

# NERVE PHYSIOLOGY

S1/5/82, 1/6/98, 4 Jan 00, 3 Jan 01, 6 Jan 03, 5 Jan 04, 9 Jan 08, 7Jan09, 4Jan10, 9Jan12, 10Nov15  
 S&M p 285, Martini's 5th pp 373-396, 6<sup>th</sup>: 7<sup>th</sup>: 392-, 8<sup>th</sup>: 398-425, 9<sup>th</sup>: 386-412

## Resting Membrane potential:

(p. 400)

Na/K pump:

K<sup>+</sup> higher conc inside,

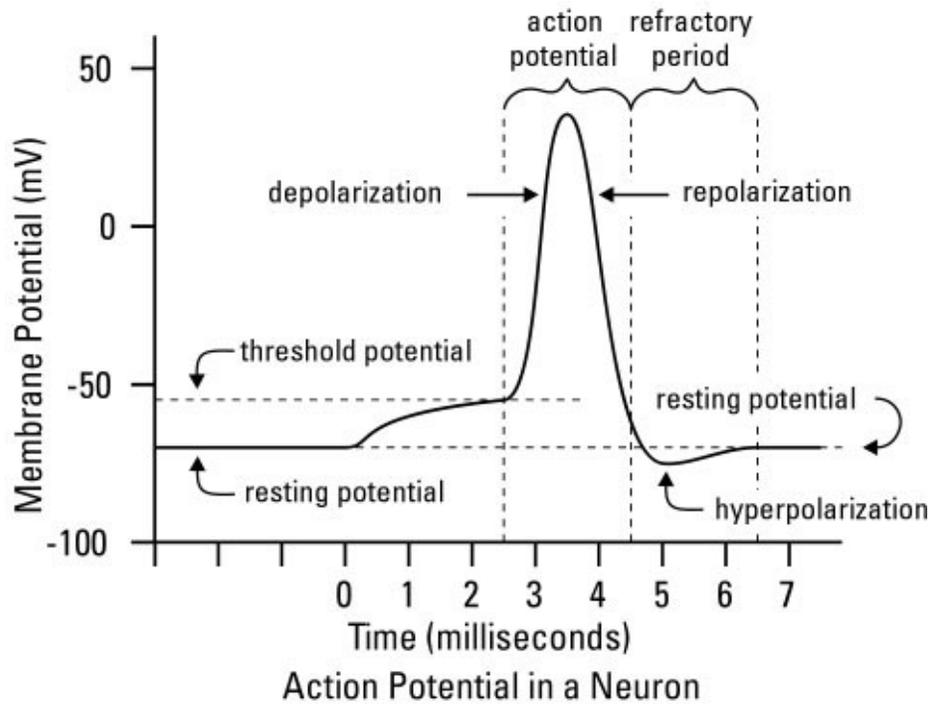
Na<sup>+</sup> higher outside

(30x as much Na<sup>+</sup> as K<sup>+</sup>).

Inside is more negative than outside due to unequal distribution of positive ions:

-60 to -90 millivolts

Nerve membrane is more permeable to K<sup>+</sup> than Na<sup>+</sup>.



## ACTION POTENTIAL: ( summary of events 408)

video: [https://www.youtube.com/watch?v=-h\\_kWFM2faQ](https://www.youtube.com/watch?v=-h_kWFM2faQ) (start at 0:35)

Stimulate neuron

membrane becomes more perm to Na<sup>+</sup>. As Na<sup>+</sup> moves in, inside becomes positive

depolarization threshold

>15-20 mv, membrane gates open to Na<sup>+</sup>, rushes into cell, become positive, increasing permeability.

This then opens K<sup>+</sup> gates, rushes out.

Result is action potential

Causes charge in permeability in adjacent membrane, propagates down membrane.

**absolute refractory period**

During change in Na<sup>+</sup> perm. No new impulses will stimulate. (but can get 500 per second or more)

**relative refractory period**

During changes in K<sup>+</sup> perm. **Requires stronger stimulus** to trigger impulse.

**strength of stimulus** Frequency of impulses indicates, each impulse identical.

Larger neurons have lower thresholds and greater propagation velocity.

**Myelinated neurons**, p 411 exhibit **saltatory conduction**, depolarize only at **node of Ranvier**, much faster than along membrane alone.

Discrimination occurs by number of neurons and freq of stimulation

Adaptation may occur where freq of impulses with given stimulation falls. Not observed in pain.

Video: <http://www.youtube.com/watch?v=wLSxS9THnGU>

## SYNAPSE: NEUROTRANSMITTERS (see table on 418-419)

Released fr **presynaptic knob**. May be either stimulatory or inhibitory. (P 424) Causes stimulation (depolarization) or inhibition (hyper polarization) in post synaptic neuron  
 transmitters are taken back up by presynaptic knob and/or destroyed by a synaptic enzyme

Summation of input from several sources can occurs

## Neuromuscular junction: (415)

buton releases **acetylcholine**, diffuses across synapse in folds in muscle cell membrane, triggers depolarization in muscle cell (or post synaptic cell).

Video: <http://www.youtube.com/watch?v=ZscXOVdGcmQ>

Neurotoxins

### acetylcholinesterase

curare (and atropine)

diisopropylfluorophosphate

botulism toxin

tetanus toxin

hydrolyzes acetylcholine (allows muscle to relax)

prevents binding to muscle (flaccid)

inhibits acetylcholinesterase (spastic)

prevents release of acetylcholine (flaccid)

blocks inhibitory signals (fr antagonists, spastic)

## Two Mechanisms of Neurotransmitter Deactivation

