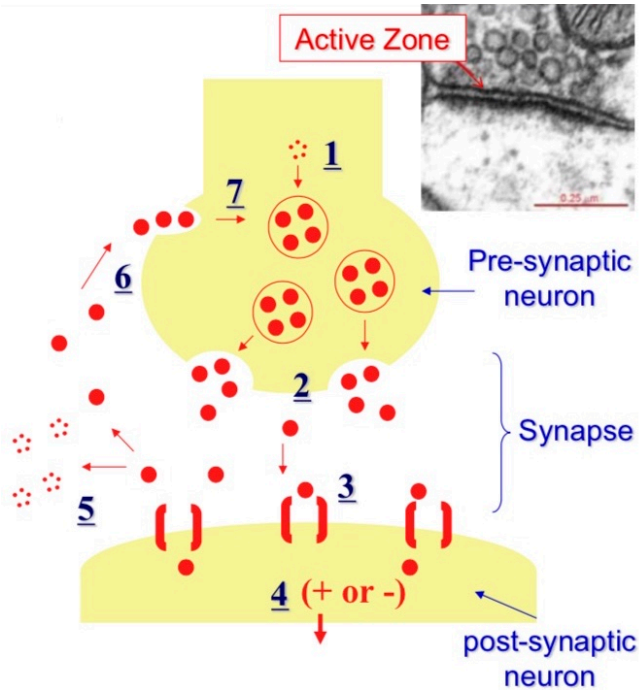
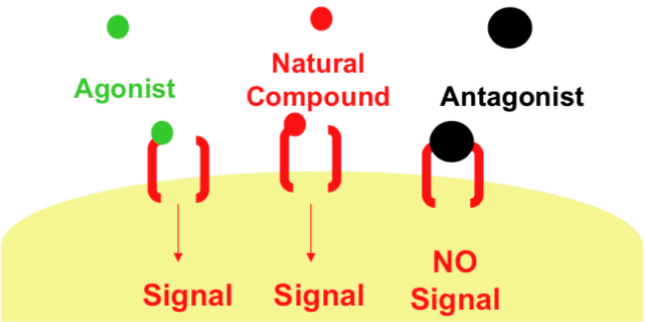




Cycle of neurotransmitters

1. Synthesis
2. Release from synaptic vesicles
3. Binds to receptors
4. +/- influence on the post synaptic neuron
5. Broken down by enzymes
6. Re-uptake of the neurotransmitter
7. Formation and storage in synaptic vesicles

- Note that **drugs** can **affect all stages**

Action at the receptor

- Drugs act by **mimicking** natural neurotransmitters or neuromodulators
- They can act as **AGONIST** by activating the receptor **like** the natural compound
- It can also act as an **ANTAGONIST** by blocking the receptor and **preventing** the natural compound from being able to activate it (or **reduce** the effects of the natural compound depending on the **degree of strength** of the molecule)
    - This is because it is a little bit like the natural neurotransmitter in structure, but it won't work properly when its docked on
    - You can also have a **partial** antagonist which works a bit like the natural compound but not as well as the natural compound

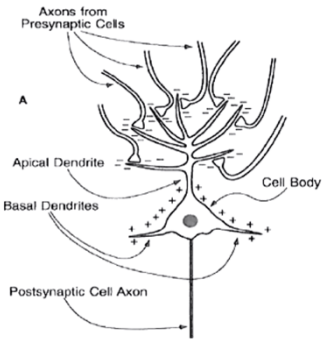
Synthesis of neurotransmitters & neuromodulators interruption

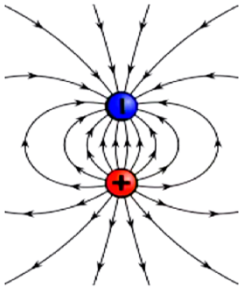
- Neurotransmitter function can be altered by increasing or decreasing synthesis of the neurotransmitter
- The synthesis of these molecules requires multiple steps
- Drugs can also impact many of these steps
    - Eg. If you had an enzyme that is important in conversion of compounds, if you block that enzyme you will end up with less neurotransmitter available

Neurotransmitters: Both Slow and Fast

- Synthesis and transport to the synapse is **relatively slower**
- However, the neurotransmitter **action** is extremely **fast** because it sits ready for release

Neurophysiology of EEG





- The activity measured as **EEG activity** does not reflect **action potentials**
- It mostly **originates** from **post-synaptic potentials**
- These are **voltages** that arise when **neurotransmitters** bind to the **receptors** on the membrane of the **post-synaptic cell**
    - Causes **ion channels** to open or close leading to **graded changes** in the **potential** across the membrane
    - There is a lot of **negative charge** build up at the dendrites due to opening and closing of **ion channels**
- This can be understood as a **small dipole**
- Signals from **single cells** are **not strong enough** to be recorded outside of the head
- However, if **many** neurons can **spatially align**, then their **summed potentials** can **add up**
    - This then creates the **signals** that can be **recorded**
- This **pooled activity** from the groups of **similarly oriented neurons** mostly comes from **large cortical pyramid cells**
- The **simultaneously activated** neurons **all** point in the **same direction**
- The **orientation** of the neurons will determine the **sign** of the **recorded potentials**
- Some orientations of neurons can lead to signals that **cannot be recorded**
    - Thus, there is actually a lot more signals that are **missed** than ones that we end up picking up
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