

[DEPTH OF BIOLOGY]

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cAMP Response Element

SIGNAL TRANSDUCTION MECHANISM

- Mechanism pathway by which receptor's activation is linked to response [DEPTH OF BIOLOGY]
- Ex: M Cholinergic receptor acts through G-protein while N cholinergic receptor gates influx of Na⁺ ions etc

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GROUPING OF TRANSDUCER MECHANISM

- 1) G-protein receptor
- 2) Ion channel receptor
- 3) Trans-membrane enzyme linked receptor
- 4) Trans-membrane JAK- STAT binding receptor
- 5) Receptor that regulate transcription factor

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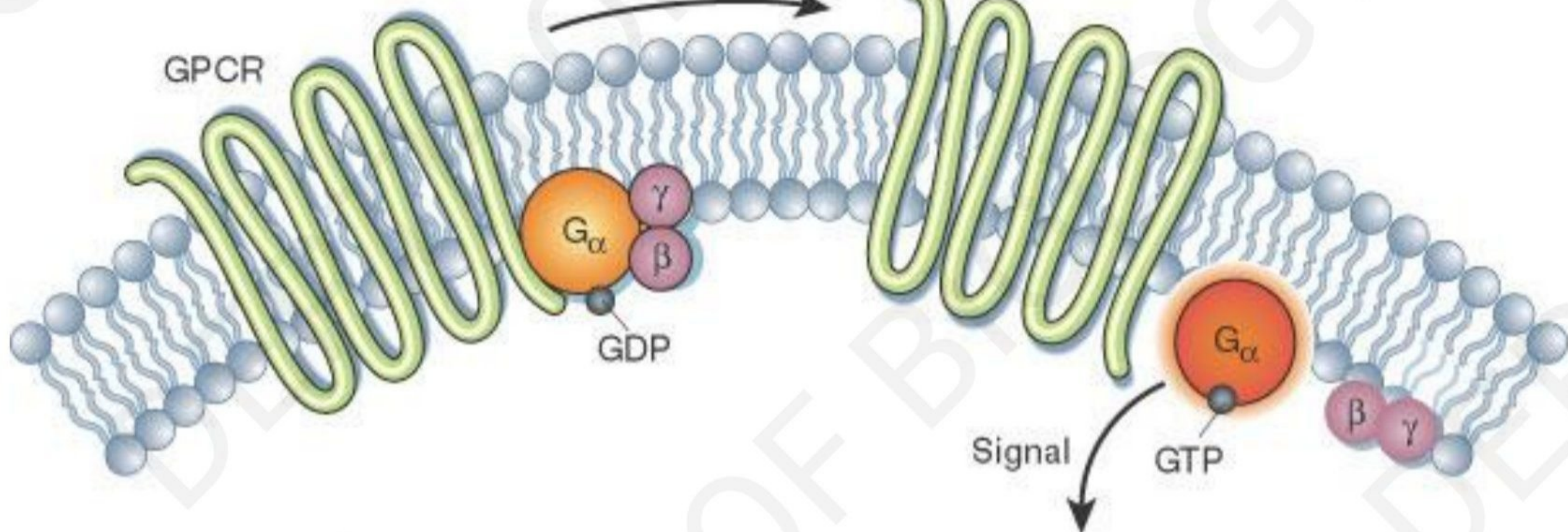
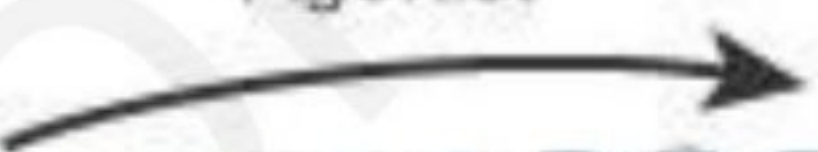
GPCR G-PROTEIN COUPLE RECEPTOR

- G- protein : guanine nucleotide-binding proteins
- Cell surface receptors [DEPTH OF BIOLOGY]
- Also known as- hepta helical receptor, 7 trans membrane receptor , metabotropic receptor
- Consist of large protein family of receptor that sense molecules [ligands] outside the cell [extracellular] & activate inside transduction pathway and give responses

