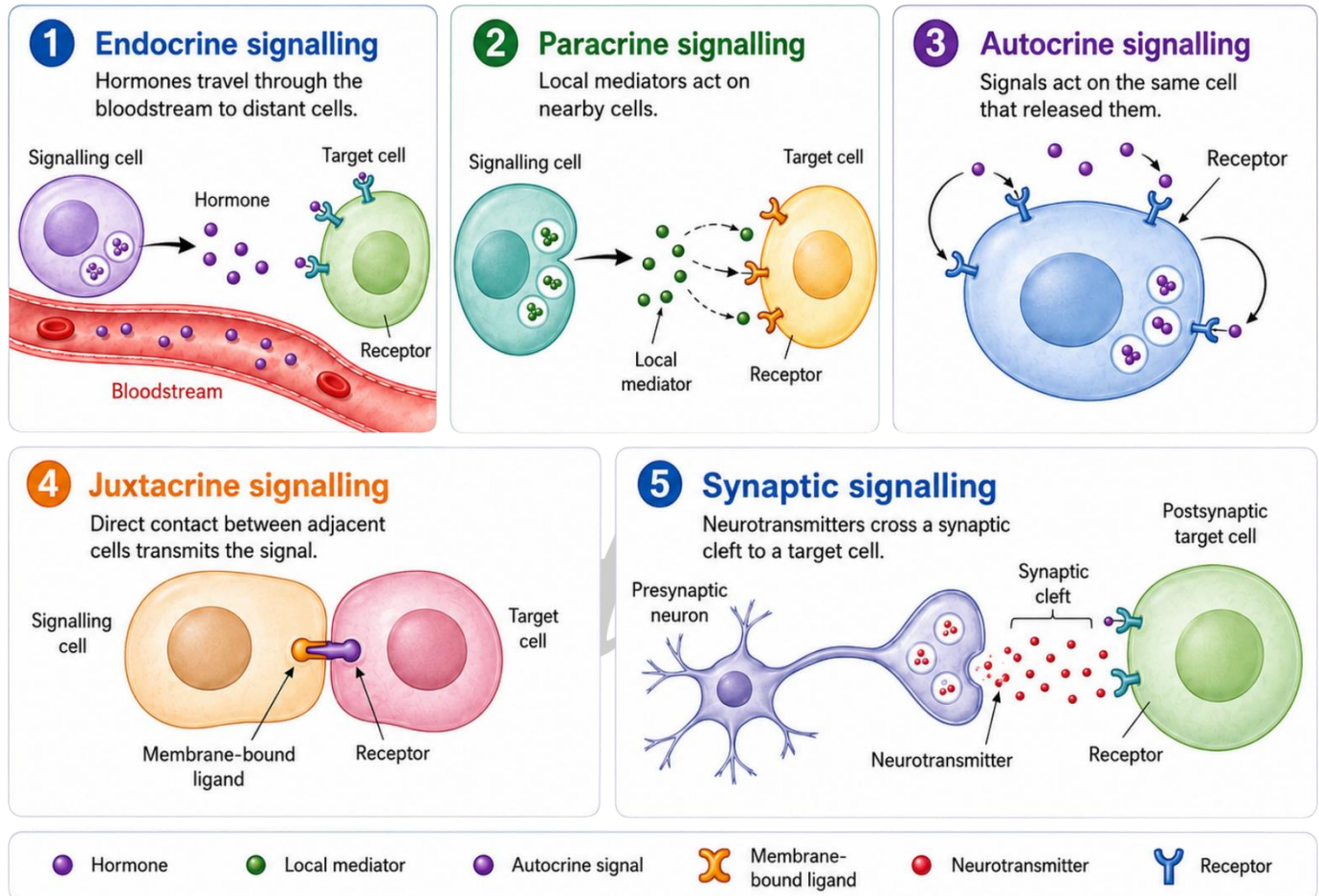


Cell signalling

Intercellular Signalling Pathways

- Intercellular signaling is the communication that occurs between different cells.
- Cells send and receive signals to coordinate body functions.
- Signaling molecules are called ligands.



Components of Intercellular Signaling

1. Signaling Cell

1. This cell produces and releases signaling molecules.

2. Ligand

- This is the chemical messenger that carries information.

