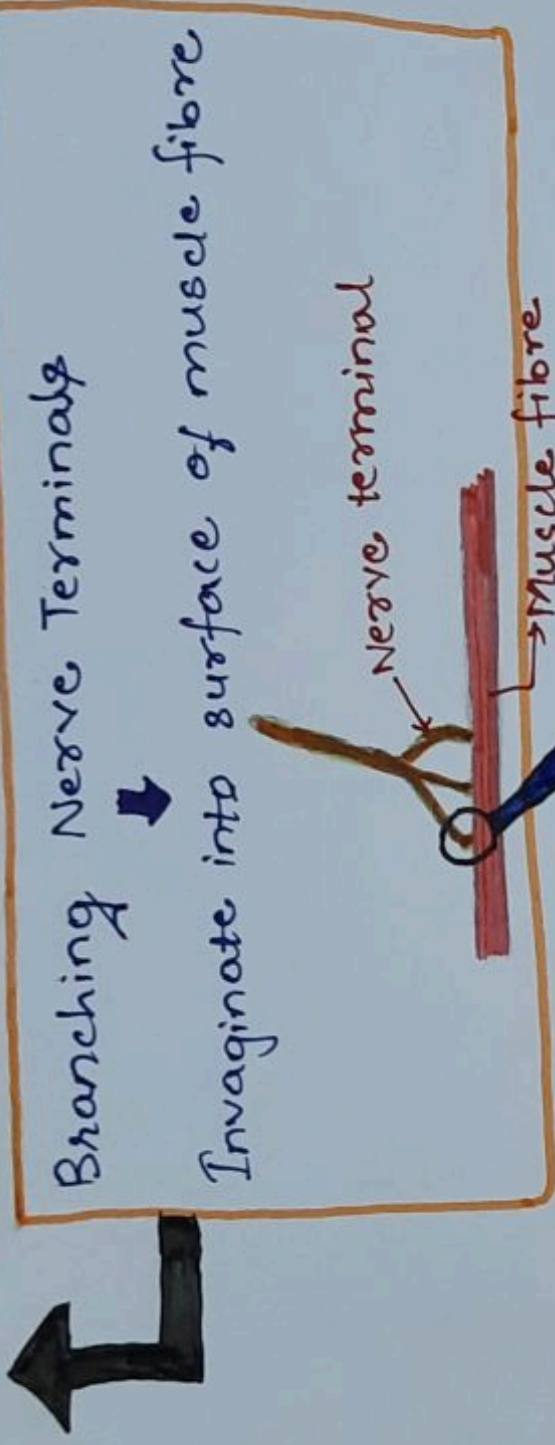


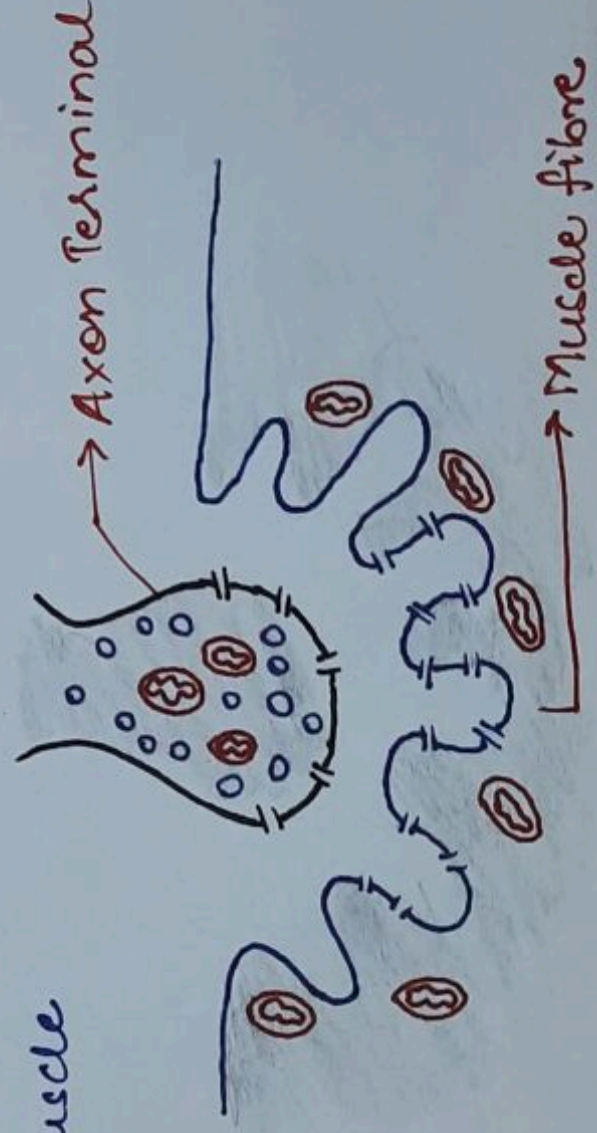
MOTOR END PLATE



NEURO-MUSCULAR JUNCTION

Junction Between
Nerve Ending & Muscle
fibre.

Generally,
1 NMJ per muscle
fibre.



PHYSIOLOGICAL ANATOMY OF NMJ.

Synaptic Gutter / Synaptic Trough :-

- Invaginated membrane of muscle fibre.

Subneural clefts :-

- folds of muscle membrane at bottom of gutter.

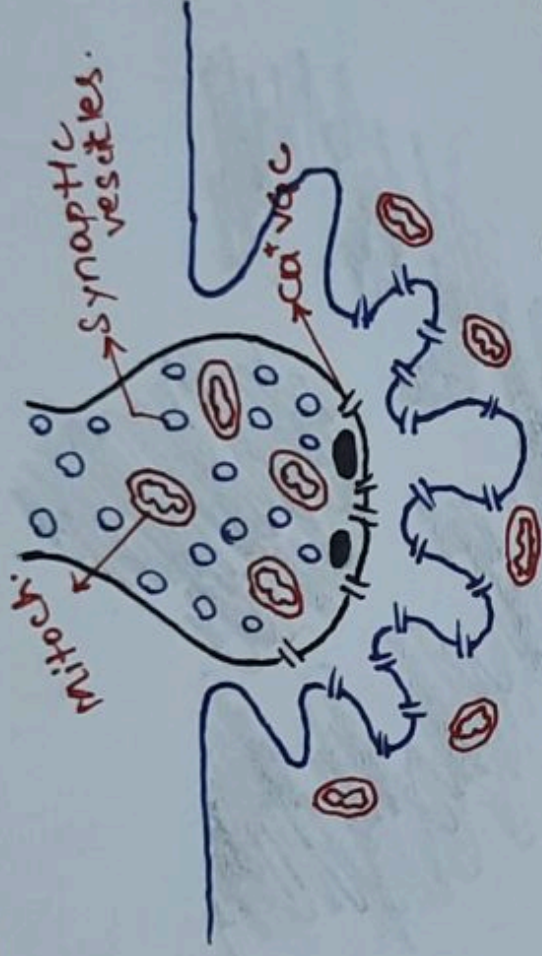
Synaptic cleft / space :-

- Space B/w Axon terminal & fibre membrane
- Approx $\rightarrow$ 20-30nm
- Contains Acetylcholinesterase enz.

