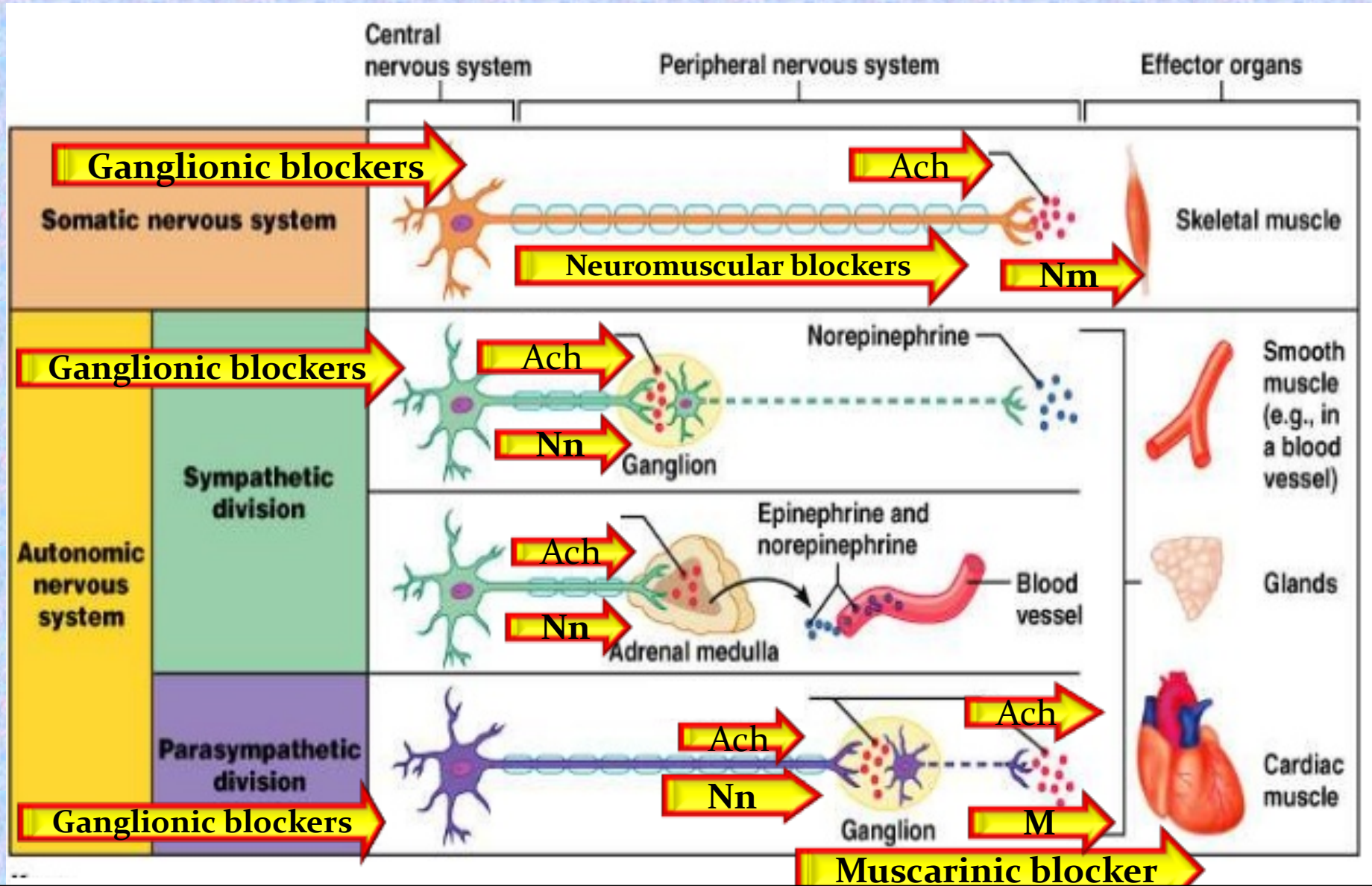
Anticholinergic Drugs



Anticholinergic Drugs

Learninig Outcomes

- Classify anticholinergic drugs
- Outline pharmacodynamic actions of anticholinergic drugs
- Discuss their pharmacokinetic properties
- Define their clinical uses
- List their ADRs & contraindications

