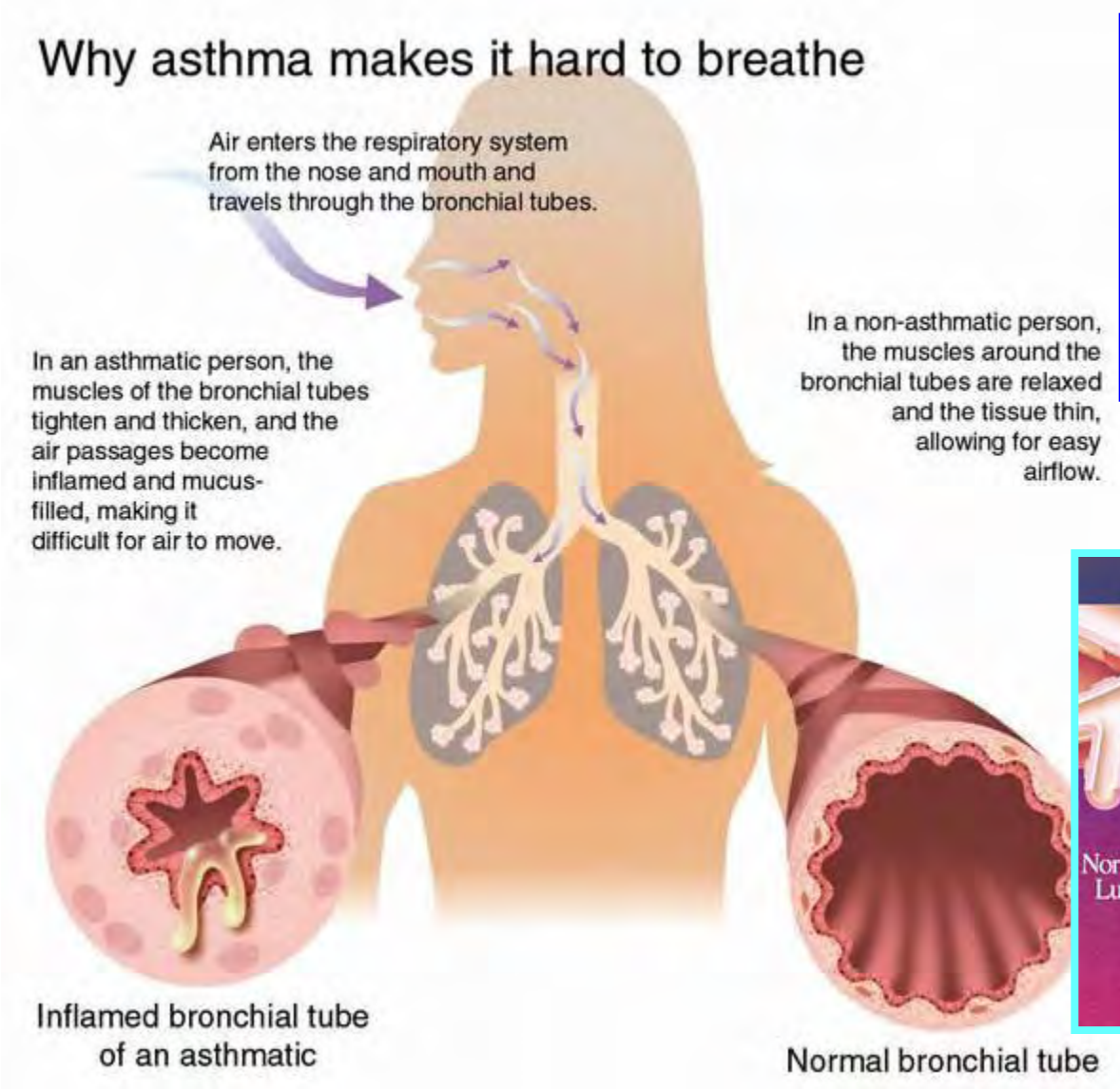
Hydration:

Sputum dilution

Mucolysis

Mucous glycoprotein network

C. *Antiasthmatic drugs*

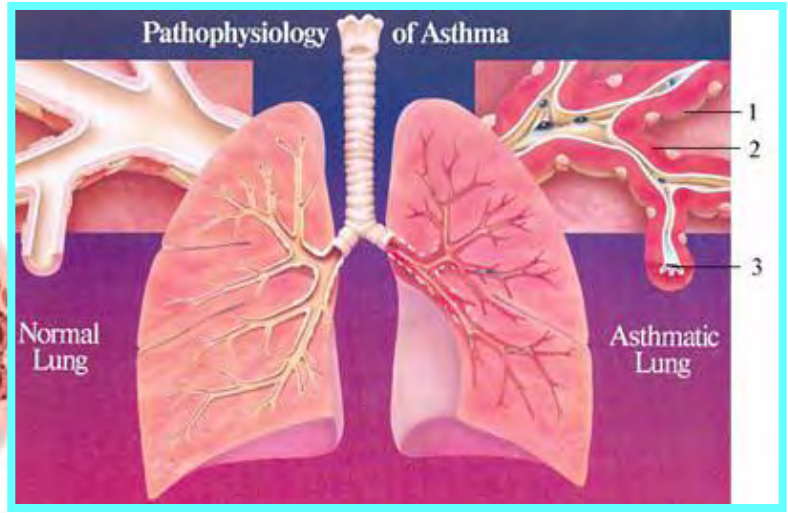


Bronchial asthma：

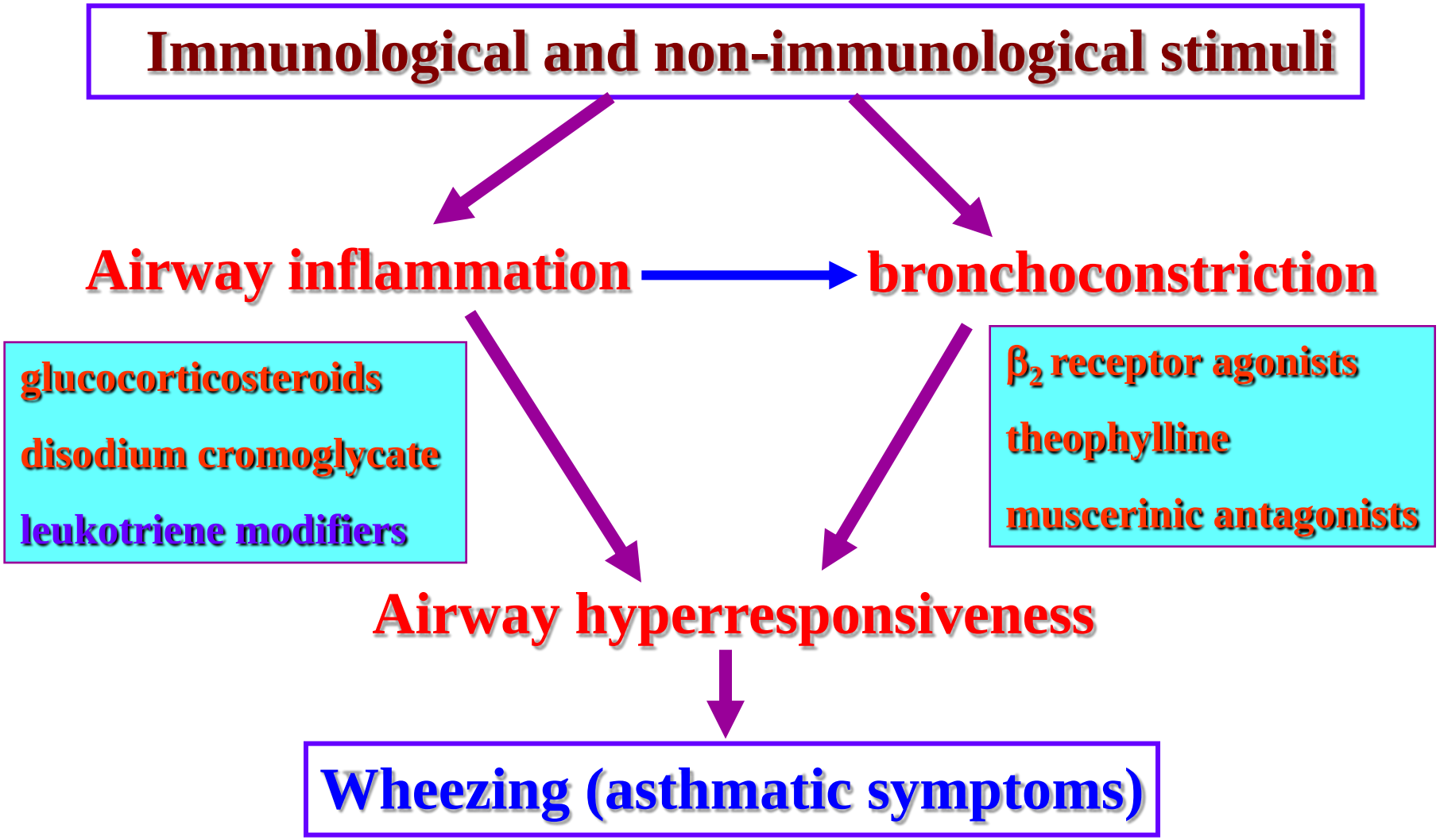
inflammation;

bronchoconstriction;