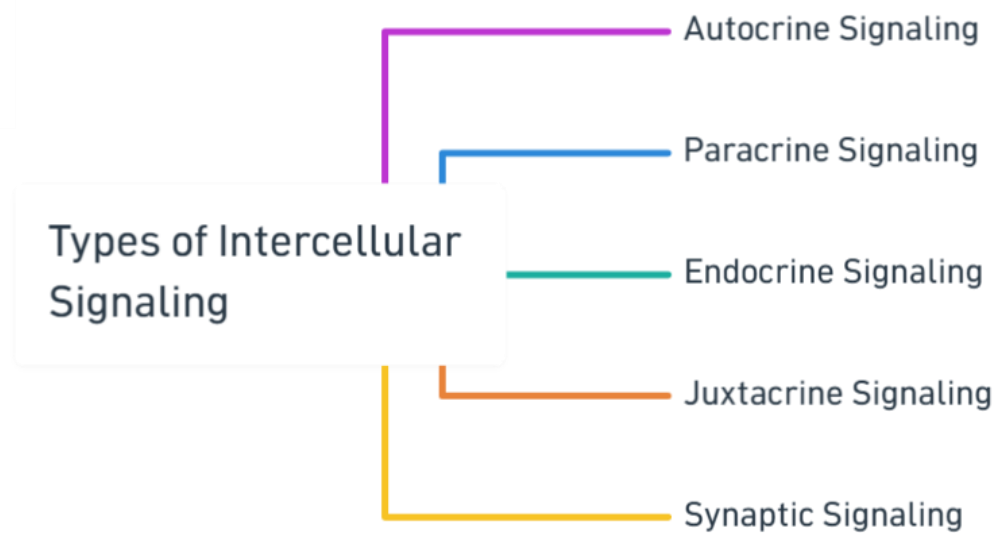
3. Target Cell

- This cell contains receptors that recognize the ligand.

4. Receptor

- This protein binds the ligand and starts a cellular response.

Types of Intercellular Signaling



1. Autocrine Signaling

- The signaling molecule acts on the same cell that released it.
- It helps regulate cell growth and immune responses.
- Cancer cells often use autocrine signaling for uncontrolled growth.

2. Paracrine Signaling

- The signaling molecule acts on nearby cells.
- The signal travels a short distance.
- It is important in wound healing and inflammation.

3. Endocrine Signaling

- Hormones are released into the bloodstream.
- The signal travels long distances to target organs.
- Example includes insulin and thyroid hormones.

4. Juxtacrine Signaling

- Cells communicate through direct physical contact.
- Membrane-bound proteins interact between neighboring cells.
- It is important in immune system activation.

5. Synaptic Signaling

- Neurons communicate through synapses.
- Neurotransmitters carry signals from one neuron to another.
- This signaling is very rapid and specific.

Steps of Intercellular Signaling

1. The signaling cell produces a ligand.
2. The ligand is released from the cell.

3. The ligand reaches the target cell.
4. The ligand binds to a specific receptor.
5. The receptor becomes activated.
6. The target cell produces a response.

Functions of Intercellular Signaling

- It controls growth and development.
- It regulates immune responses.
- It coordinates activities between tissues and organs.
- It maintains body homeostasis.

Intracellular Signalling Pathways

- Intracellular signaling is the transmission of signals within the cell.
- It begins after a receptor is activated by a ligand.
- It transfers information from the cell membrane to different parts of the cell.

Components of Intracellular Signaling

1. Second Messengers

- These molecules carry signals inside the cell.
- They amplify the signal.
- Examples include cAMP, calcium ions, IP3, and DAG.

2. Protein Kinases

- These enzymes add phosphate groups to proteins.
- They regulate protein activity and signaling pathways.

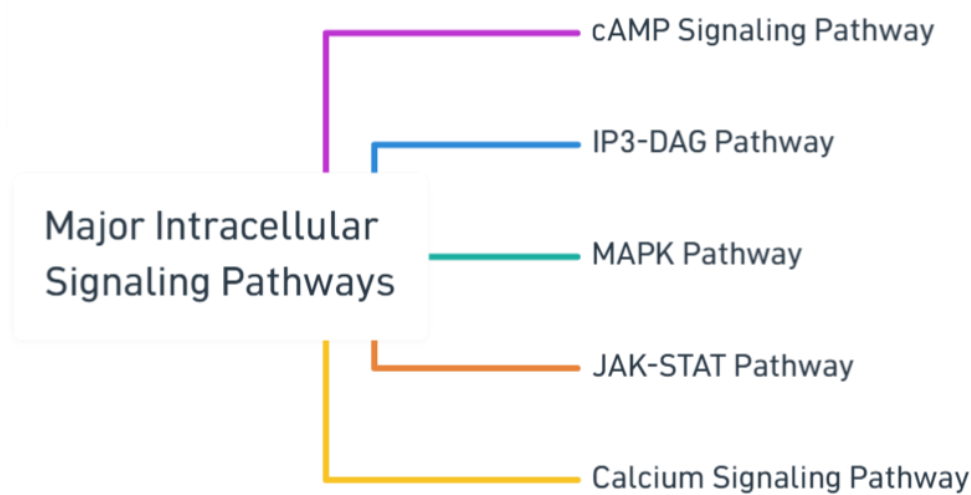
3. Phosphatases

- These enzymes remove phosphate groups from proteins.
- They help stop signaling pathways.