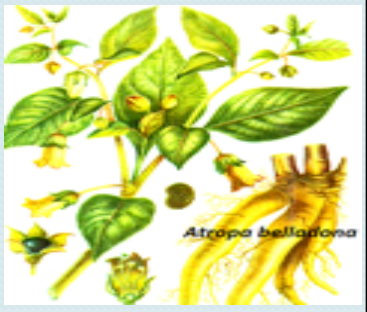
Anticholinergic Drugs

CLASSIFICATION

Antimuscarinic Drugs

According to source

- Natural
  - Atropine
  - Hyoscine
- Semisynthetic
  - Homatropine
- Synthetic
  - Ipratropium, tropicamide



Anticholinergic Drugs

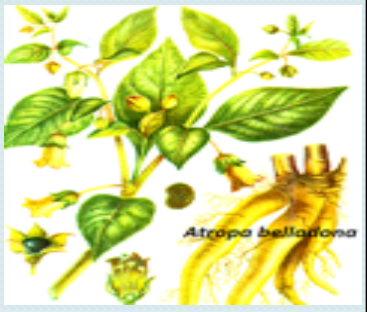
CLASSIFICATION

According to structure

- Tertiary amines
- Quaternary ammonium — Ipratropium

According to selectivity

- Non-selective
- Selective — Pirenzepine(M1), Darifenacin(M3)



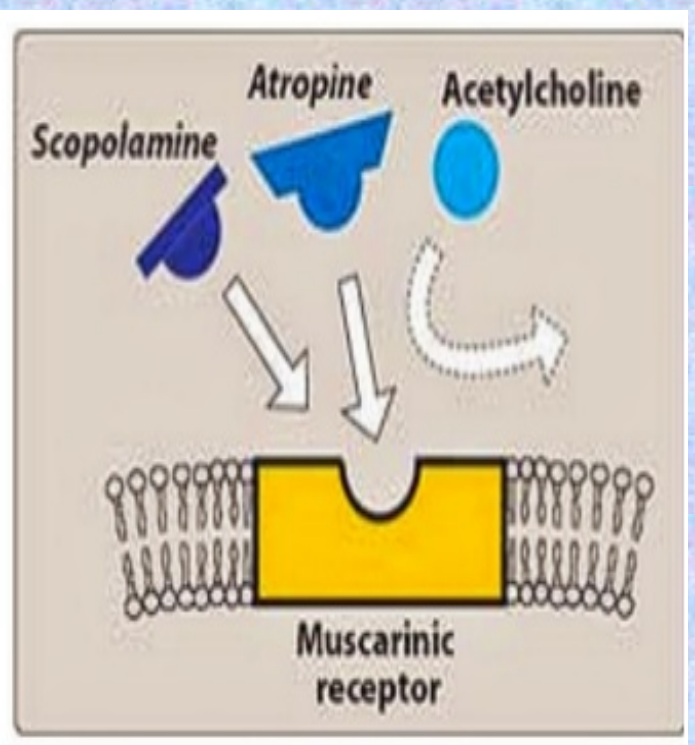
Mechanism of action

Competitively block muscarinic receptors

Salivary, bronchial, and sweat glands are most sensitive

Smooth muscle and heart are intermediate

Gastric glands and gastric smooth muscles are the least.

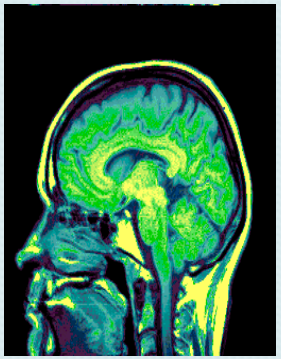


Pharmacodynamic Actions

CNS:-

Atropine at clinical dose, initial stimulation followed by slower longer –lasting sedative effect

Hyoscine →sedative effect



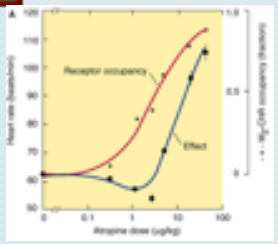
Atropine stimulates many medullary centers, vagal, respiratory, and vasomotor.

