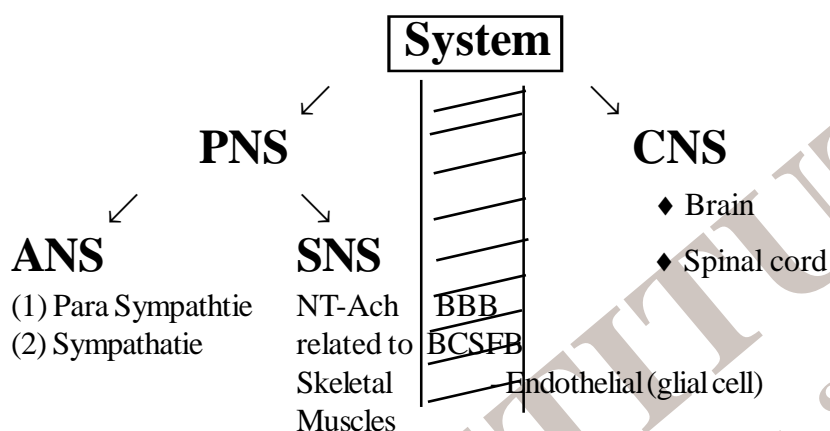


PHARMACOLOGY

Autonomic Nervous System[ANS]

Autonomic Nervous System



- ◆ Parasympathetic fibre originated from cranial nerve and sacral spinal cord.
- ◆ Sympathetic fibres originated from thoracic and lumbar spinal cord

(1) Parasympathetic system

↑ Ach - mimetic

↓ Ach - lytic

- ◆ **Neurotransmitter** - Acetyl choline, synthesized from acetyl Co A and choline
- ◆ **Receptor** - (1) Muscarinic - M_1 (GIT)
 M_2 (Heart)
 M_3 (GIT, Eye, Bladder, Bronchi gland, CNS)
 (2) Nicotinic - N_M - skeletal Muscles
 N_m - ganglia

(2) Sympathetic

Neurotransmitter - Adrenaline, Nor Adrenaline and Dopamine

Receptor - α - α_1 - Blood Vessels, Eye

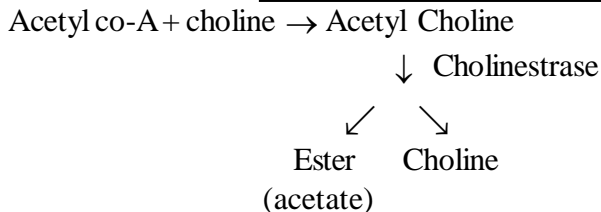
α_2 - Decide Sympathetic outflow

β - β_1 = Heart (Myocardium)

β_2 - Bronchi, uterus, Bladder, Blood vessels

β_3 - Adipose tissue

Biosynthesis of Acetylcholine



Pharmacological action of cholinergic drug

- 1) **Heart** - Negative chronotropic, Negative drototropic
- 2) **Blood vessels** - Vasodilation due to NO release
- 3) **Gland** - ↑ Salivation, ↑ Lacrimation, ↑ Sweating (M₃ Effect)
- 4) **GIT** - ↑ HCl Secretion, causes Hyperacidity ↑ Gut motility ↑ Intestinal colic
- 5) **Eye** - Causes Miosis, by stimulating sphincter pupil (circular muscles causes contraction of ciliary muscles)
- 6) **Urinary Bladder** - Stimulate detrussor and relax trigone (sphincter) of urinary bladder, ↑ Micturition
Resulting urinary incontinence .
- 7) **Bronchi** - causes Broncho constriction, can precipitate asthma and COPD
- 8) **Male sex organ** - Erection of male sex organ.
- 9) **Ganglia** - stimulated by acting on N_M receptor .
- 10) **Skeletal Muscle** - stimulated by acting on N_M receptor.

