Neuropharmacology

* What interaction occurs at the synapse, between Excitatory and inhibitory pre-synapt. neurons?

Once NT is in the cleft, it binds to SPECIFIC Receptors on Post-Synaptic Neuron → act as "gates" (to let ions enter or leave depending on who binds).

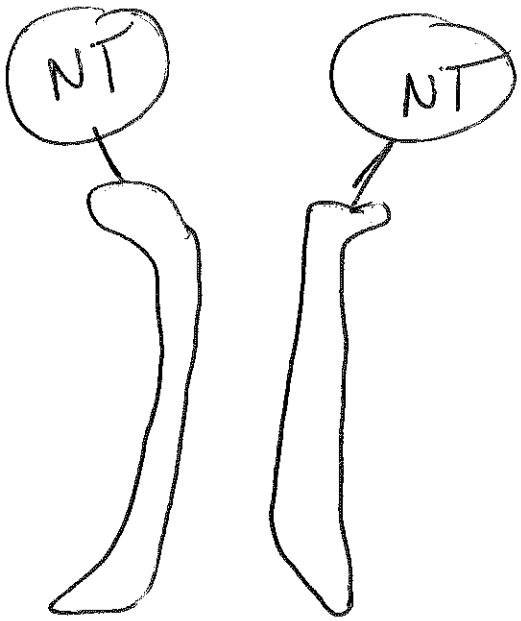
EXCITATORY: ACH
→ ↑ permeable. to (+) ions.
. Na^+ → in; Local depolarization.
. Depol → net (+) charge ↑.
'This is how impulse propagates.

AP: happens IF DEPOL. is Raised above threshold

Inhibitory: GABA.
~ ↑ Perm. to (-) Ions.] HYPERPOLARIzation
~ or ↑ K^+ leaving.

Summation: Sum of +/- signals at Post Syn. Neuron
IF Sum is exit → impulse moves thru

MODULATION:

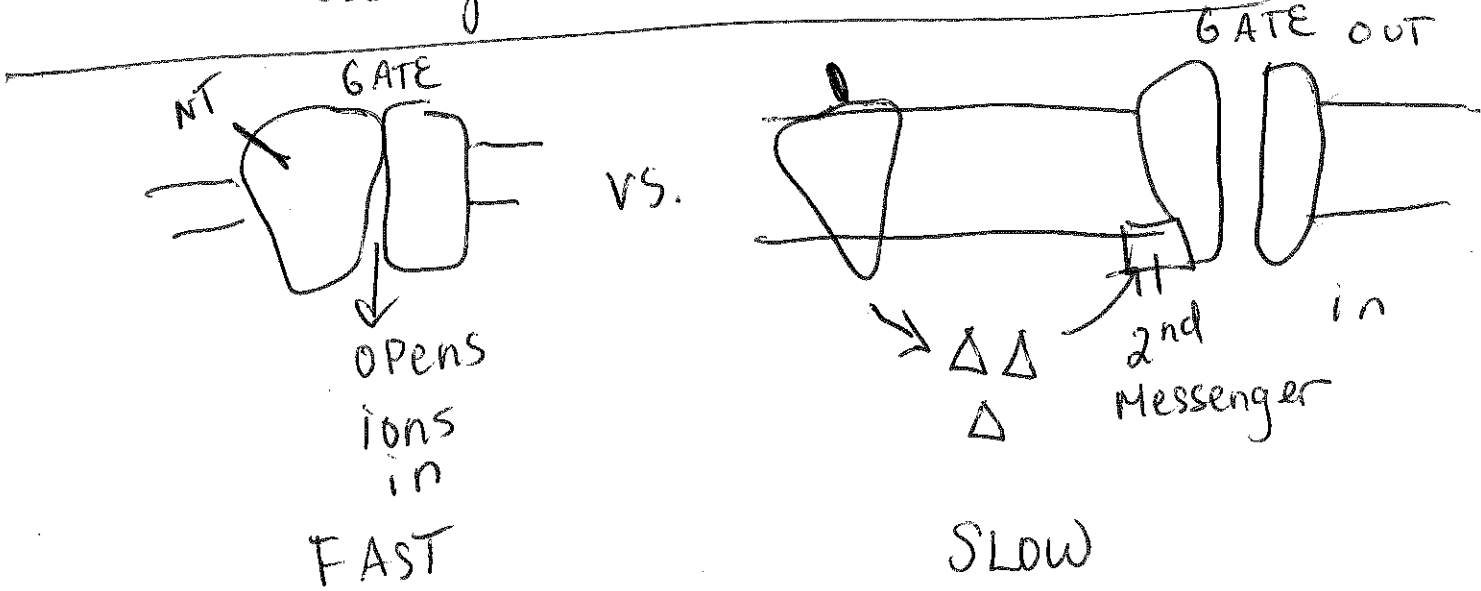
NT → 

Binds to door BUT Doesn't go in.

Fast: act on target cell w/ 1 msec of Receptor binding

Slow: can take up to a min to have impact.

→ slow acting act on a 2nd Messenger.



SLOW ACTING NTs:

Neuro. "modulators".

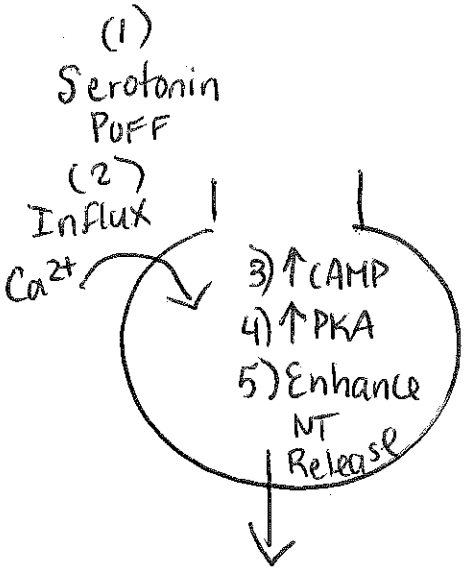
~ Modulate Fast Acting NTs.

[100 billion nerve cells in brain & each 1 communicates w/ 1000 others]

* slow acting NTs play role in learning & memory.

Eric Kandel — Aplysia (giant marine snail).

Serotonin (slow NT) [long-term potentiation]



Ca^{2+} in → cAMP → PKA (Kinase)

2nd Messenger

Learning: Short-term

Memory: Long-term.

- long-term requires Protein Synthesis → gene activation.

⊛ Growth of new changes:
New Connections form.

* Video clip.

Fast Acting NTs: (Rapid breakdown)
GABA (inhibitory)
ACH (EXCITATORY) ← ACH-esterase breaks it down.

SLOW ACTING NTS: (longer lived, secondary messengers)
EPINEPHRINE, Norepinephrine
DOPAMINE
Serotonin

Psychoactive Drugs

- Affect brain by either ↑ or ↓ Post Synaptic transmission.

N.T. = Neurotransmitter

Mechanisms:

1). Enhance N.T.* release } Pre Synaptic Neuron
2). Block N.T. release }
3). Block Removal (Re-uptake) of N.T.

STIMULANT

(ex. Nicotine, Amphetamines, Cocaine)

Nicotine: STIMULATES Parasympathetic Pathways. ↑s N.Ts released.
- MIMICS ACH; binds ACH receptors (not broken down like ACH)

THC (Cannabis): ↓ release of N.Ts.
↑ release of N.Ts

Cocaine: BLOCKS re-uptake so N.Ts stay in synapse.
→ Dopamine continues to stimulate Post Synaptic Neuron.
* Enhances Mood & pleasure feelings
* Highly addictive.

Sedative Drugs

Alcohol, benzodiazapines, THC (cannabis)

1) w/o THC → Dopamine release is moderated (inhibited) by GABA

w/ THC THC inhibits GABA release so more dopamine is present.

2). w/o Alcohol → GABA inhibits post-synaptic transmission

→ Glutamate excites Post-synaptic transmission.

Alcohol ↑s inhibitory effect of GABA (GABA stays longer bound to it's Receptor)

Alcohol binds & blocks excitatory transmission by Glutamate.

Anaesthetics

Inhibit transmission of impulses from sensory perception receptors and CNS.