High doses of atropine cause cortical excitation, restlessness, disorientation, hallucinations, and delirium followed by respiratory depression and coma

Pharmacodynamic Actions

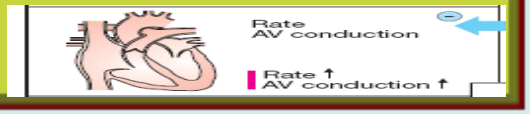
CVS:-

Atropine causes *tachycardia in isolated heart*, due to blockade of M_2-receptors on SA node

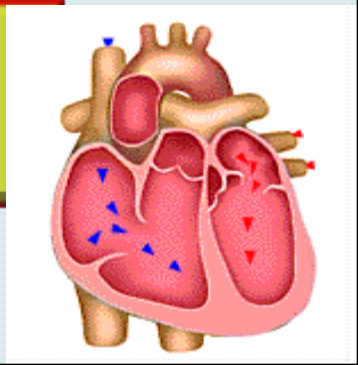


In intact animals, initial bradycardia followed by tachycardia

Atropine *shortens the refractory period of AV conduction*

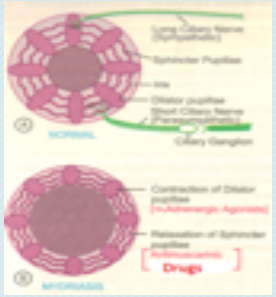


Atropine does not influence BP. It blocks the vasodepressor action of cholinergic agonists



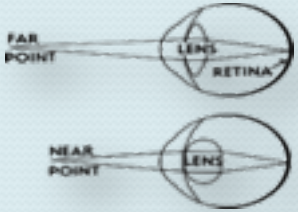
Pharmacodynamic Actions

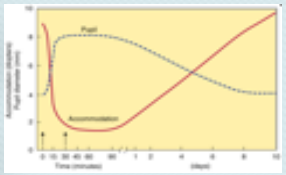
Eye:-



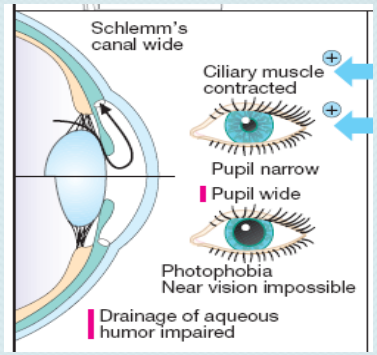
Relaxes pupillae constrictor →mydriasis

Relaxes cilliary muscle *abolition of light reflex &* [cycloplagia].





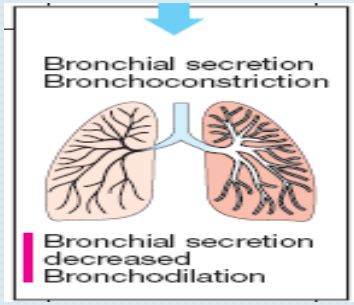
Increase intraocular pressure



↓ Lachrymal secretions

Pharmacodynamic Actions

Respiratory system

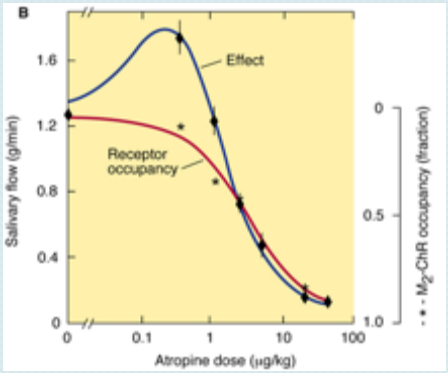


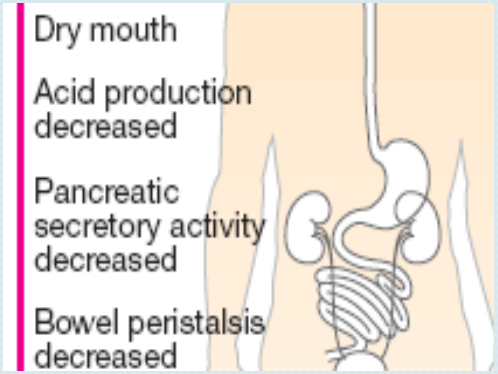
Atropine→ bronchodilation &↓ of secretion

GIT:-

↓Motility

↓ Secretion.



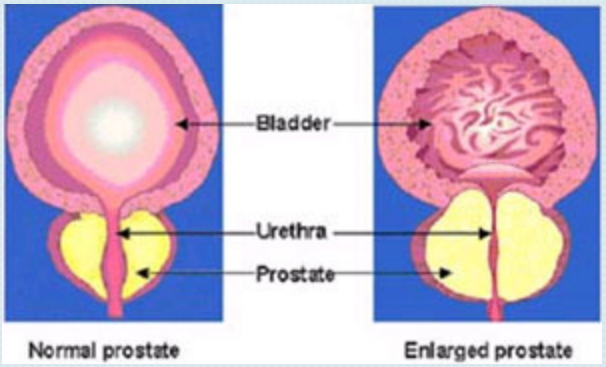


Pharmacodynamic Actions

Genitourinary tract:-

Atropine has relaxant action on the uriters & bladder wall

Urinary retention can occur in older men with prostatic hyperplasia.