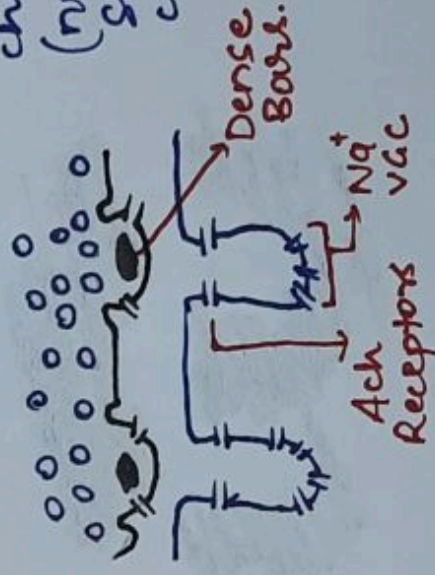
$\Downarrow$
Destroys ACh a few milisees after it has been released from synaptic vesicle.

Axon terminal :-

- $\uparrow$ Mitochondria (for ATP supply) $\Rightarrow$ syn. of ACh.



Fibre membrane:
- ACh gated ion channels (near neck of subneural cleft)



- Linear dense bars
- Synaptic vesicles (cont. ACh)
- Ca^{++} VGC

MECHANISM OF NEUROMUSCULAR TRANSMISSION

Action Potential reaches Axon Terminal.

↓
Opening of Ca^{++} VGC

↓
Entry of Ca from synaptic space to interior of nerve terminal.

