

Structure and Functions of Neurons

Neuron: structural and functional unit of nervous system.

parts

- cell body { soma | perikaryon } → { Golgi
mitochondria
lysosome }
- axon →
- dendrite →

special.

- in dendrites ✓
- not in axon & axon hillock
- Nissl's granules: RER
- Neurofilaments.
- [Alzheimer's - neurofibrillary tangle]

- **Myelinated**: Myelin sheath: CNS → oligodendrocytes.
PNS → Schwann cell
- **Unmyelinated**: Ranvier doesn't coil around completely. Schwann cell is present.

Functions:

- Increase speed of conduction
- reduce energy expenditure by cell.
- covering to axon
- forms white matter

Axoplasmic Transport / Axoplasmic flow.

- various proteins, organelles & other substances
- transport block → colchicine, cyanide, azide, dinutrophenol

- Types:
 - Anterograde transport: from cell body to axon
 - Retrograde transport: axon terminal to soma.
 - Transneuronal transport: transport across synapse (NGF's)

Anterograde

- soma → axon Trnl.
- eg: neurotransmitters packed in vesicles.
- mitochondria.

Mapped by: $[^3H]$ -leucine.

rate

Fast AT.

- 400 mm/day.
- by kinesin.
- organelles, vesicle, membrane glycoproteins.

Slow AT.

- 0.5 - 2 mm/day.
- structural compns actin, neurofilaments.
- For regeneration.

kinesin
dynein
kinesin
dynein

Retrograde

- axon terminal to soma
 - ≈ 200 mm/day.
 - dynein.
 - mapping: horse-radish peroxidase.
 - Inform about synaptic environment.
- examples.

1. Transport of virus

- # Chicken pox virus
Varicella zoster
→ herpes simplex.

rabies virus

2. Transport of Toxins

- Tetanus toxin.

3. NGF

- ### 4. synaptic neurotransmitter reuptake.
- eg: Norepinephrine, choline.

Trans neuronal

- NGFs are transported across synapse to presynaptic of another neuron.

- Cell body & Dendrite : receptor zone
- Axon hillock : generate AP.
- axon : transmission
- axon terminal : discharge of neurotransmitters.

difference between action potential and graded potential.

Action potential.

1. • propagative
2. • Long-distance signal
3. • depolarization & repolarisation
4. • obeys - all or none law
5. • Summation X
6. • Has refractory period.

Graded potential.

- Non-propagative.
- short-distance signal.
- depolarization or hyperpolarizations.
- does not obey all or none law.
- summation ✓
- No refractory period.

- In most cases, graded potential $\xrightarrow{\text{cause}}$ action potential.
Some case \rightarrow hyperpolarize.

Definition:

(1) Action potential:

transient change in membrane potential that is conducted along axon in all or none fashion. occurs in two phases: depolarization & repolarization.

(2) Graded potential: mild local change in membrane potential that is non-propagative and characterized by mild depolarization or hyperpolarization.

Monophasic action potential and its ionic basis.

Monophasic action potential: Series of electrical changes that occur in stimulated muscle or nerve fibre which is recorded by placing recording electrode inside and reference electrode outside.

≈ 1ms.

Ionic Basis:

