



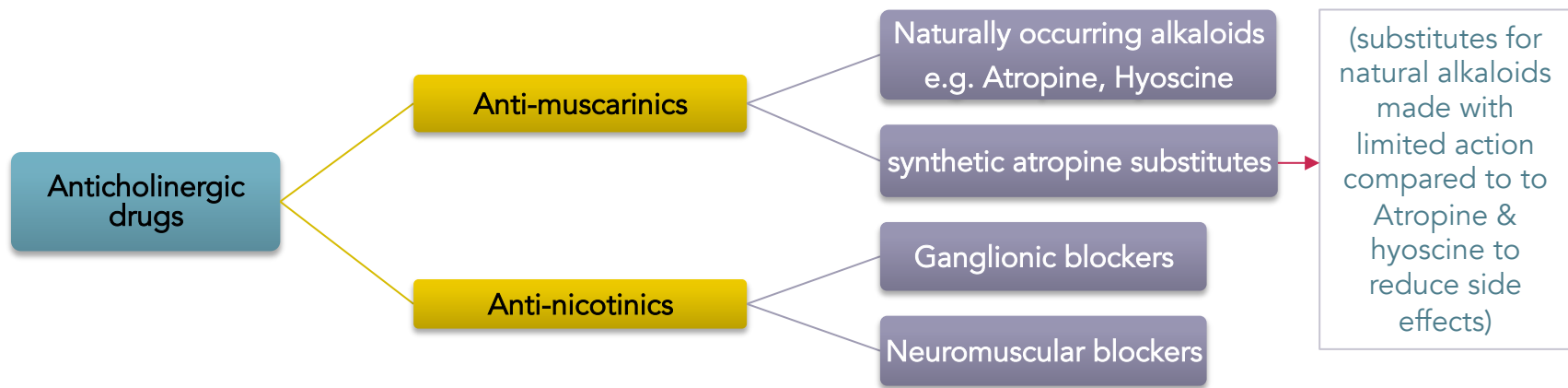
Lecture 1

Anticholinergic drugs

Objectives:

1. Describe Kinetics of muscarinic antagonists , The effects of atropine on the major organ systems.
2. To list the clinical uses of muscarinic antagonists.
3. To know adverse effects & contraindications of anticholinergic drugs.
4. To identify at least one antimuscarinic agent for each of the following special uses as peptic ulcer & parkinsonism, motion sickness.