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Agonist

GPCR

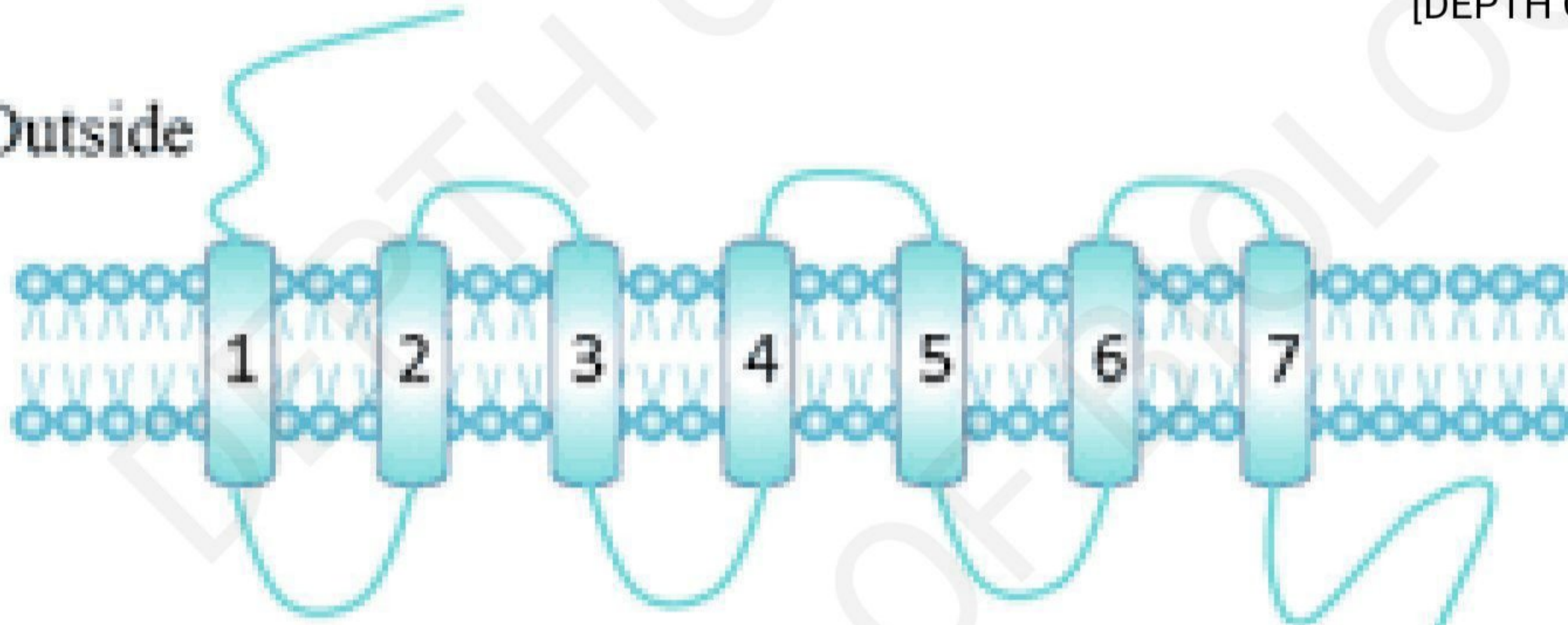


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N-terminus

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Outside



Inside

C-terminus

- Has 7 alpha helical membranes which contains 3 intra and 3 extracellular loops
- Triemeric complex form [α , β and γ] of G-protein in which GDP is attacked on α .

