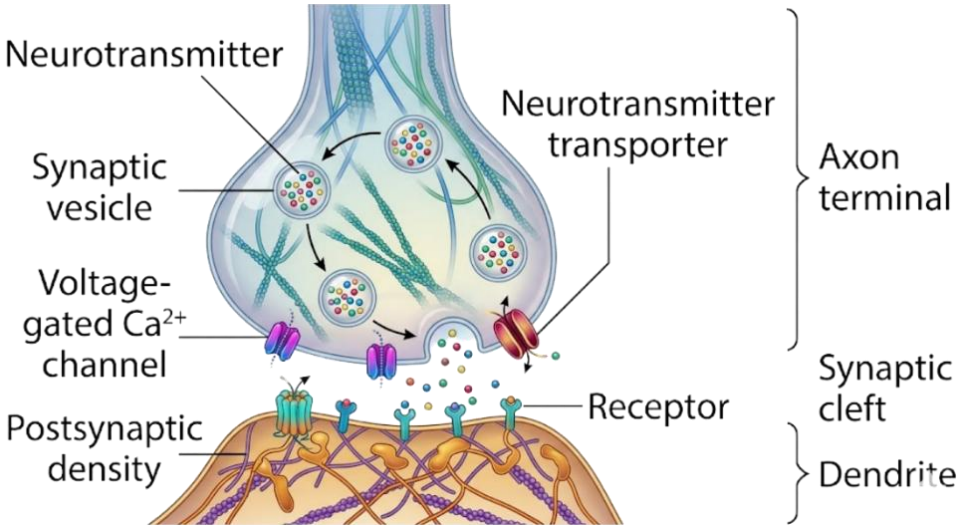
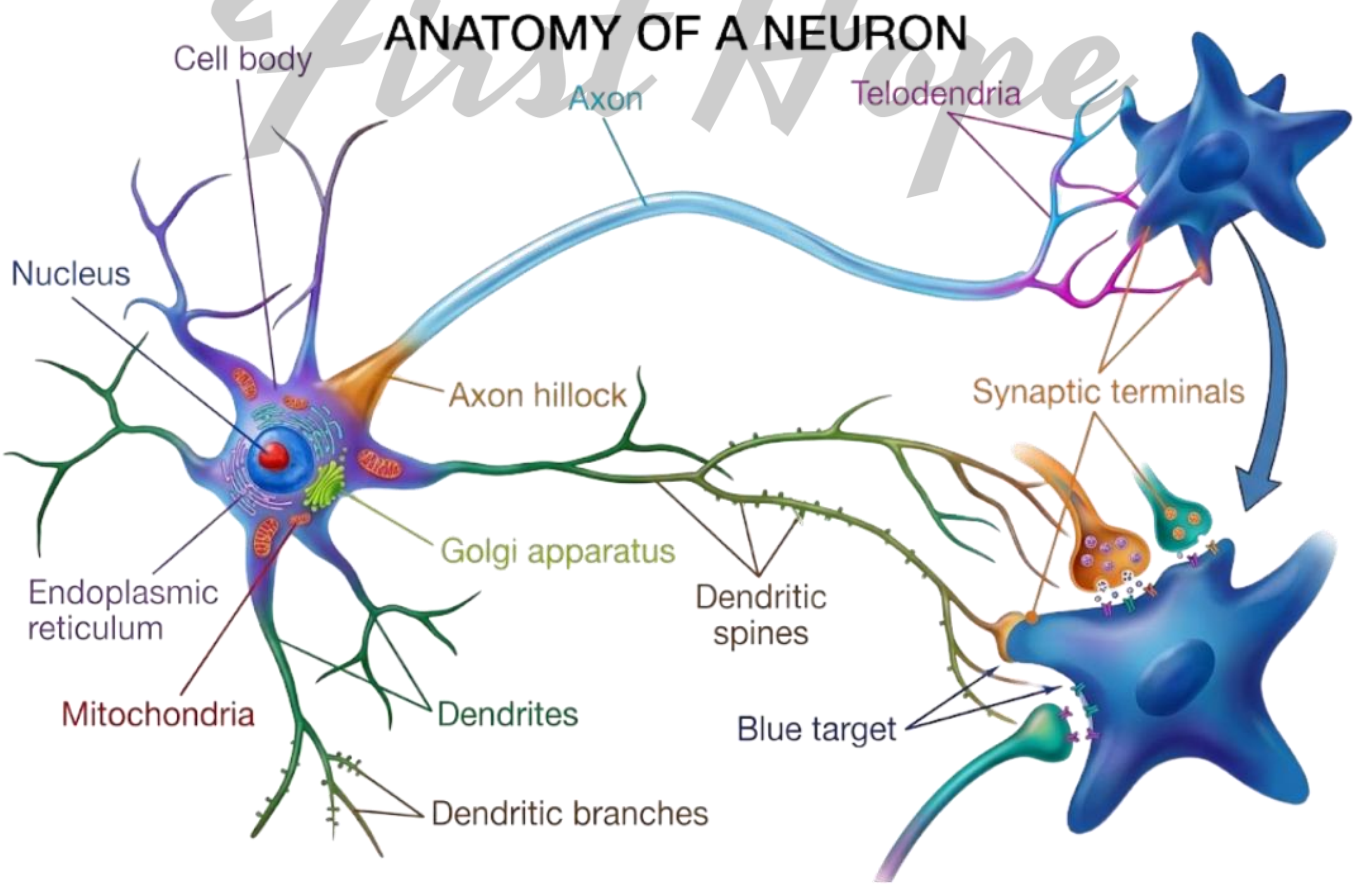
Neurotransmission