- Additional Notes
- Important
- Explanation –Extra-

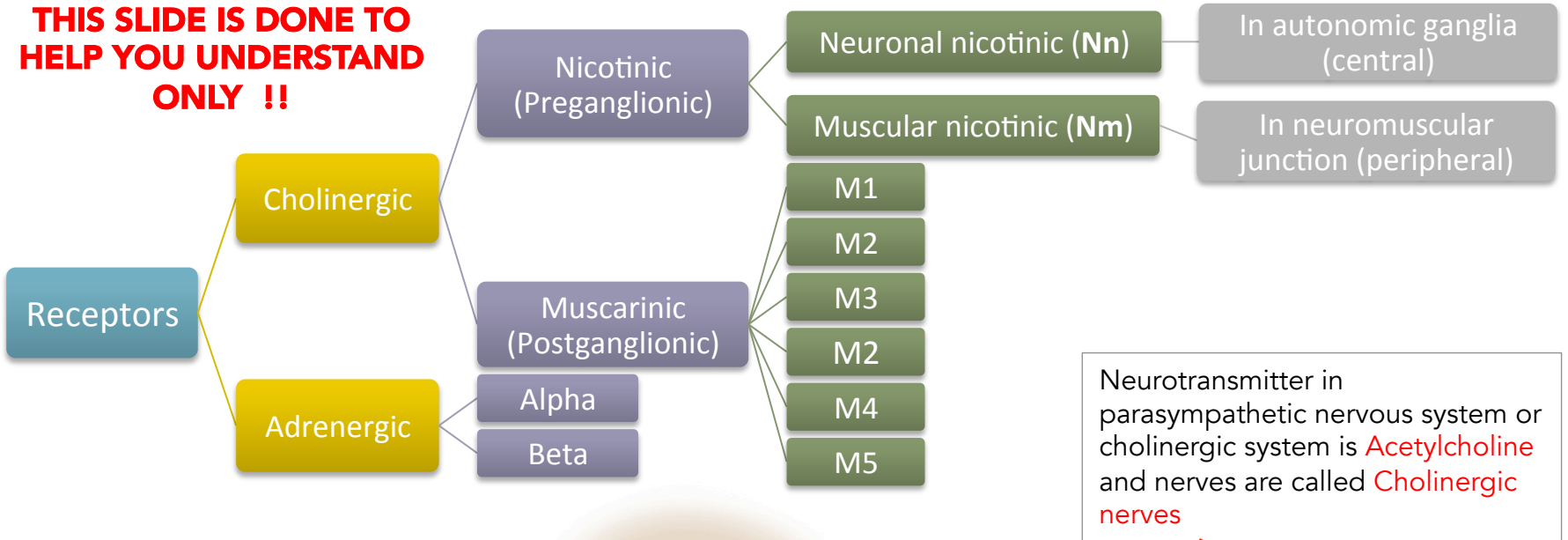


Organs	Cholinergic actions	Anticholinergic actions
Eye	-Contraction of circular muscle of iris (miosis) -Contraction of ciliary muscles for near vision -Decrease in intraocular pressure (IOP)	-relaxation (mydriasis) -relaxation (cycloplegia) (loss of accommodation)
Heart Endothelium	-Bradycardia (decrease in heart rate)	-Tachycardia (increase in heart rate)
Lung	-Constriction of bronchial smooth muscles (Bronchoconstriction) -Increase in bronchial secretion	-dilatation of bronchial smooth muscles (Bronchodilatation) -decrease in bronchial secretion
GIT	-Increase in motility (peristalsis) -Increase in secretion -Relaxation of sphincter defecation (Diarrhea)	-decrease in motility (peristalsis) -decrease in secretion -contraction of sphincter defecation (constipation)
Urinary Bladder	-Contraction of muscles -Relaxation of sphincter -Urination	-Relaxation of muscles -contraction of sphincter - Urinary retention
Exocrine glands	-Increase of secretions of exocrine glands, sweat, saliva, lacrimal (tears), bronchial, intestinal secretions	-Decrease all secretions

Anticholinergic drugs: Drugs that block cholinergic receptors. So, when we block the muscarinic receptors – which are in parasympathetic ANS – we activate the actions of the sympathetic system.

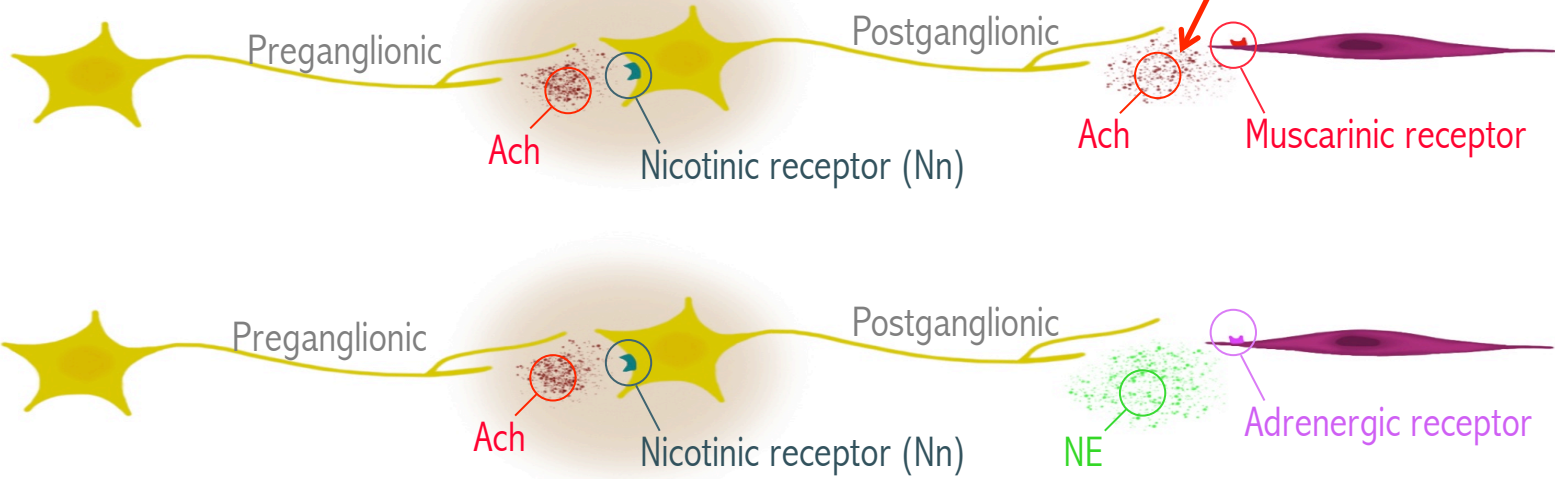
What does cycloplegia mean? Miosis (contraction of ciliary muscles) happens when the eyes try to focus on near subjects (near vision). In the other hand, Mydriasis happens for far vision. In normal situations, when the sympathetic NS is activated, ciliary muscles of the eye relax causing mydriasis. At the same time if you bring a close object to eye miosis will happen (contraction of ciliary muscles) to allow seeing the near object. In the other hand, patients who have administered anticholinergic drugs (e.g. Atropine toxicity), their ciliary muscles won't be able to contract even if they want to see something near. That's why the doctors use this method to detect anticholinergic drugs administration or toxicity. So, **Cycloplegia means:** Paralysis of the ciliary muscles of the eye.