Cholinergic drugs (Parasympathomimetic Drug)

(a) **Direct acting** -

- ◆ Acetylcholine
- ◆ Pilocarpine
- ◆ Metha choline
- ◆ Carbachol
- ◆ Betacholine

(b) **Indirect acting** - Protect Ach from cholinesterase So called anti cholinesterase or cholinesterase inhibitor

(1) **Reversible carbamate**

- | | | |
|--------------------|---|--------------------------|
| a) Physostigmine | } | Lipid soluble carbamate |
| b) Rivastigmine | | |
| c) Doneprozile | | |
| d) Gallantamine | | |
| e) Neostigmine | } | Water soluble carbamate |
| f) Pyrido stigmine | | |
| g) Edrophonium | | |
| i) Techrine | | (Lipid Soluble Acridine) |

(2) Irreversible**Organophosphate**

Malathion
Parathion
Echothiophate
Dyflor

Carbamate

Carbaryl
Propoxur

Physostigmine - Lipid soluble, long acting, Tertiary amine, Anti dote of Atropine poisoning, used in Glucoma as mitotic drug, Also used in curare poisoning as muscle stimulant

Neostigmine - used in Myasthenia gravis and curare poisoning (water soluble) Also more effective in curare poisoning.

Edrophonium - used in diagnosis of myasthenia gravis (Tensilon test)

- ◆ Donepezil, rivastigmine and galantamine most preferred drug for **Alzheimer's disease**.
- ◆ Atropine is antidote of organophosphate and carbamate poisoning.

Anti cholinergic Drug

- Act on Both muscarinic and Nicotinic receptor
- Drug Block N_m receptor called Neuro muscular blocking agent,
- Drug block N_N Receptor are ganglion Blocker

Classification

1. **Alkaloid** -
 - ◆ Atropine - CNS Stimulant,
 - ◆ Hyoscine (Scopolamine) - CNS depressant
2. **Semisynthetic** - Homotropine, Ipratropium, Tiotropium
3. **Synthetic** -
 - (a) **Mydriatic** - cyclopentolate, Tropicamide
 - (b) **Anti spasmodic**-
 - ◆ **Tertiary amine** - Dicyclomine, pirenzepine and Tolenzepine
 - ◆ **Quaternary amine** - Propanthaline isopropamide and glycopyrolate
4. **Anti parkinson** - Trihexi phenidyl (Benhexol), Biperiden, procyclidine, Binztropine

Pharmacological action**(1) CNS**

- ◆ Atropine CNS stimulant,
- ◆ Scopolamine is CNS depressant,
- ◆ Scopolamine induce "**Twilight sleep**" Also called **Truth serum**.
- ◆ Transdermal patch used in Motion sickness
- ◆ Trihexi phenidyl (Benzhexol), Biperiden, and Benztropine drug of choice for drug induced parkinson

(2) Eye

- ◆ Causes Mydriasis and cyclopegia . Ex- cyclopentolate, Tropicamide
- ◆ Atropine has long duration of action than scopolamine
- ◆ Tropicamide is shortest acting mydriatic
- ◆ Anti cholinergic action contraindicated in glaucoma

(3) CVS

- ◆ Atropine initially causes Bradycardia (Presynaptic), But on increased dose causes Tachycardia (Post synaptic)
- ◆ Atropine used in drug induced Bradycardia and AV Block

(4) Respiratory system

- ◆ Causes Bronchodilation, used in Asthma and COPD .
Ex- Ipratropium and Tiotropium
- ◆ Glycopyrolate used in pre-anaesthetic medication

(5) GIT

- ◆ Decrease gut motility, tone and secretion
- ◆ Pirenzepine, tolenezepine used in peptic-ulcer
- ◆ Dicyclomine, propantheline used as antispasmodic and also in intestinal colic.

(6) Genito urinary

- ◆ Anti cholinergic ↓ Motility of urinary tract and causes urinary retention so used in urinary incontinence and renal colic

(7) Gland

- ◆ ↓ Salivation, ↓ Lacrimation and sweating.
- ◆ Atropine is contra indicated in children due to risk of hyperthermia (↓ sweating)
- ◆ Atropine is antidote in early Mushroom poisoning, physostigmine, organophosphate and carbamate poisoning.