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MECHANISM

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Drugs bind with receptor



Current flow through loops

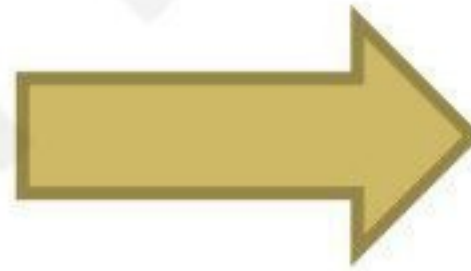


G-protein activate

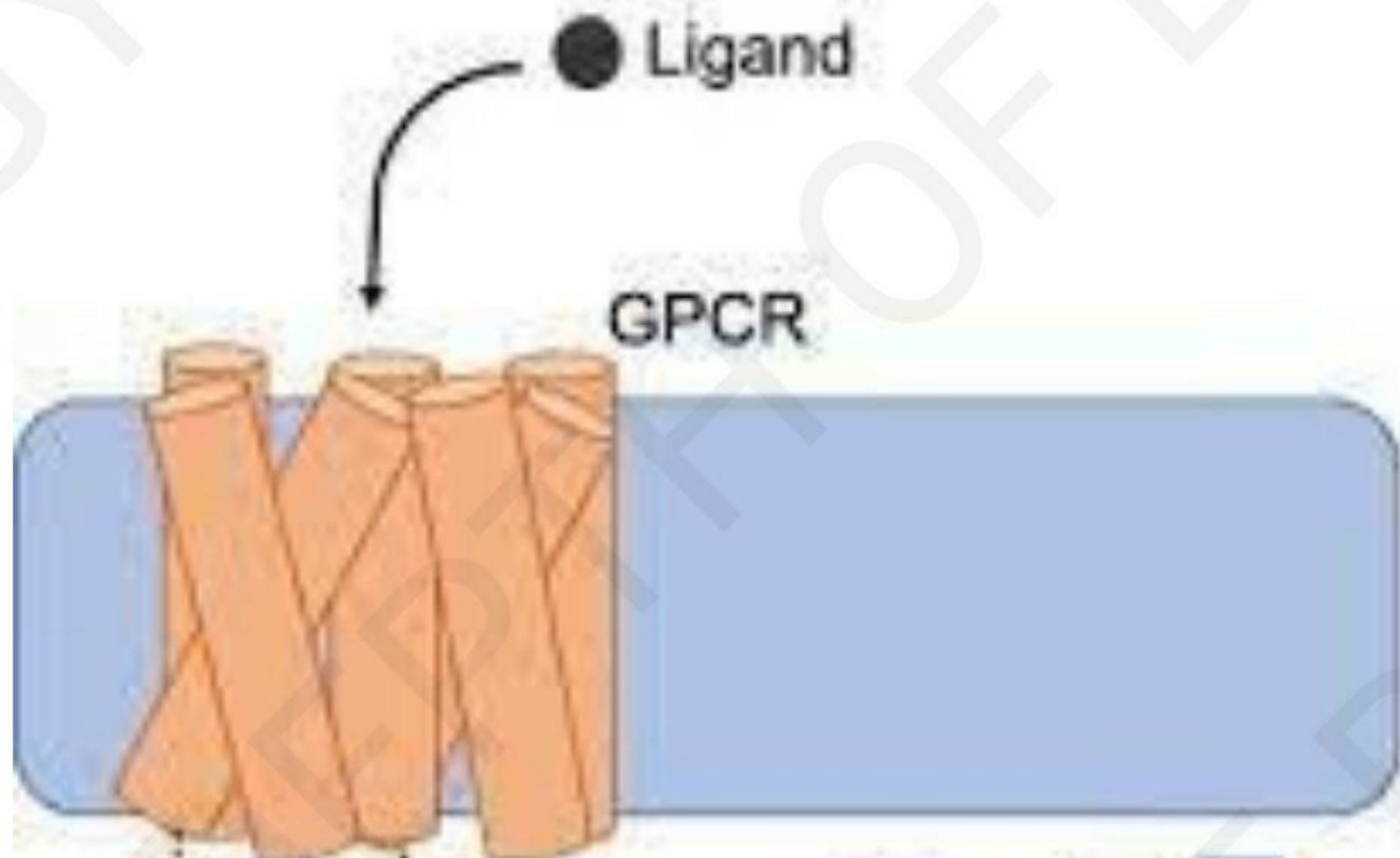


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GDP replaced by GTP



breakdown of trimers



Cellular Response

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Activates effector enzymes-
adenylyl cyclase &
phospholipase C