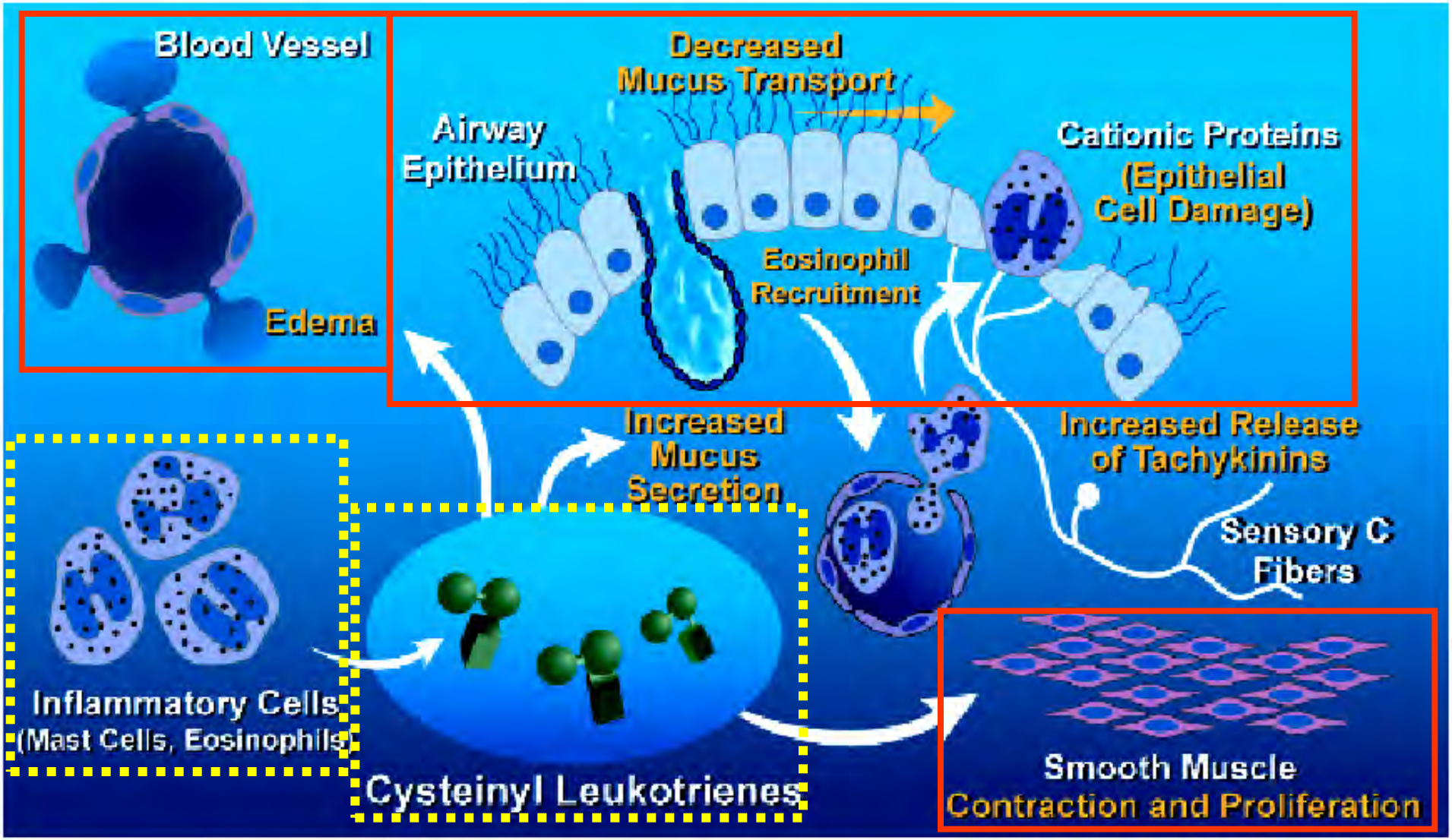
airway hyperresponsiveness



C. *Antiasthmatic drugs*

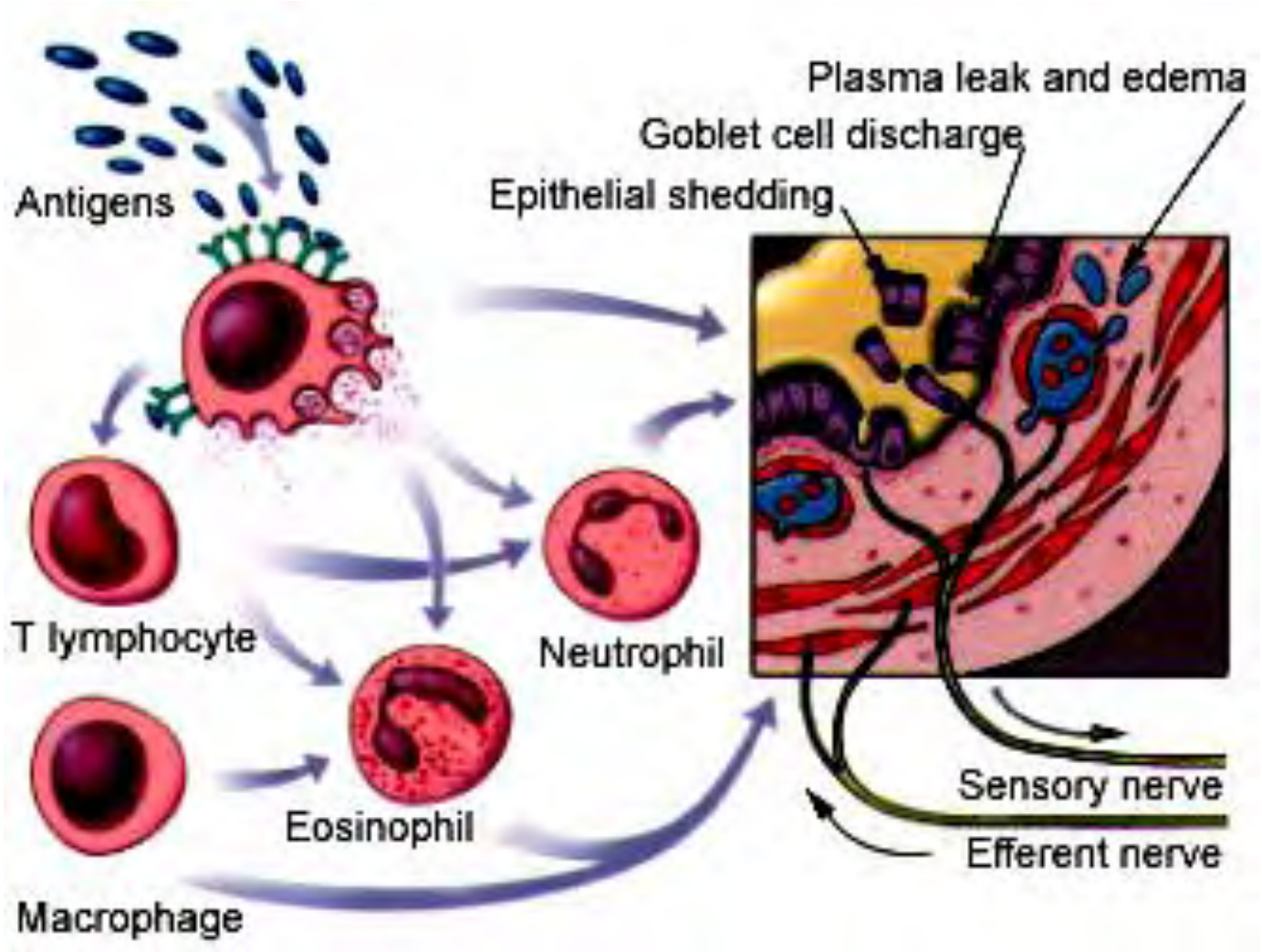


C. *Antiasthmatic drugs*



Airway pathological changes in pathogenesis of bronchial asthma

C. *Antiasthmatic drugs*



Airway pathological changes in pathogenesis of bronchial asthma

C. *Antiasthmatic drugs*

- **Bronchodilators**
- **β Receptor agonists**
- **Non-selective:** adrenaline, isoprenaline
- **β_2-selective: moderate-acting:** salbutamol, terbutaline
- **long-acting:** salmeterol, formoterol
- **Theophyllines:** aminophylline
- **Muscarinic antagonists:** ipratropine
- **Anti-inflammatory drugs**
- **Glucocorticosteroids:**
- **Systemic:** hydrocortisone, dexamethasone
- **Inhalation:** beclomethasone, budesonide
- **Inhibitors of mediator release:** cromolyn sodium, nedocromil

Drugs used in the treatment of asthma

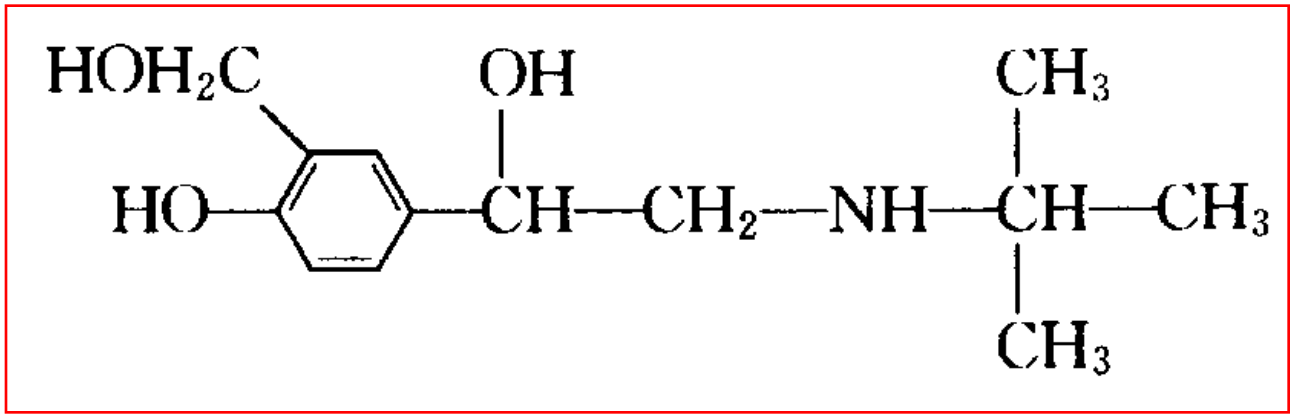
- Classification in Grash Course: Respiratory system (2nd Edition) -

- **Relievers - *Bronchodilators***
- **β_2 agonists**
- **short-acting:** salbutamol, terbutaline
- **long-acting:** salmeterol, formoterol
- **Anticholinergics (muscarinic antagonists):** ipratropine
- **Xantines (theophyllines):** aminophylline

- **Preventers - *Anti-inflammatory drugs***
- **Glucocorticosteroids:**
- **Inhaled steroids:** beclomethasone, budesonide, fluticasone
- **oral steroids:** hydrocortisone, prednisone, ***dexamethasone***
- **Leukotriene (LT) receptor antagonists (leukotriene modifiers):**
- **LT antagonists:** montelukast (孟鲁司特), zafirlukast (扎鲁司特)
- **5-lipoxygenase inhibitors:** zileuton (齐留通)
- **Inhibitors of mediator release:** cromolyn sodium, nedocromil