Neurotransmission: General Concept

- **Neurotransmission** is the process by which nerve cells (neurons) communicate with each other or with target organs (muscles, glands) using chemical substances called neurotransmitters.



What is a Neuron?



- **A neuron is a specialized cell that:**
  - Receives signals
  - Processes them

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- Transmits them to another cell

- **Main parts:**
  - **Cell body (soma):** contains nucleus
  - **Dendrites:** receive signals
  - **Axon:** carries signals away
  - **Axon terminal:** releases neurotransmitter

Types of Neurotransmissions

- **Electrical transmission** – via electrical impulses (within neuron)
- **Chemical transmission** – via neurotransmitters (between neurons)

Synapse (Site of Communication)

- A synapse is the junction between two neurons or between neuron and effector organ.
- **Types:**
  - Chemical synapse (most common)
  - Electrical synapse (less common)

Components of Chemical Synapse

1. Presynaptic neuron – releases neurotransmitter
2. Synaptic cleft – small gap
3. Postsynaptic neuron – receives signal

Importance in Pharmacology

- **Most drugs act by:**
  - Increasing neurotransmitter action
  - Blocking neurotransmitter action

Steps Involved in Neurotransmission

- Neurotransmission occurs in a **step-by-step sequence**:

Steps

Step 1: Synthesis of Neurotransmitter

➢ Neurotransmitter is produced inside the neuron

Example:

- **Acetylcholine is synthesized from:** Choline + Acetyl-CoA

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Step 2: Storage in Vesicles

- Neurotransmitter is stored in synaptic vesicles
- Protects it from degradation

Step 3: Arrival of Action Potential

- Electrical signal travels along axon
- Reaches presynaptic terminal

Step 4: Calcium Entry

- Voltage-gated Ca^{2+} channels open
- Calcium enters the neuron

Step 5: Release of Neurotransmitter

- Vesicles fuse with membrane
- Neurotransmitter released into synaptic cleft
- This process is called exocytosis

Step 6: Binding to Receptors

- Neurotransmitter binds to receptors on postsynaptic cell

Step 7: Generation of Response

Causes:

- Excitation (activation)
- Inhibition (suppression)

Step 8: Termination of Action

- Neurotransmitter action must stop to avoid continuous stimulation.