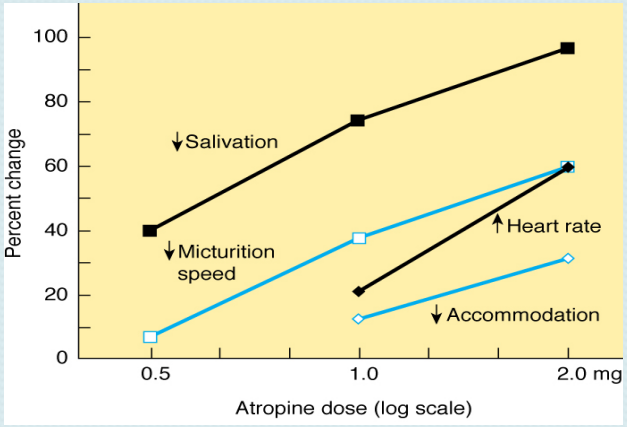
Pharmacodynamic Actions

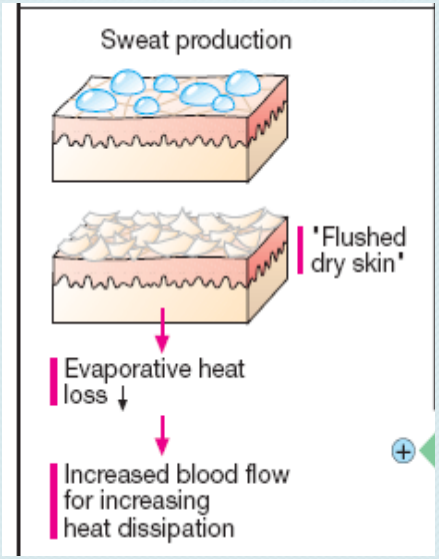
Sweat glands:-

Atropine decreases sweat secretion (*M_3-blockade*)

In children modest doses →”**atropine fever**”

Summary of Effects





Pharmacokinetics

Atropine and hyoscine are rapidly absorbed from the GIT

When applied to the eyes they penetrate the cornea.

Passage of atropine across BBB is restricted.

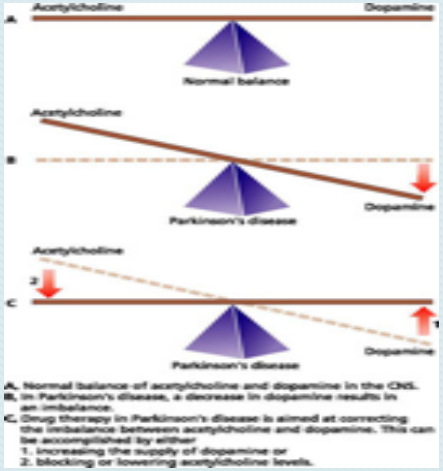
50% of atropine is metabolized in the liver and 50% excreted unchanged in urine.

Atropine has $t_{1/2\ of}$ 3–4 h

Hyoscine is more completely metabolized and has better BBB penetration.