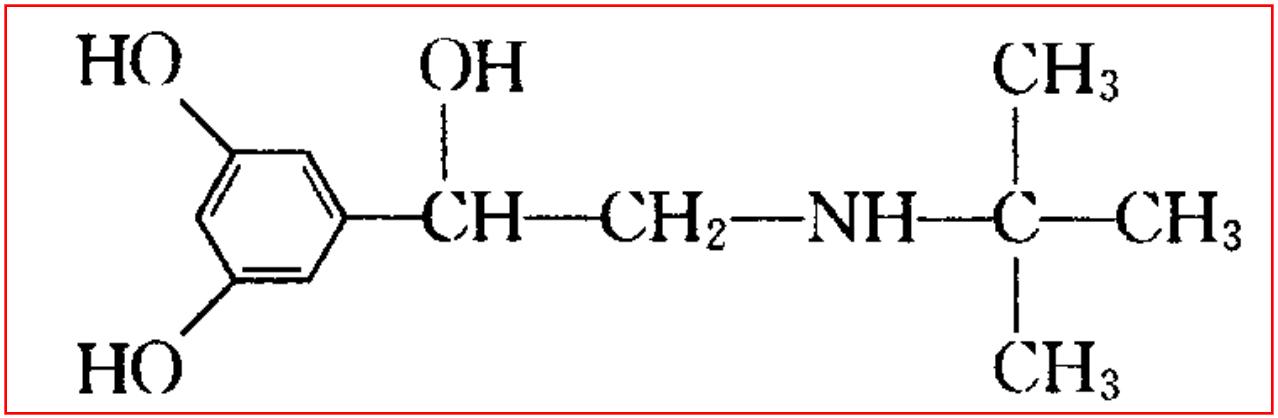
C. *Antiasthmatic drugs*

- **Bronchial dilators**
- **β_2 receptor selective agonists**



Salbuterol

沙丁胺醇



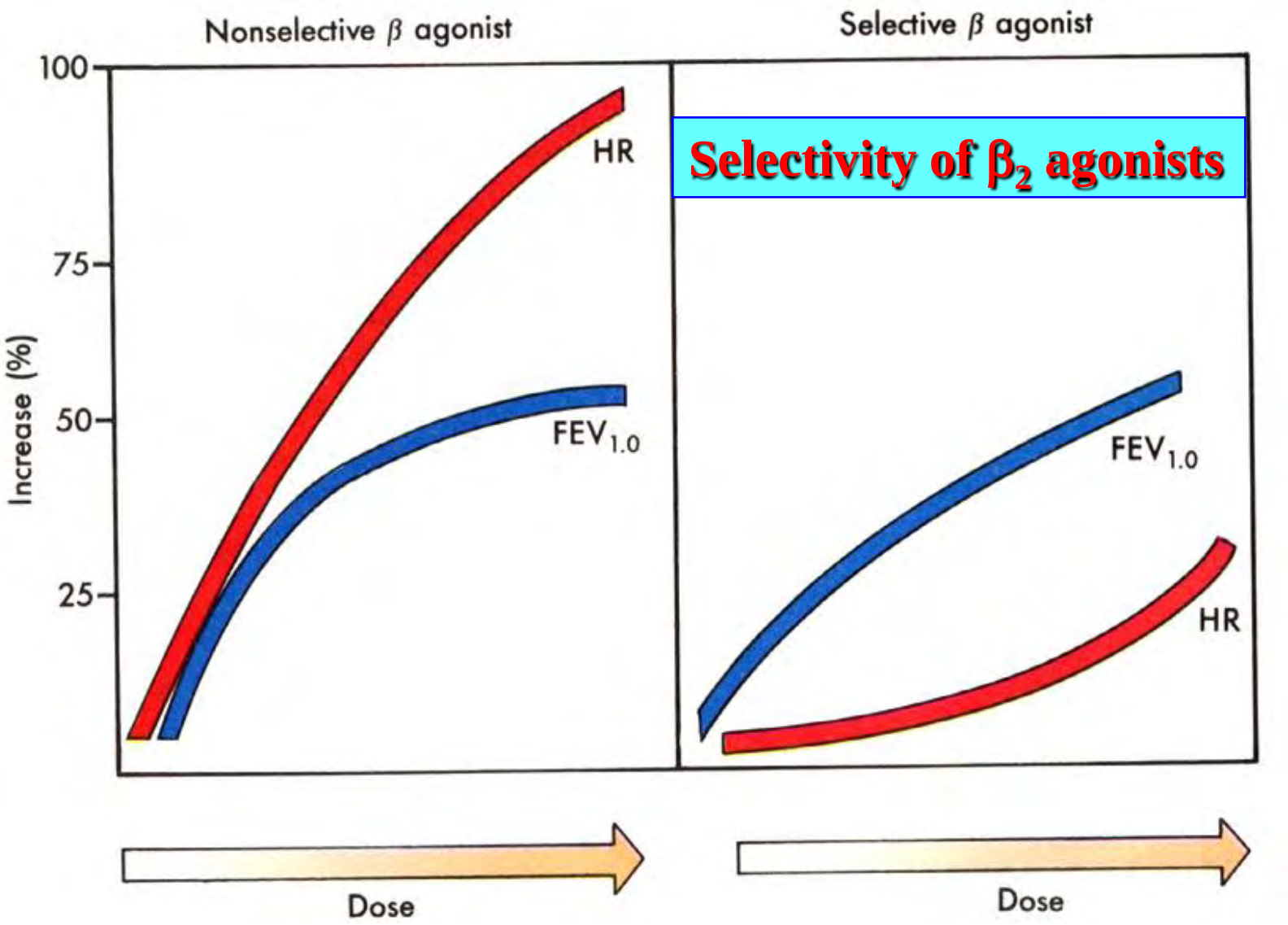
Terbutaline

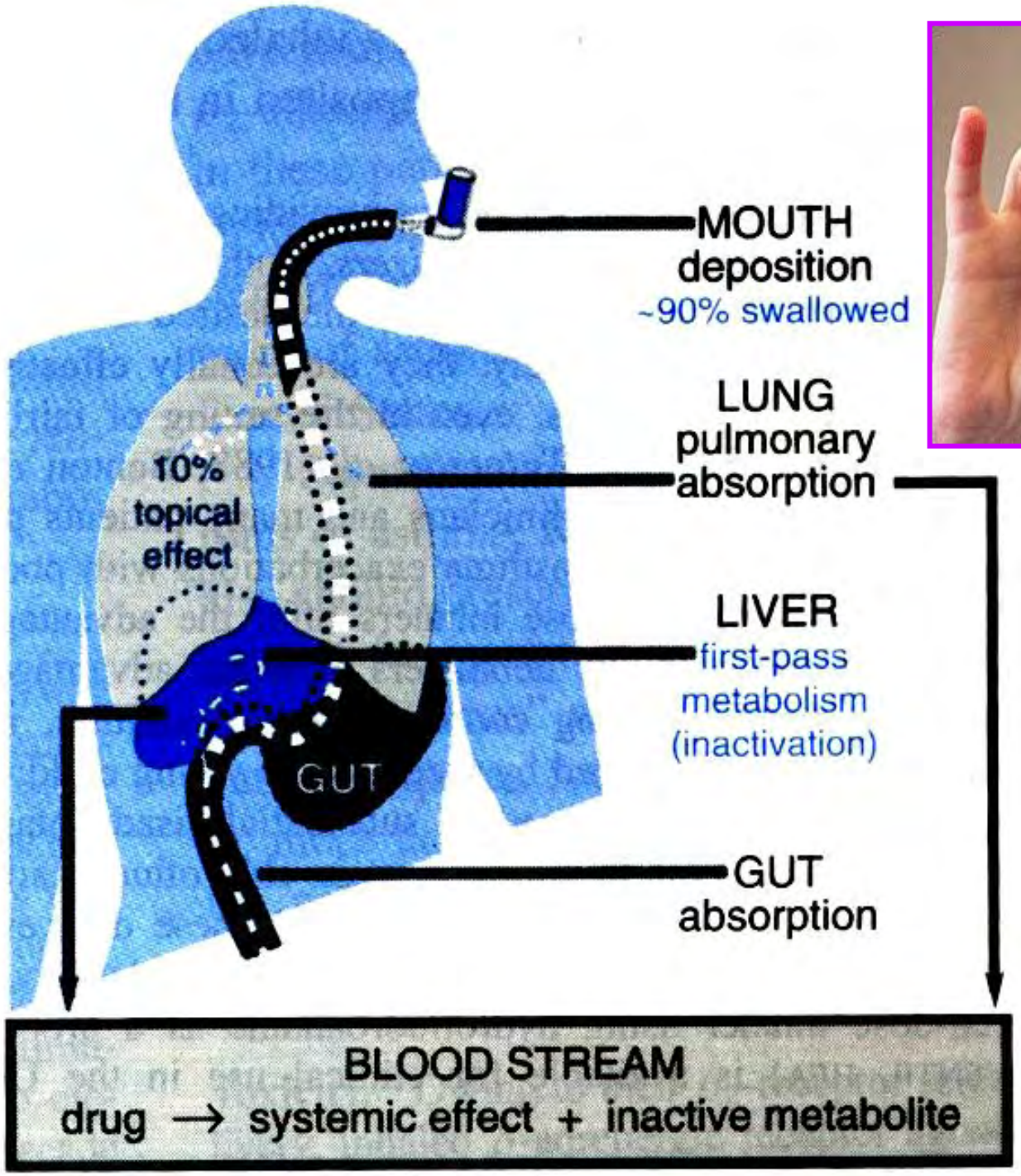
特布他林

C. *Antiasthmatic drugs*

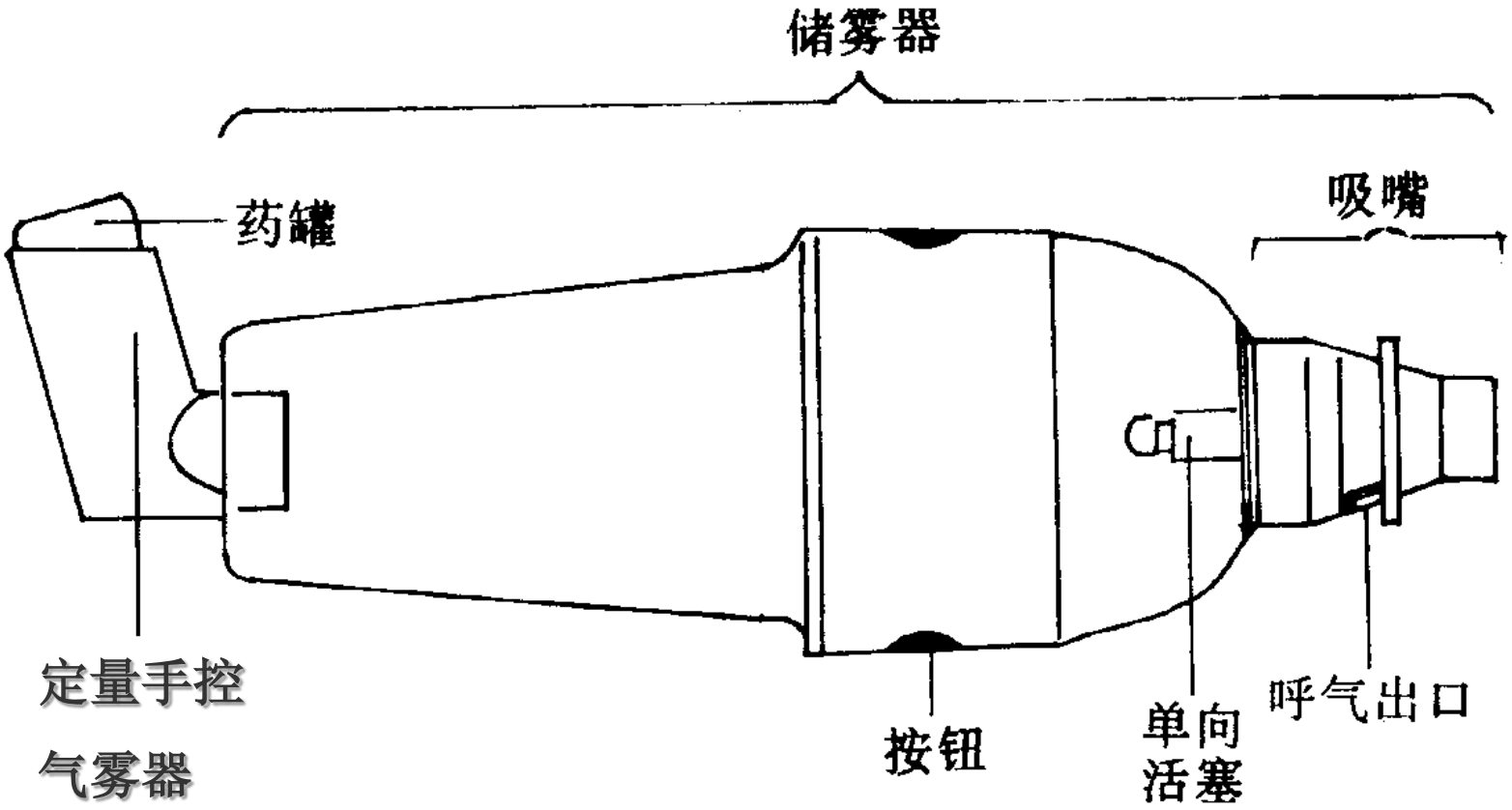
Salbuterol 沙丁胺醇

- 1. *Pharmacological effects*
- Relaxing bronchial smooth muscles
- 2. *Clinical uses*
- Controlling asthmatic symptoms
- Given by inhalation, oral or injection
- 3. *Adverse effects*
- Skeletal muscle tremor
- Cardiac stimulation (larger doses)
- Dysfunction of metabolism (hypokalemia, *etc*.)