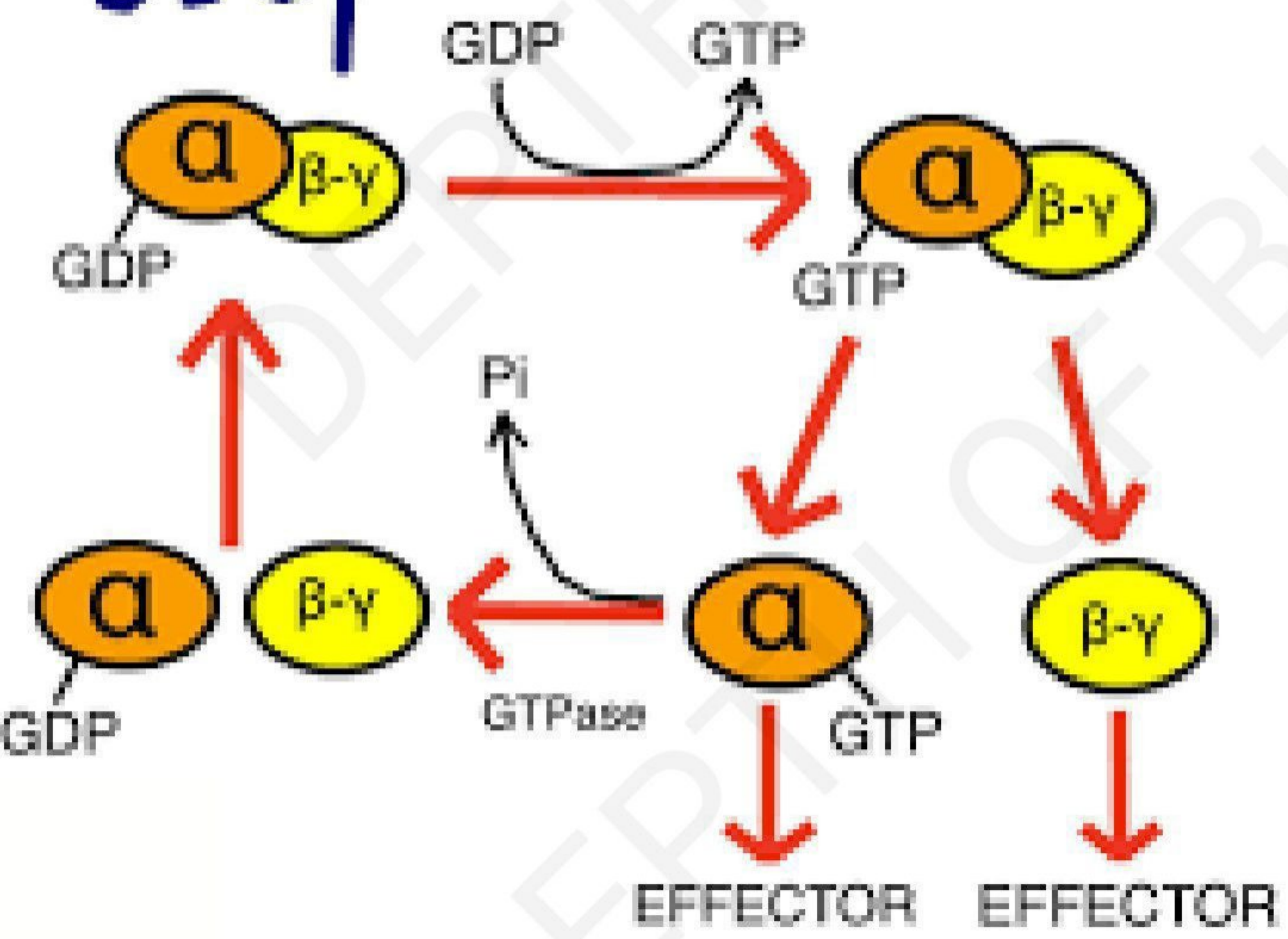
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ION CHANNEL
REGULATION



Ligand

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TYPES

1. Gs- adenylyl cyclase action, Ca²⁺ channel opening
2. Gi- adenylyl cyclase inhibition, K⁺ channel opening
3. G₀- Ca²⁺ channel inhibition [DEPTH OF BIOLOGY]
4. Gq- phospholipase activation

GPCR produce their action via 3 pathways

- A. cAMP pathway
- B. IP₃- DAG [phospholipase c]
- C. Channel regulation [DEPTH OF BIOLOGY]