THIS SLIDE IS DONE TO HELP YOU UNDERSTAND ONLY !!



Neurotransmitter in parasympathetic nervous system or cholinergic system is **Acetylcholine** and nerves are called **Cholinergic nerves**

Autonomic NS



Somatic NS



Muscarinic Antagonists

Natural alkaloids: (come from plants so, they're lipid soluble) (not selective for the receptors)

Drug	Atropine (prototype)	Hyoscine
MOA	Reversible competitive blockade of all muscarinic receptors (not selective)	
Duration of action	long	shorter than atropine
Effect on CVS	<ul style="list-style-type: none"> - Tachycardia (increase in heart rate) - Therapeutic dose: ↓ Vasodilatation (doesn't cause vasoconstriction, but it cancels out the dilatation happened by cholinergic action) induced by cholinomimetics. - Toxic dose: Cutaneous vasodilatation (results from releasing of prostaglandin, not NO) → (Atropin flush). 	Less CVS effect
Effect on CNS	CNS depression (Sedation), centrally Antiemetic effect (block vomiting center) and Anti-parkinsonian effect (block basal ganglia) (in this disease, low Dopamine & high Ach, we can reduce the amount of Ach by anticholinergic drugs) Toxic dose: Hyperthermia – excitement – hallucination.	More CNS depressant action More antiemetic action used in motion sickness Can produce Amnesia (loss of recent memory): used as an anesthetic
Effect on Urinary tract	<ul style="list-style-type: none"> - Relaxation of smooth muscles of urinary bladder. (accommodates more urine) - Sphincter contraction → Urinary retention. 	Pharmacokinetics: -for both Atropine and Hyoscine- <ul style="list-style-type: none"> • Lipid soluble • Good oral absorption • Good distribution • Cross blood brain barrier (have CNS actions) Treatment of toxicity: <ul style="list-style-type: none"> • Gastric lavage. • Anticonvulsant. • Cooling blanket. (for hyperthermia) Antidote: Physostigmine (lipid soluble=CNS effects) (IV slowly) (indirect acting anticholinesterase). Side effects: <ul style="list-style-type: none"> • Eye: Blurred vision – mydriasis • CVS: Tachycardia - atropine flush • UT: Urinary retention • GIT: Constipation (contracted sphincter), paralytic ileus (decreased peristalsis) • Secretions: dryness of mouth, sandy eye, increased body temperature. • CNS: sedation, hallucination, excitation (toxic dose). Contraindication: Glaucoma (angle closure glaucoma), Tachycardia, Constipation Prostate hypertrophy in old patients, Children (in case of Atropine → Hyperthermia).
Effect on Respiratory system	<ul style="list-style-type: none"> - Relaxation of bronchial muscles (bronchodilator) - ↓ Bronchial secretion → ↑ viscosity 	
Effect on Eyes	<ul style="list-style-type: none"> - Passive mydriasis (anticholinergic drugs inhibits parasympathetic system as a result, mydriasis occurs. Sympathetic system causes active mydriasis). Due to paralysis of circular muscle. - Cycloplegia (loss of near accommodation) due to paralysis of ciliary muscle. - Loss of light reflex. - Increase I.O.P # glaucoma. (by relaxation of circular & ciliary muscles) - ↓ Lacrimal secretion (tears) → sandy eye. 	
Effect on Secretions	<ul style="list-style-type: none"> ↓ Salivary secretion → (Dry mouth). ↓ Sweating → dry skin → Fever in infants and children. (Atropine can't be used in children even with therapeutic dose). 	
Effect on GIT	Relaxation of smooth muscles. ↓ GIT motility → Antispasmodic effect. ↑ Sphincter contractions	

Synthetic atropine substitutes (selective = less side effects)

Drug	Benz tropine	Hom atropine	Tropicamide	Ipr atropium	Pirenzepine
organ	CNS	Eye		Respiratory system	Stomach
uses	Parkinson's disease	Fundus examination of eye		asthma, COPD, (used by inhalation to reduce side effects)	Peptic ulcer

Clinical uses of anti-muscarinic drugs:

- Parkinsonism
- Vomiting
- Asthma
- Peptic ulcer.
- Intestinal spasm as antispasmodics
- Constipation
- Urinary urgency

Uses of Atropine and Hyoscine (They work on **CNS**):

- Pre-anesthetic medication
- Antispasmodic
- Motion sickness **-Hyoscine Only-** It has central antiemetic action → prevents dizziness and vomiting (It should be administered before the trip).

Why do we use Atropine and Hyoscine as Pre-anesthetic medications?

- Sedation effect.
- During surgery Bradycardia could happen, so they prevent it from the beginning.
- Decrease secretion of mucus to improve ventilation during surgery.

Although they block parasympathetic actions. Why do anti-muscarinic drugs cause sedation?

Because they play a role in blocking H1 receptors in the brain.

★ Summary

Drug	Kind	Site of action	Uses
Atropine	Natural alkaloid (lipid soluble)	Non-selective	<ul style="list-style-type: none"> • Pre-anesthetic medication • Antispasmodic
Hyoscine			<ul style="list-style-type: none"> • Pre-anesthetic medication • Antispasmodic • Motion sickness
Benz tropine	Synthetic (Lesser side effects)	CNS	Parkinson's disease
Homat ropine		Eye	Fundus examination of eye
Tropic amide		Respiratory system	asthma, COPD, (used by inhalation to reduce side effects)
Iprat ropium		Stomach	Peptic ulcer
Pirenze pine			

Contraindication:

- Glaucoma (angle closure glaucoma).
- Tachycardia.
- Constipation.
- Prostate hypertrophy in old patients.
- Children (**Atropine** → **Hyperthermia**).

Toxic effect of Atropine :

- Dry mouth .
- Inhibition of sweating.
- Tachycardia and cutaneous vasodilation.
- Blurring of vision.
- Hallucination.

Mnemonic to help you remember:

“**D**ry as a bone, **H**ot as a hare, **R**ed as a beet,
Blind as a bat, **M**ad as a hatter”



<https://www.youtube.com/watch?v=OutqM2WENfo>

To understand the physiological part watch this video.

★ MCQs

1. Which is not an example of Antimuscarinics?

- A) Neuromuscular blockers
- B) Glycopyrrolate
- C) Atropine
- D) Hyoscine

2. Which is a characteristic of Natural Alkaloids?

- A) Poor absorption
- B) Poor distribution
- C) Polar
- D) Cross BBB

3. Which is not a Synthetic Atropine Substitute?

- A) Benztropine
- B) Ipratropium
- C) Oxybutynin
- D) Hyoscine

4. Effect of Atropine on CVS?

- A) Bradycardia
- B) Sedation
- C) Positive dromotropic effect
- D) Increased viscosity

5. Which does not act on CNS?

- A) Atropine
- B) Hyoscine
- C) Homatropine
- D) Benztropine

6. Which is true for Hyoscine?

- A) Long duration of action
- B) Less CNS depressant action
- C) Less CVS effect
- D) Less used in motion sickness

Good luck!

Done by Pharmacology team 434

Moneera Al Draihem

Maha Al-Rabiah

Mesha'al Hussain

Khulud Al Enzy

Hanan Muhammad

Noha Al Gwaiz

Muhammad Kharraz



For any correction, suggestion or any useful information do not
hesitate to contact us: Pharmacology434@gmail.com