Clinical Uses

CNS:-



i-Parkinsonism:-

Benzhexol, benztropine

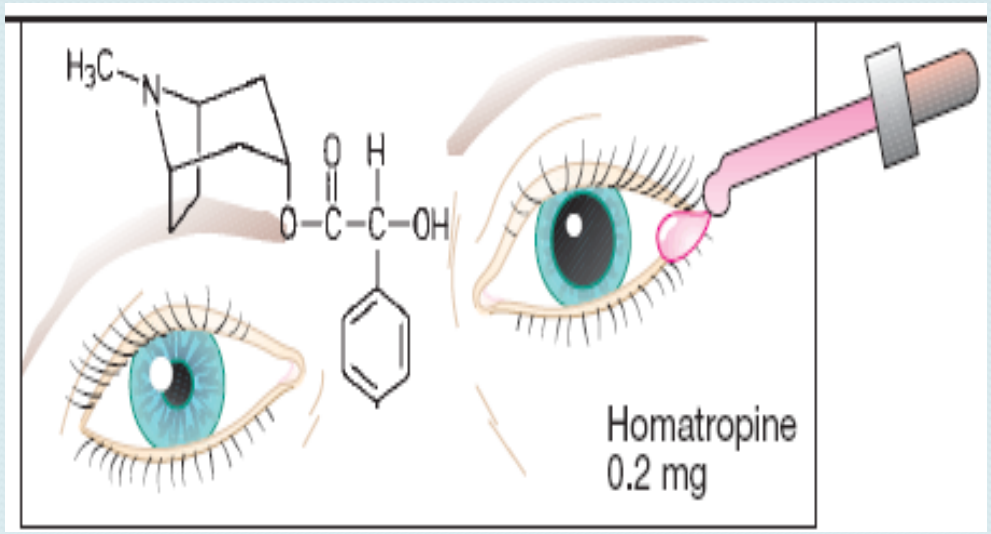
ii-Motion sickness

Hyoscine

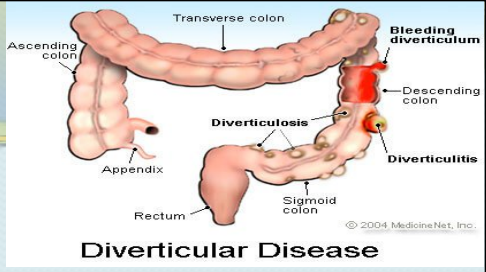
Clinical Uses

Ophthalmic disorders:-

Ophthalmoscopic examination of retina



Clinical uses



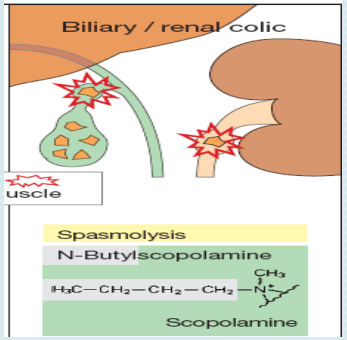
Diverticular Disease

GIT:-

Ulcer ⟹ **Pirenzepine**

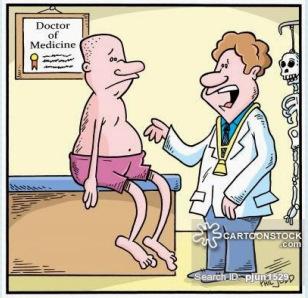
Irritable bowel syndrome, colonic diverticular disease e.g. dicyclomine

Traveler's diarrhoea with opioid [Atropine + diphenoxylate]



Biliary & renal colic.

Urinary urgency caused by minor inflammatory bladder disorders. Urinary incontinence (oxybutynin)



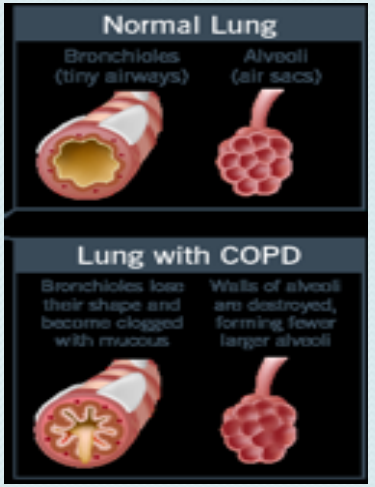
"Do I know much about incontinence? No I was never good at Geography."

Clinical Uses

Respiratory disorders:-

Pre- operative medication when anaesthetic →↑secretion & laryngospasm

Hyoscine→ amnesia,



Bronchial asthma & chronic obstructive pulmonary disease (COPD)

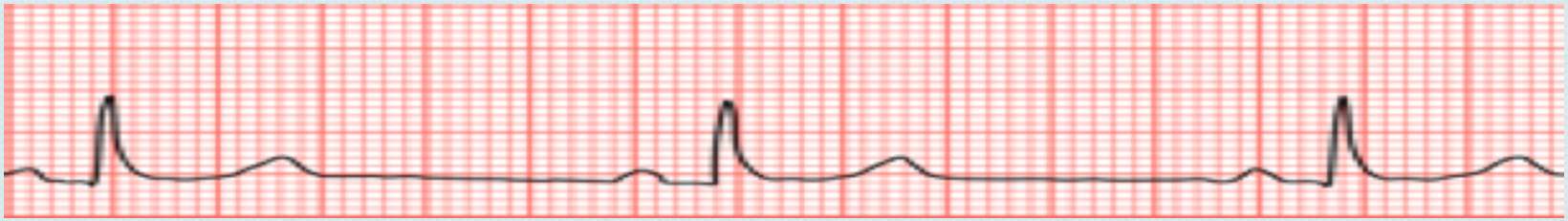
Ipratropium(inhalation)