CYCLIC AMP PATHWAY

- Activation by Gs & inhibition by Gi
- Atp is converted into by adenylyl cyclase, it further activates protein kinase enzyme Pka
- The function of many enzymes get altereted by phosphorylation

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FUNCTION

- Cardiac contractility increased [DEPTH OF BIOLOGY]
- Relaxation in smooth muscles
- Lipolysis, glycogenolysis, release of hormones etc.
- Opening of Ca^{2+} channel in heart brain & kidney [DEPTH OF BIOLOGY]

IP3- DAG pathway

FUNCTION-

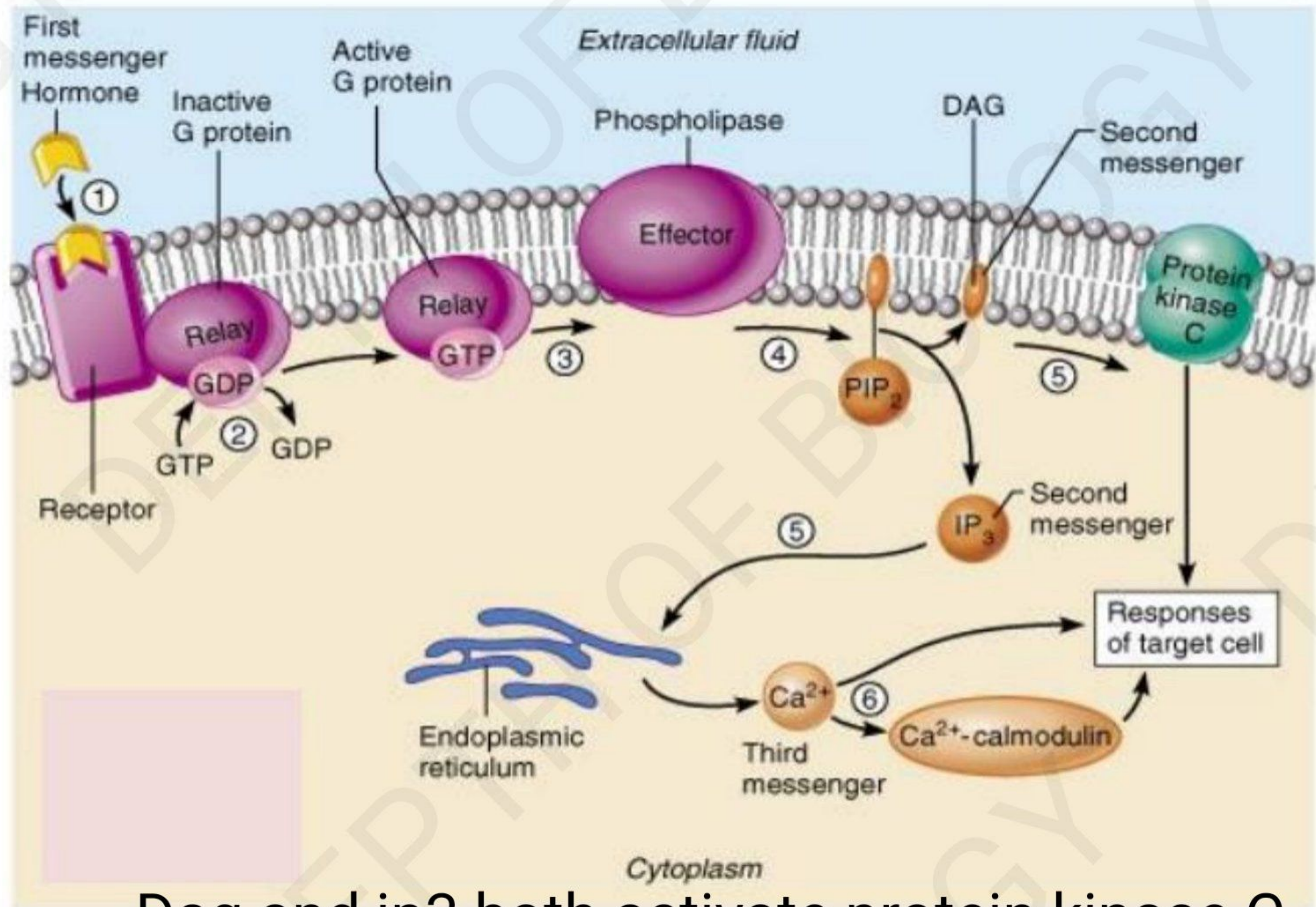
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Contraction, secretion, intracellular movement & membrane function.