Mechanisms:

a) **Enzymatic degradation**

- **Example:** Acetylcholine broken by acetylcholinesterase

b) **Reuptake into neuron**

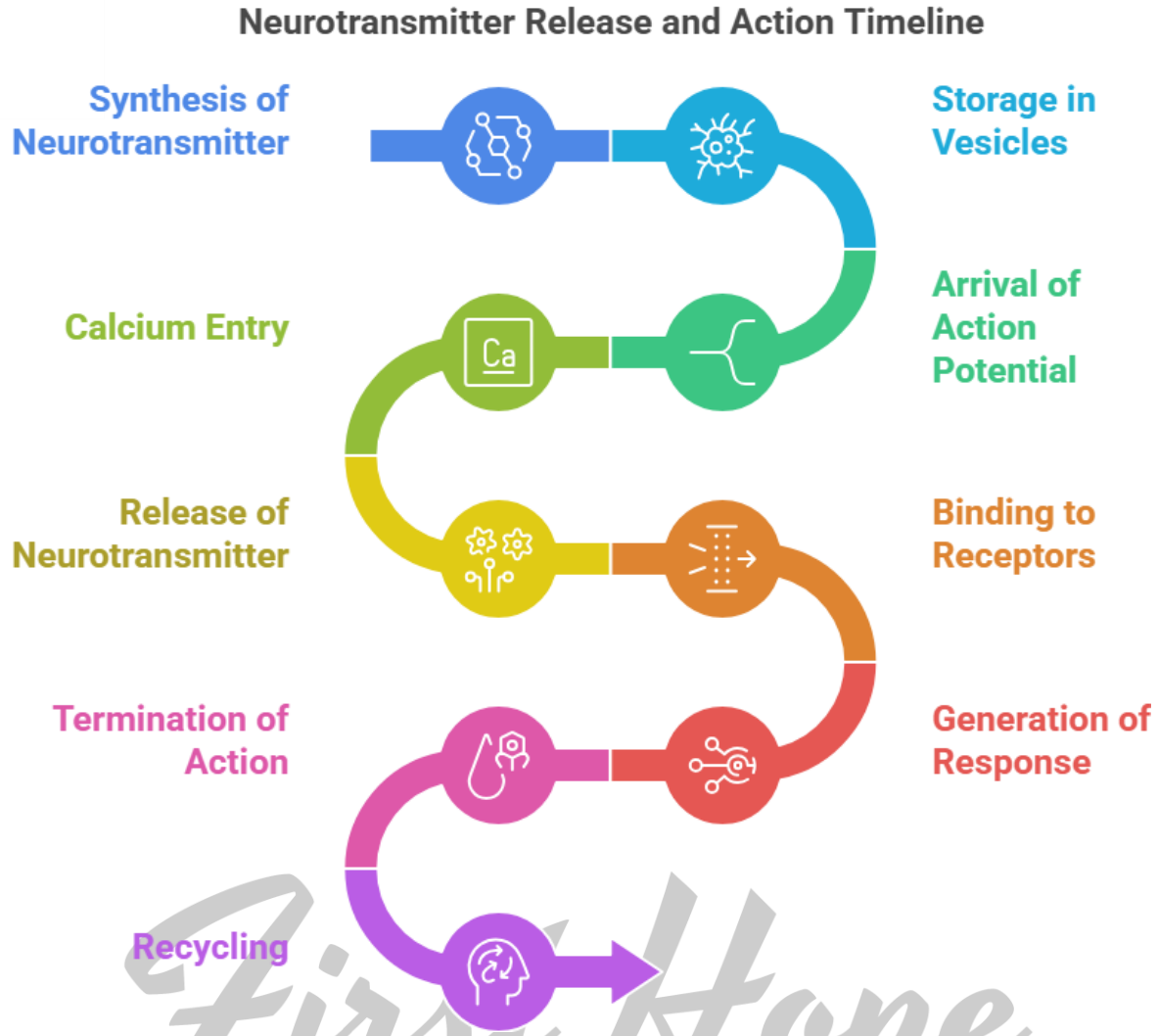
- **Example:** Noradrenaline

Step 9: Recycling

- Components reused for new neurotransmitter synthesis

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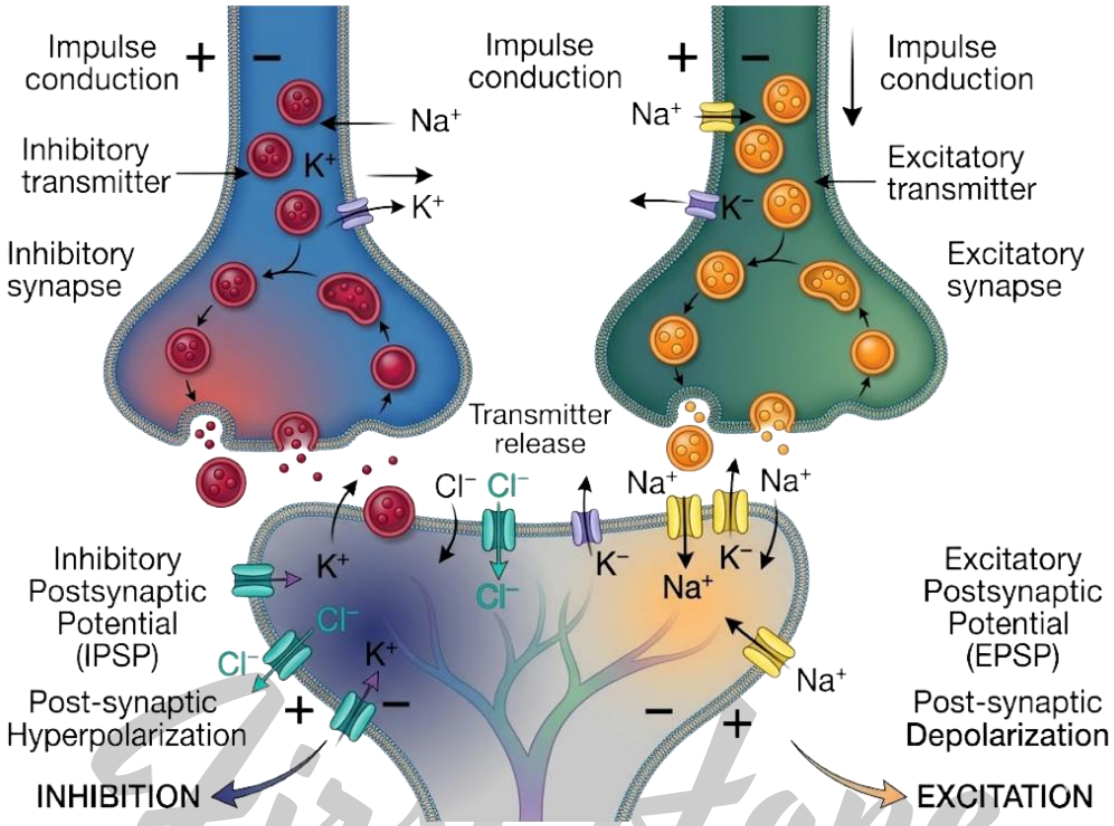
Clinical Importance

- **Drugs can act at any step:**
  - Block synthesis
  - Enhance release
  - Inhibit degradation

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Neurohumoral Transmission in Autonomic Nervous System (ANS)

- The ANS controls **involuntary functions** like heart rate, digestion, and glandular secretion.



Divisions of ANS

1. **Sympathetic Nervous System (SNS)**
   - "Fight or flight"
   - Uses adrenaline (epinephrine) and noradrenaline
2. **Parasympathetic Nervous System (PNS)**
   - "Rest and digest"
   - Uses acetylcholine

Basic Organization

Each pathway has two neurons:

1. **Preganglionic neuron**
   - Originates in CNS
   - Releases acetylcholine
2. **Postganglionic neuron**
   - Innervates target organ
   - **Releases:**

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