4. Transcription Factors

- These proteins regulate gene expression.
- They activate or repress specific genes.

Major Intracellular Signaling Pathways



1. cAMP Signaling Pathway

- It is activated by G-protein coupled receptors.
- Adenylyl cyclase converts ATP into cAMP.
- cAMP activates protein kinase A.
- Protein kinase A changes the activity of target proteins.

2. IP3-DAG Pathway

- It is activated by phospholipase C.
- IP3 causes release of calcium from the endoplasmic reticulum.
- DAG activates protein kinase C.
- This pathway regulates secretion and muscle contraction.

3. MAPK Pathway

- MAPK stands for Mitogen Activated Protein Kinase pathway.
- It controls cell growth and differentiation.
- It is activated by growth factors.

4. JAK-STAT Pathway

- It is activated by cytokines and hormones.
- JAK proteins activate STAT proteins.
- STAT proteins move to the nucleus and regulate genes.

5. Calcium Signaling Pathway

- Calcium ions act as important signaling molecules.
- They regulate muscle contraction and neurotransmitter release.

Characteristics of Intracellular Signaling

1. Signal Amplification

- One signal can activate many molecules inside the cell.

2. Specificity

- Each signal produces a specific response.

3. Regulation

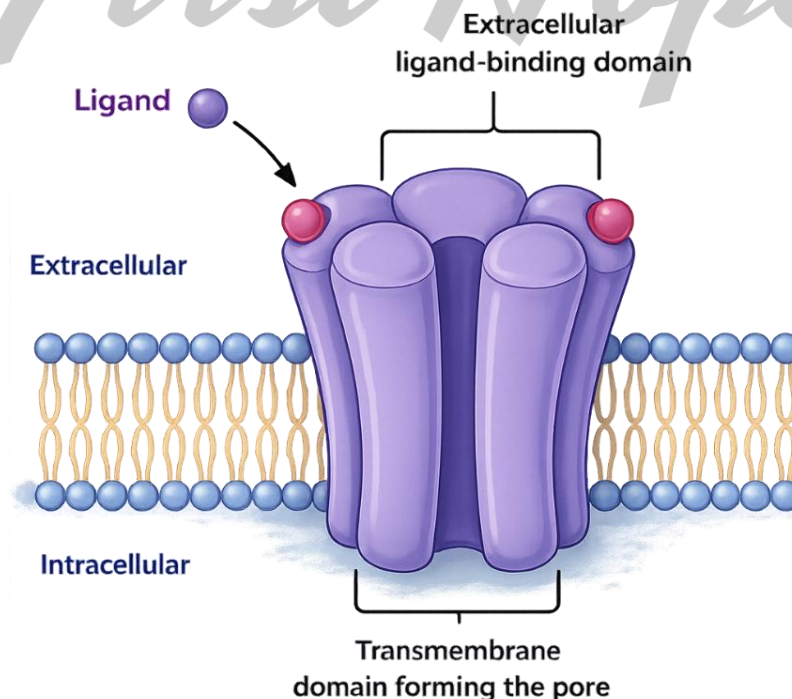
- Signaling pathways can be turned on or off when needed.

Functions of Intracellular Signaling

- It regulates metabolism.
- It controls gene expression.
- It helps in cell division and differentiation.
- It coordinates cellular responses to external signals.

Ligand Gated Ion Channels

- Ligand gated ion channels are membrane receptors that open or close ion channels when a ligand binds to them.
- They help in rapid communication between cells.
- These receptors are mainly found in nerve and muscle cells.



Structure of Ligand Gated Ion Channels

1. Ligand Binding Site

- This region is present on the extracellular surface.
- It specifically binds signaling molecules such as neurotransmitters.

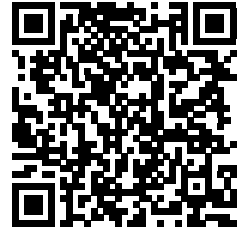


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