CHANNEL REGULATION

- Does not requires secondary messenger and is activated by Gs, Gi, Go
- Gs open Ca²⁺ channel in myocardium
- Gi and Go open K⁺ channel in heart & smooth muscles

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Dag and ip3 both activate protein kinase C

Four forms of intercellular signaling

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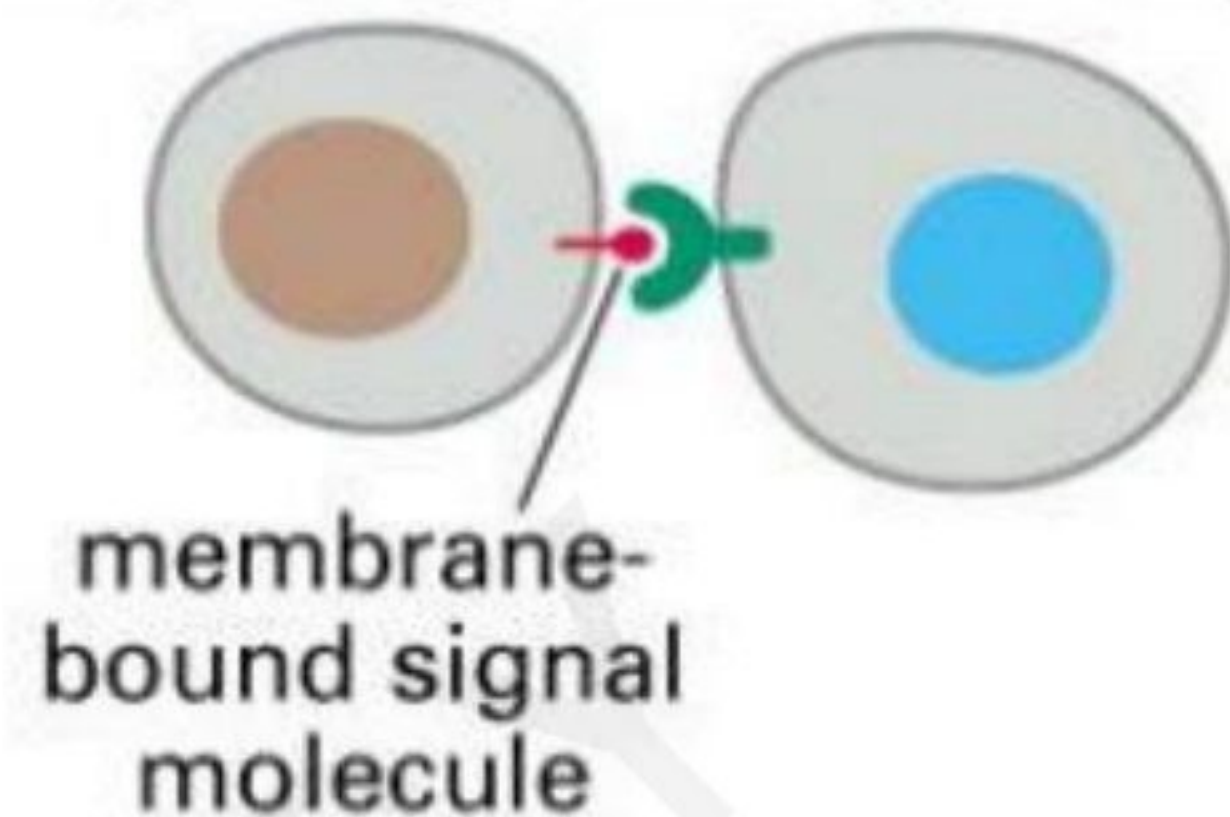
- Cells usually communicate with each other through **extracellular messenger molecules**.