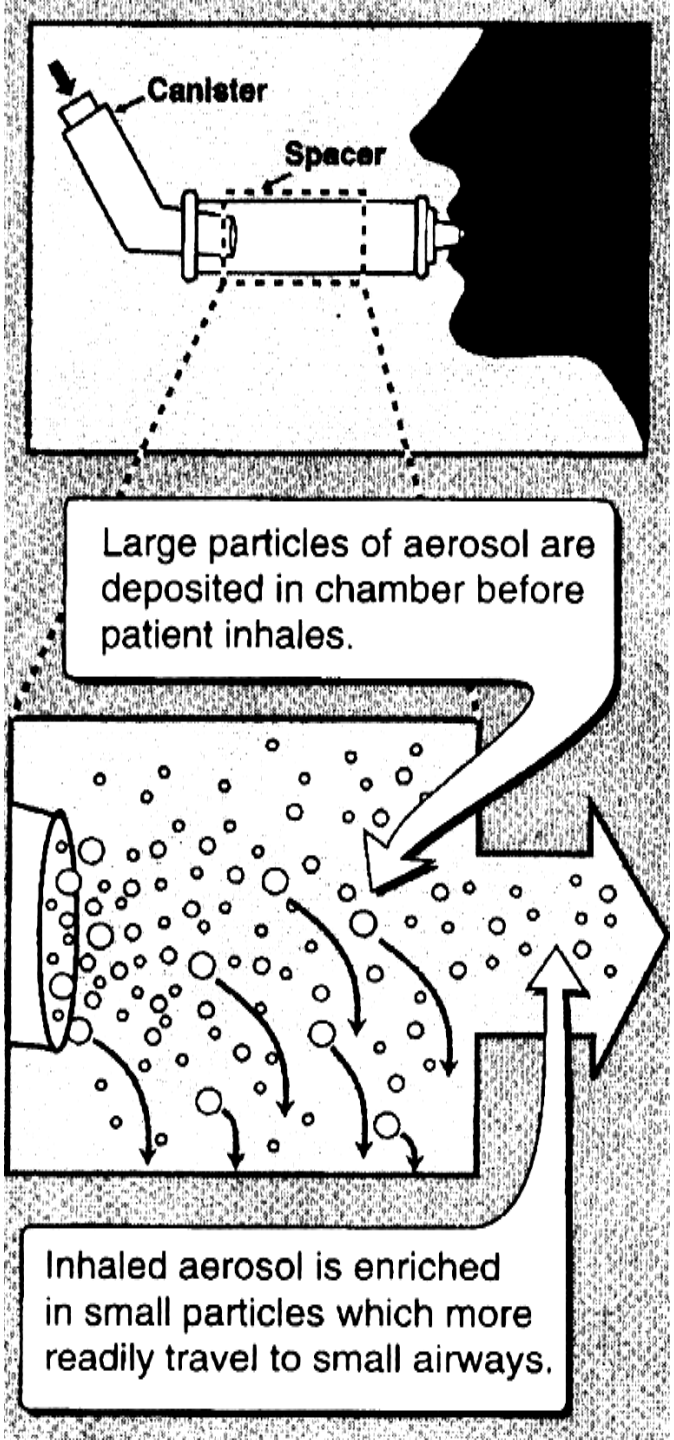

Nonselective β agonist
Selective β agonist
Selectivity of β2 agonists
100
75
50
25
Increase (%)
HR
FEV1.0
FEV1.0
HR
Dose
Dose



Aerosol inhalation



Spacer used for aerosol inhalation



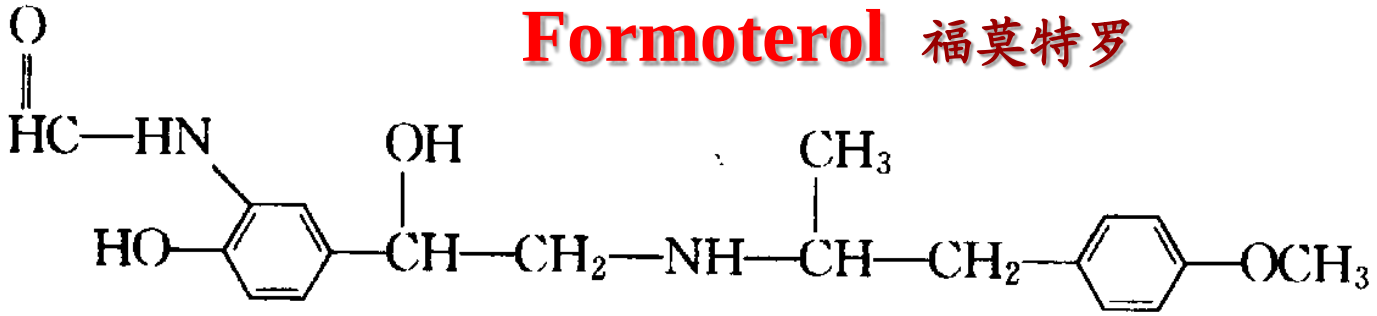
Spacer will aid patients to inhale the aerosolized drugs easier

C. *Antiasthmatic drugs*

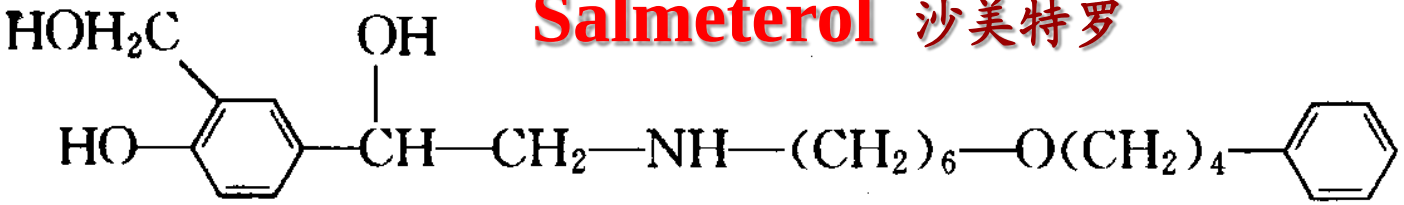
β_2 receptor selective agonists:

long-acting

Formoterol 福莫特罗



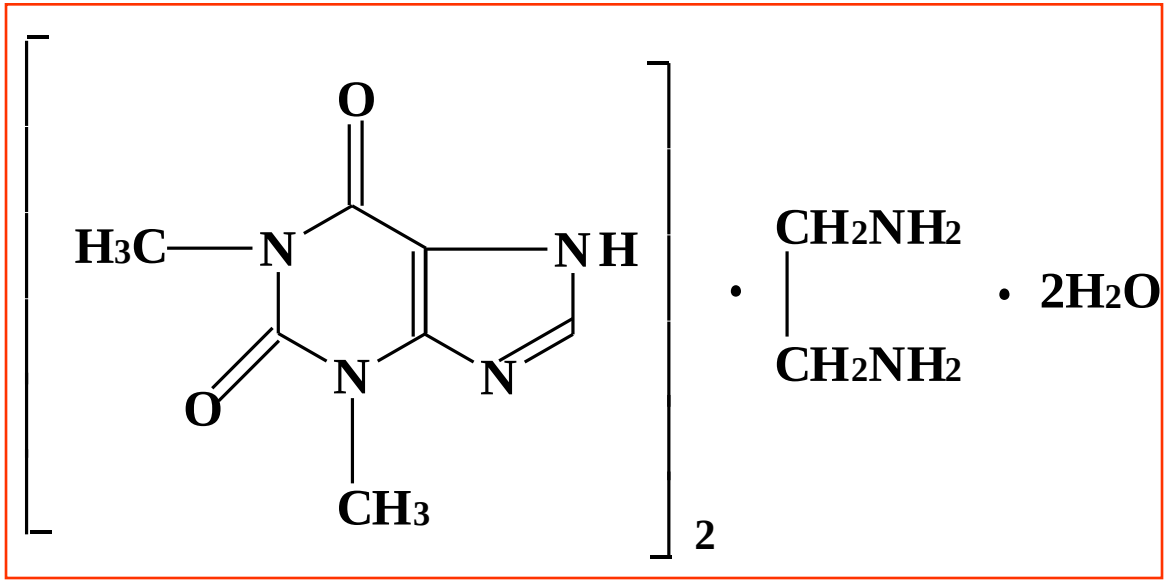
Salmeterol 沙美特罗



C. *Antiasthmatic drugs*

- **Theophyllines**

Aminophylline 氨茶碱



Theophyllines:

One type of xanthine derivatives (甲基黄嘌呤类衍生物)