Clinical Uses

Cardiovascular effects:-

Pain of myocardial infarction → depression of SA, AV node

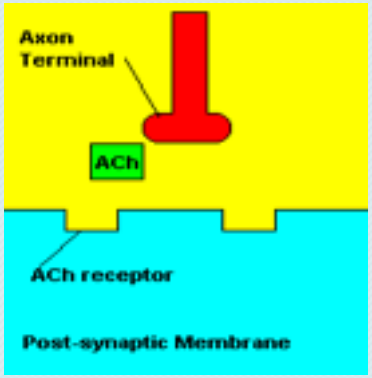
Sinus bradycardia



Clinical Uses

Cholinergic poisoning:-

Cholinesterase inhibitors “insecticides”.



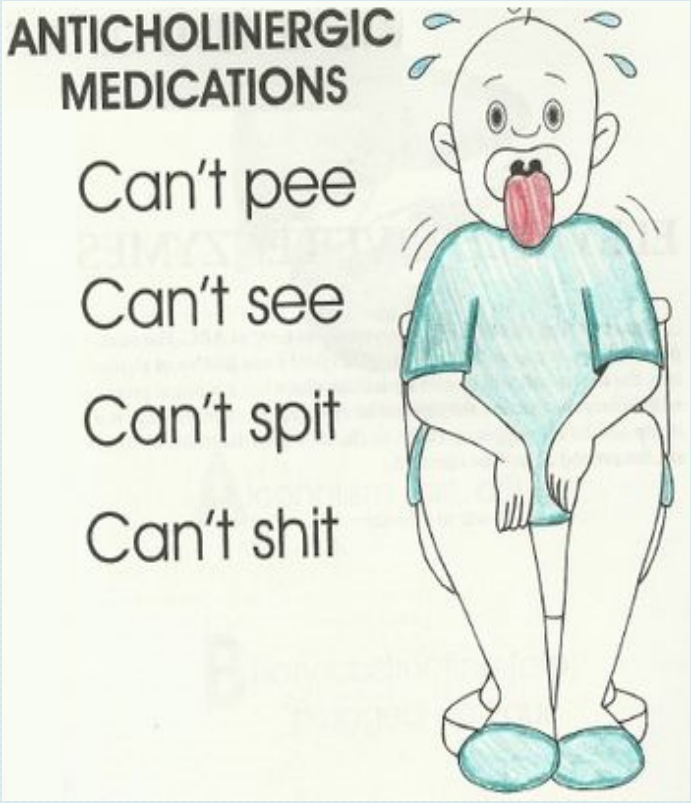
Mushroom poisoning.

Clinical Uses

Hyperhydrosis:-

Adverse Effects

- Mydriasis, blured vision
- Confusion, agitation, delirium
- Dry mouth , hot flushed skin,
- Constipation, urinary retention
- Tachycardia
- ↑ Body temperature



The Mnemonic

Red as a beet

Dry as a bone

Blind as a bat

Full as a Flask

Mad as a hen

Hot as Hell fire

Contra-indications

- Glaucoma
- Elderly people with prostatic hypertrophy
- Tachycardias secondary to thyrotoxicosis or cardiac insufficiency
- GI obstructive disease
- Paralytic ileus.
- Non selective M blockers →ulcer

Quiz 1?

- **A patient is brought into the emergency room. Upon examination you find the following: a high fever, rapid pulse, no bowel sounds and dilated pupils that do not respond to light. His lungs are clear. His face is flushed and his skin is dry. He is confused, disorientated and reports 'seeing monsters'. Based on these symptoms, you suspect he has been 'poisoned'. Which of the following, is the MOST obvious cause of poisoning?**
- A. Neostigimine
- B. Physostigmine
- C. Atropine sulfate
- D. Acetylcholine

Quiz 2?

You are working in the post anesthesia care unit of a hospital. You have just received a patient back from surgery and you are monitoring his status. Knowing that the patient has received atropine, which of the following statements/observations is UNEXPECTED?

A. The patient is complaining of extreme thirst.

B. The patient complains he is unable to clearly see the clock located just across from him.

C. The patient's heart rate is elevated.

D. The patient reports he has cramping and diarrhea.