1. Contact dependent signaling requires cells to be in direct membrane-membrane contact. This is important during development and in immune responses.

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(A) CONTACT-DEPENDENT

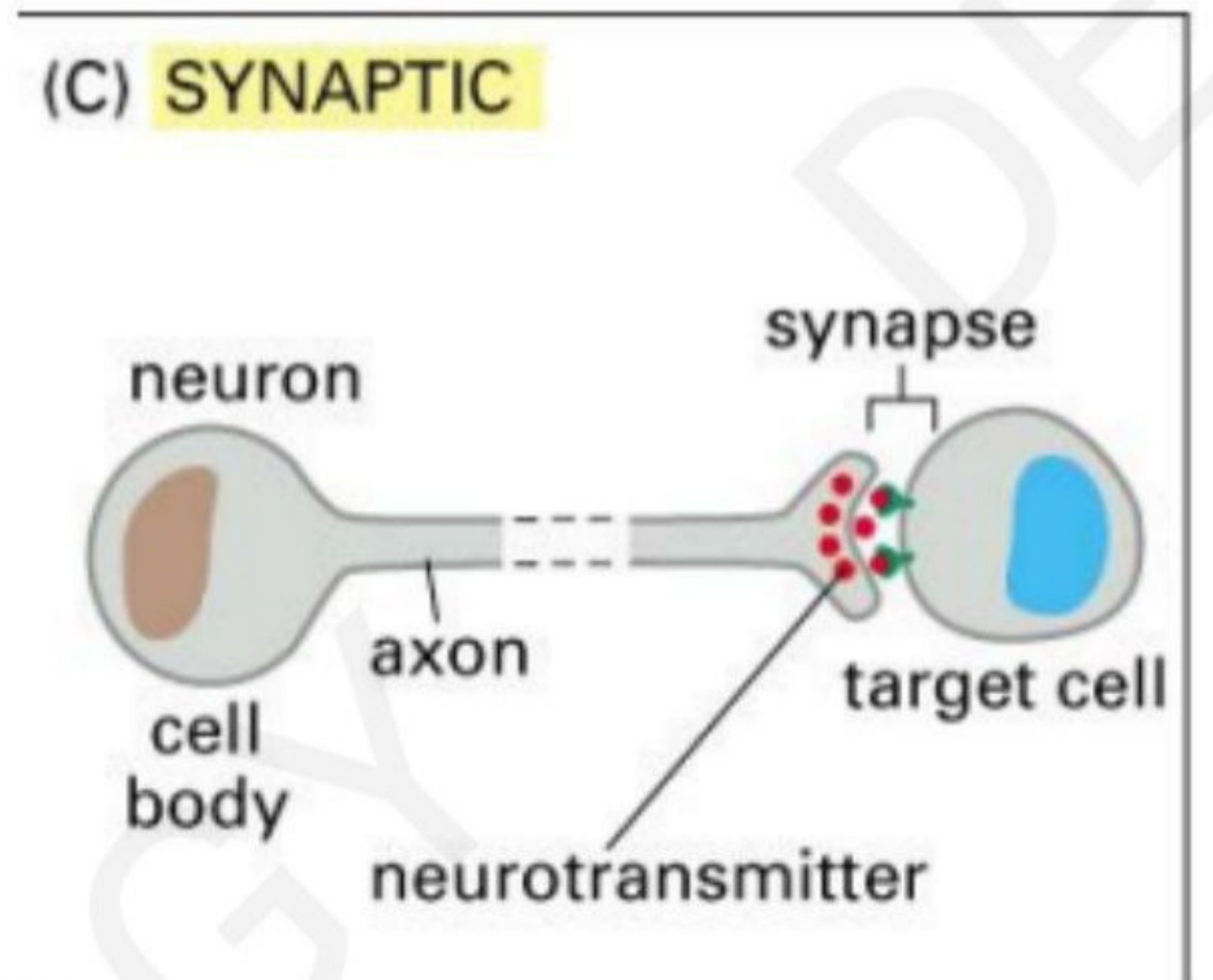
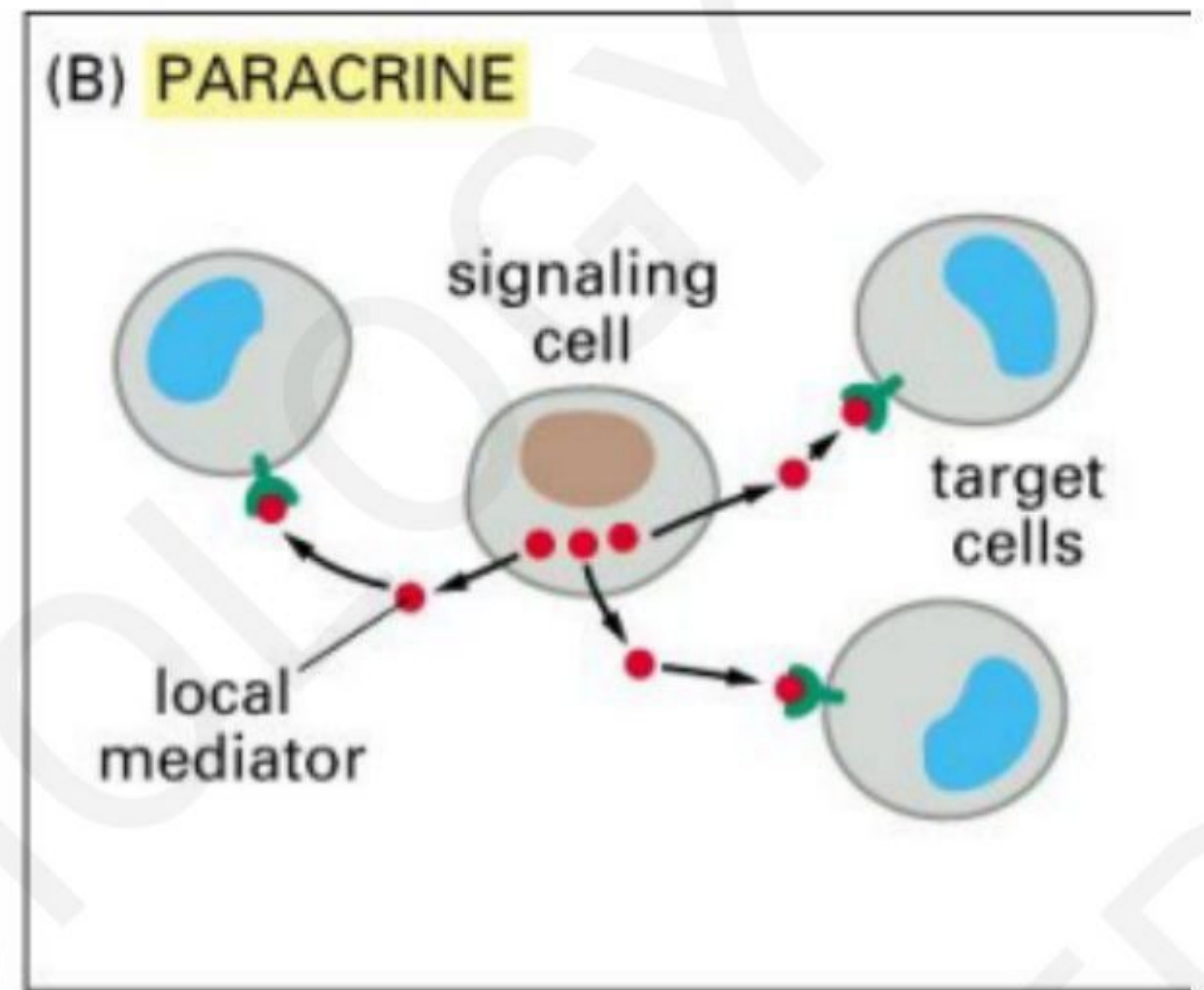
signaling cell target cell



cell to cell communication

- **2. paracrine signaling** depends on local mediators that are released into the extracellular space and act on neighbouring cells. E.g. nerve-muscle
- **3. synaptic signaling** is performed by neurons that transmit signals electrically along their axons and release neurotransmitters at synapses.

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- **4. endocrine signaling** depends on endocrine cells, which secrete hormones into the bloodstream for distribution throughout the body [DEPTH OF BIOLOGY]