C. *Antiasthmatic drugs*

- **1. *Pharmacological effects***
- **Inhibiting phosphodiesterase;**
- **Blocking adenosine receptors;**
- **Increasing catecholamine release;**
- **Immunomodulation;**
- **Increasing respiratory muscle contractility;**
- **CNS stimulation, diuretic, gastric acid secretion, *etc*.**

C. *Antiasthmatic drugs*

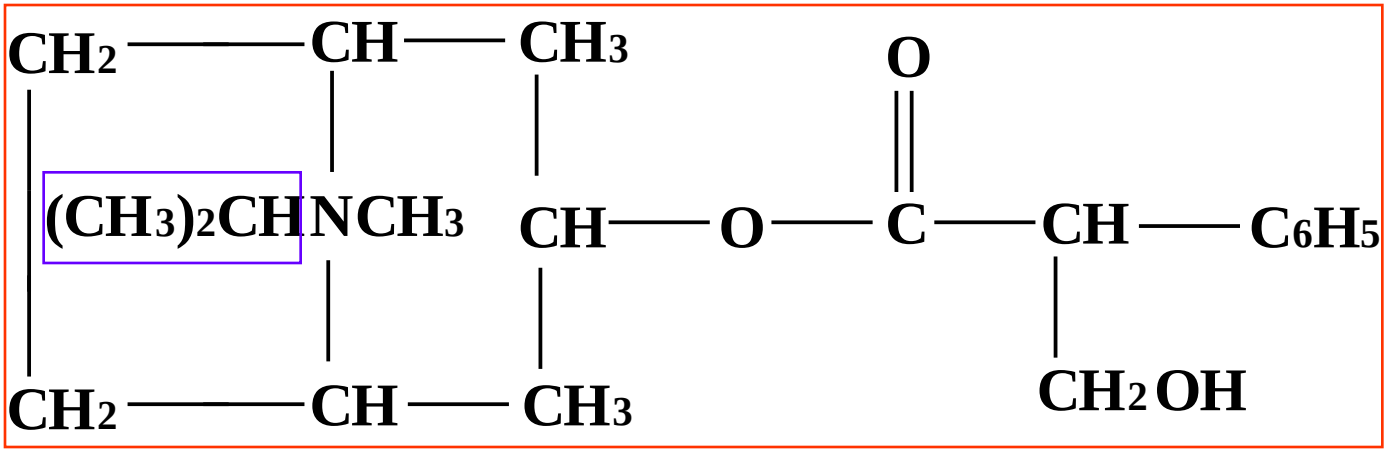
- **2. *Clinical uses***
- **Bronchial asthma (*p.o.*, *i.v.*)**
- **Others: acute pulmonary edema, *etc.***

- **3. *Adverse effects***
- **GI reactions**
- **CNS stimulation**
- **CVS reactions**
- **Acute intoxication (*i.v.* injection too rapidly)**

C. *Antiasthmatic drugs*

- **Muscarinic antagonists**

Ipratropine 异丙托溴铵，异丙托品



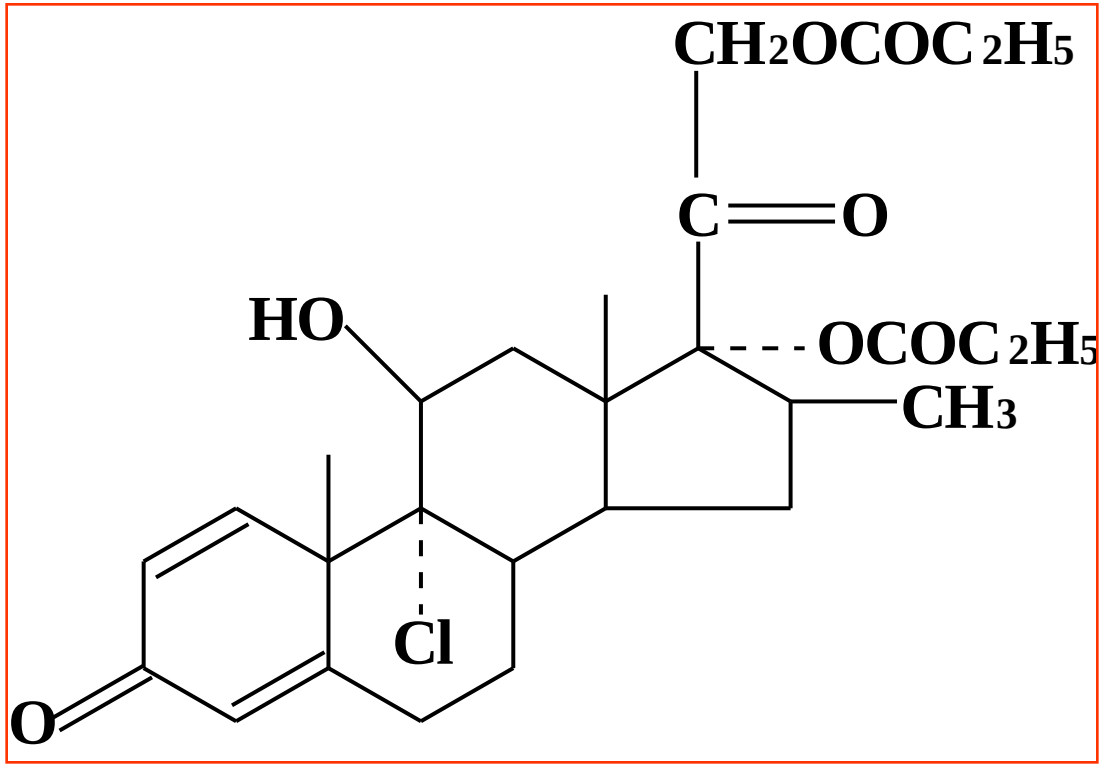
C. *Antiasthmatic drugs*

- **Glucocorticosteroids**
- **Systemic:**
- hydrocortisone 氢化可的松
- prednisone 泼尼松
- dexamethasone 地塞米松
- **Inhaled:**
- beclomethasone dipropionate 二丙酸倍氯米松
- budesonide 布地奈德
- triamcinolone acetonide 曲安奈德
- fluticasone propionate 丙酸氟替卡松
- flunisolide 氟尼缩松