↓
Ca activates Ca^{++} -calmodulin dependent protein kinase
↓
Anchors the Ach vesicles to cytoskeleton of presynaptic terminal.

↓
Phosphorylation of Synapsin

↓
Freezes Ach vesicles from cytoskeleton.

↓
Vesicles move to active zone of presynaptic neural membrane adjacent to dense bars.

↓
Vesicles • Dock & fuse; empties Ach
By Exocytosis

↓
2 Ach molecules are required to open
Ach-gated ion channel.

↓
Conformational changes opens channel.

↓
⊕ ions can pass but ⊖ cannot because of -ve charge on channel

↓
Na⁺ ion enters through channels

↓
Generation of Local positive potential known as
"End plate Potential" (50-75mV)

↓
Initiation of Action Potential & its spreading
along muscle membrane.

↓
Muscle Contraction.

Ach Removed from Space :- [To prevent persistent depolarisation]

⇒ Mostly by Acetylcholinesterase.

⇒ Small amount by diffusing out of synaptic space & no longer available.

Fatigue :- when

- Rate of impulse > 100 times per sec
- for several minutes



consumption of Ach > Ach production
for transmission



Depletion of Ach



Fatigue of NMJ.

DRUGS AFFECTING NMJ.

1.) Botulinum (clostr. B.) :- Acts presynaptically
↓
Prevents Ach vesicles from fusing
↓
Preventing release of Ach.

2.) Methacholine, Carbachol, nicotine :-

↓
have same effect as Ach.
↓
causing depolarisation.

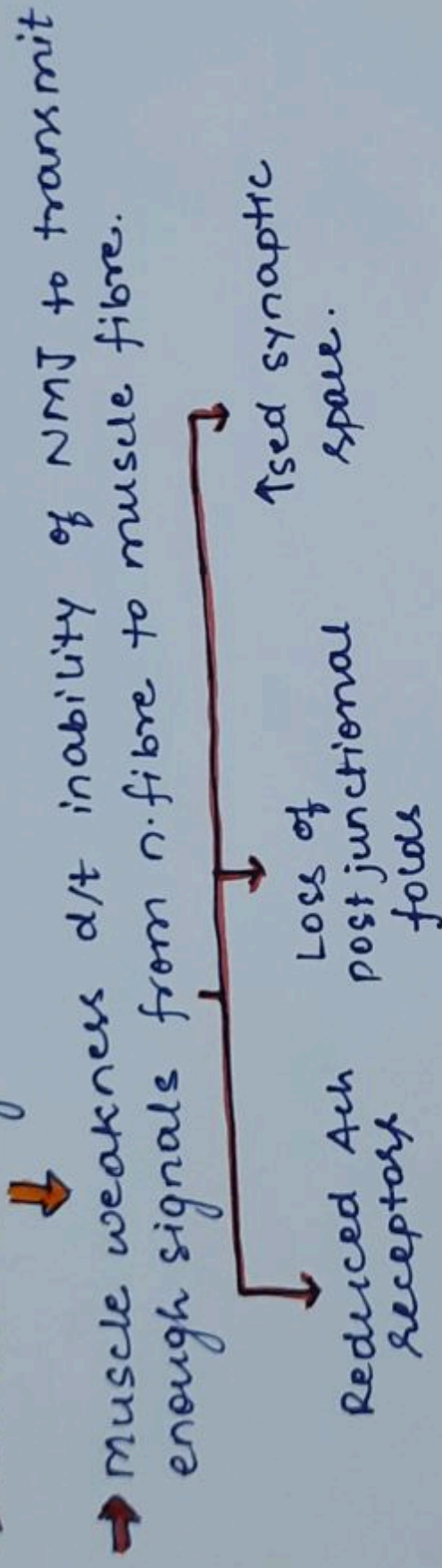
↓
But can't be destroyed by AChEsterase.

↓
Initial muscle twitching & then paralysis d/t persistent depolarisation
3.) Neostigmine, Physostigmine, Diisopropyl fluorophosphate :-

↓
Inactivates AChEsterase
↓
Persistent depolarisation
↓
Muscle spasm.

Myasthenia Gravis :-

- ➡ Autoimmune disorder
- ➡ Occurrence :- 1 in 20,000 person
- ➡ Antibodies against ACh receptors.



- ➡ Tx :- frequent dosage of Neostigmine ↓
⊖ AChErase.