C. Antiasthmatic drugs

Beclomethasone dipropionate

二丙酸倍氯米松



C. *Antiasthmatic drugs*

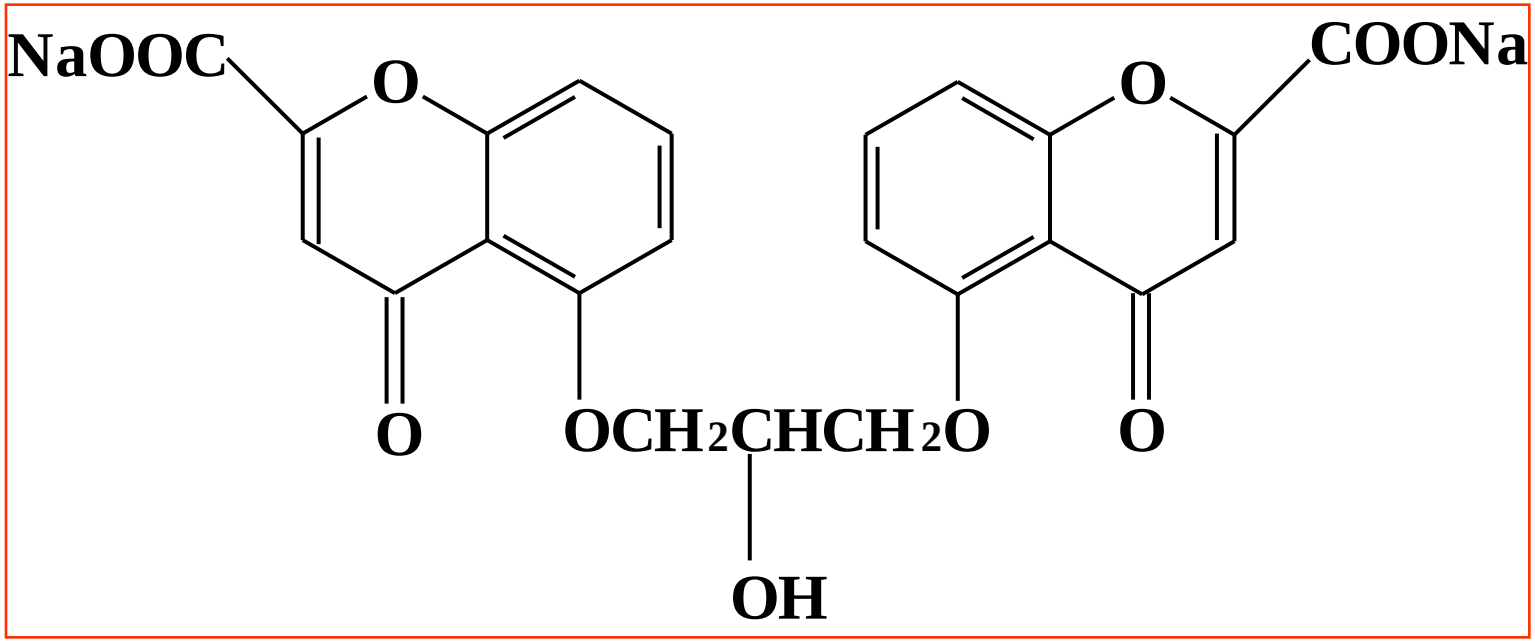
- **1. *Pharmacological effects***
- **Antiinflammation: inhibiting inflammatory cell activities, antibody production, mediator release**
- **2. *Clinical uses***
- **As first-line drugs, currently**
- **Controlling chronic symptoms**
- **Ineffective for acute symptoms**
- **3. *Adverse effects***
- **Local: oropharyngeal candidiasis—using spacer**
- **Systemic effects**

C. *Antiasthmatic drugs*

- **Inhibitors of mediator release**

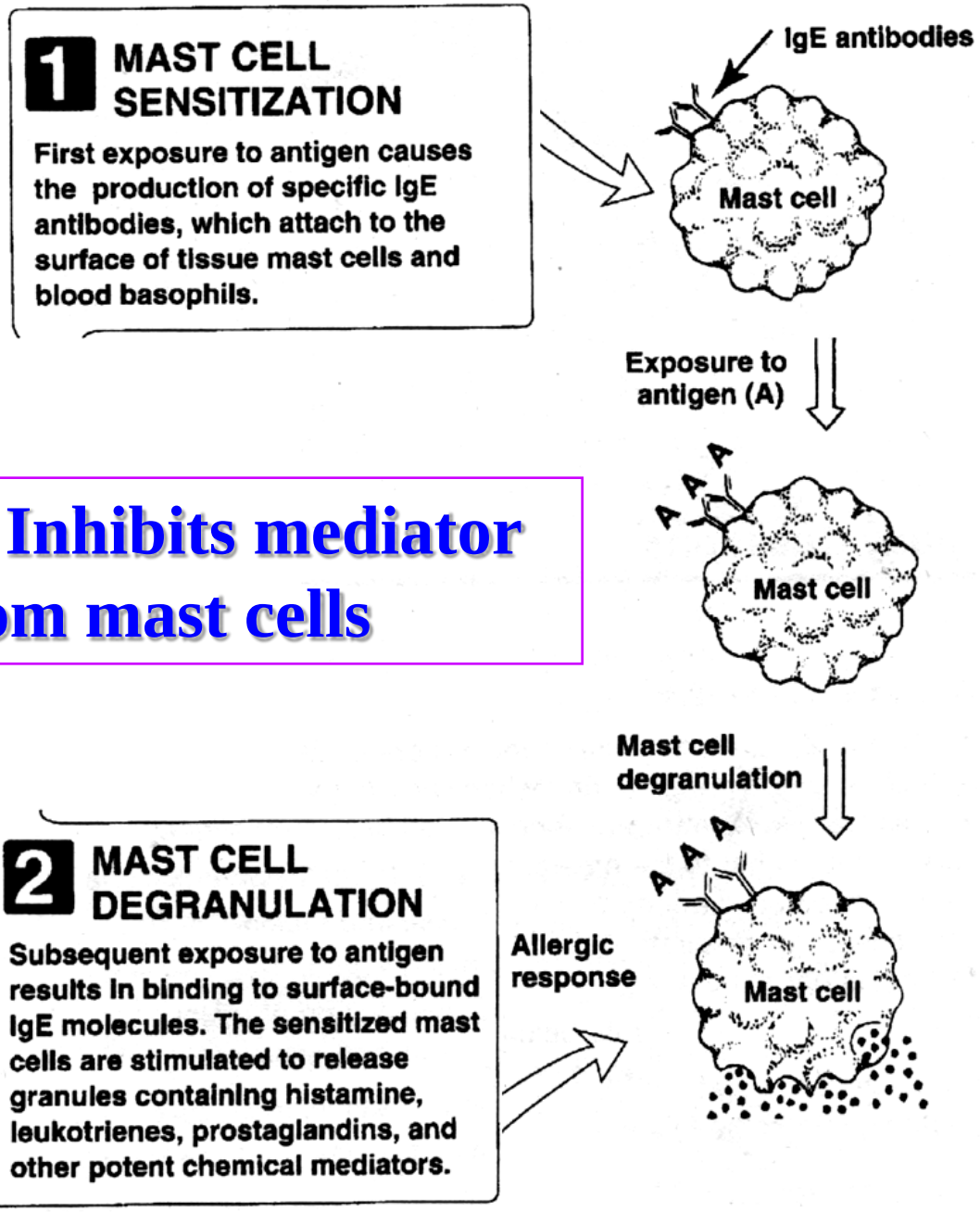
Disodium cromoglycate **色甘酸二钠**

(cromolyn) **(色甘酸钠)**



C. *Antiasthmatic drugs*

- **1. *Pharmacological effects***
- **Inhibiting mediator release from mast or other cells**
- **Inhibiting sensory neuropeptide release**
- **2. *Clinical uses***
- **Prevention of allergic asthma**
- **Acting slowly (2-4 weeks)**
- **3. *Adverse effects***
- **Oropharyngeal irritation**



Cromolyn Inhibits mediator release from mast cells

C. *Antiasthmatic drugs*

- **Other inhibitors of mediator release**

- **Nedocromil sodium** 奈多罗米钠
- **Tranilast** 曲尼司特
- **Ketotifen** 酮替芬(H_1 receptor antagonist)