Hormones' receptors

Extracellular receptors

On the cell membranes of the target cells

For : 1-Hydophilic hormones

2- Eicosanoids(Lipophilic hormones)

3- Catecholamine hormones (They are a group of closely related hormones produced mainly by the adrenal medulla and some nerve tissues. They play a central role in the body's fight-or-flight response) , **like: A-Adrealine(Epinephrine)**

B-Noradrenaline(Norepinephrine)

C-Dopamine

Intracellular receptors

In the cytosol

For: **Steroid hormones**

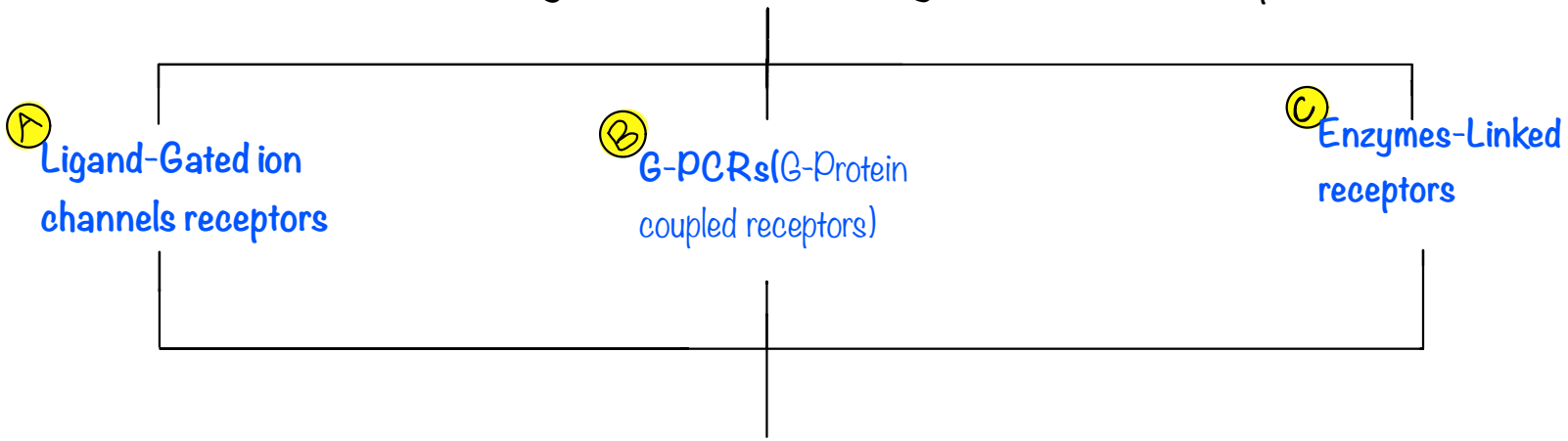
In the nucleus

For: **Thyroids hormones**

For: Lipophilic hormones

The effect of the hormone can appear only when the hormone binds to its receptor to form :**Hormone-Receptor complex**

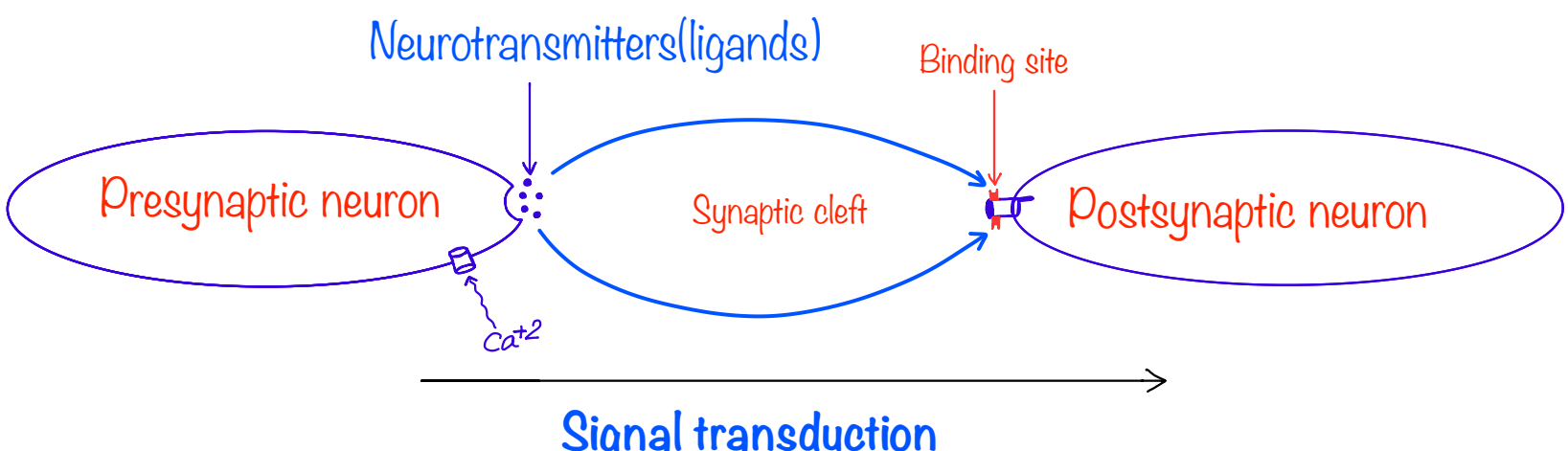
The hormones which they bind to the following extracellualr receptors :



The hormones can follow different pathways to cause cellular responses and this depends on the receptor's type which the ligands bind to it

A- Ligand-Gated ion channels receptors

At the chemical synapse the action potential can be transmitted between the neurons via :**Synaptic signaling** so the ligands are secreted from the presynaptic neuron once the action potential reaches at the axon terminal so this promotes the exocytosis of the ligands (like:neurotransmitters) so these ligands in the synaptic cleft some of them bind to binding sites (receptors) at the ligand-gated ions channels so this leads to cause conformational changes for those channels so eventually they become opened and the sodium, chloride and potassium ions can flow via those channels and we,can say that : **The signal is transduced to the postsynaptic neuron**



B- G-PCRs

G-PCR has three parts:

- **Extracellualr part** — Binding site where the ligand binds
- **Transmembrane(TM) part** — Seven segments as alpha helices(zig-zag segments) that loop in and out of the cell membrane
- **Intracellualr part** — It is coupled to **G-protien** — Called: Heterotrimeric (Different (heterogeneous), Three, Parts(subunits)) Guanosine triphosphate (GTP) -Binding proteins (G-proteins)

It has three parts(subunits):

Binds to:

- Alpha subunit
- Beta subunit
- Gamma subunit

Beta subunit — Always binded to each other in complex(Beta-Gamma complex(**GYβ**)) whether the Alpha subunit is stimulatory or inhibitory

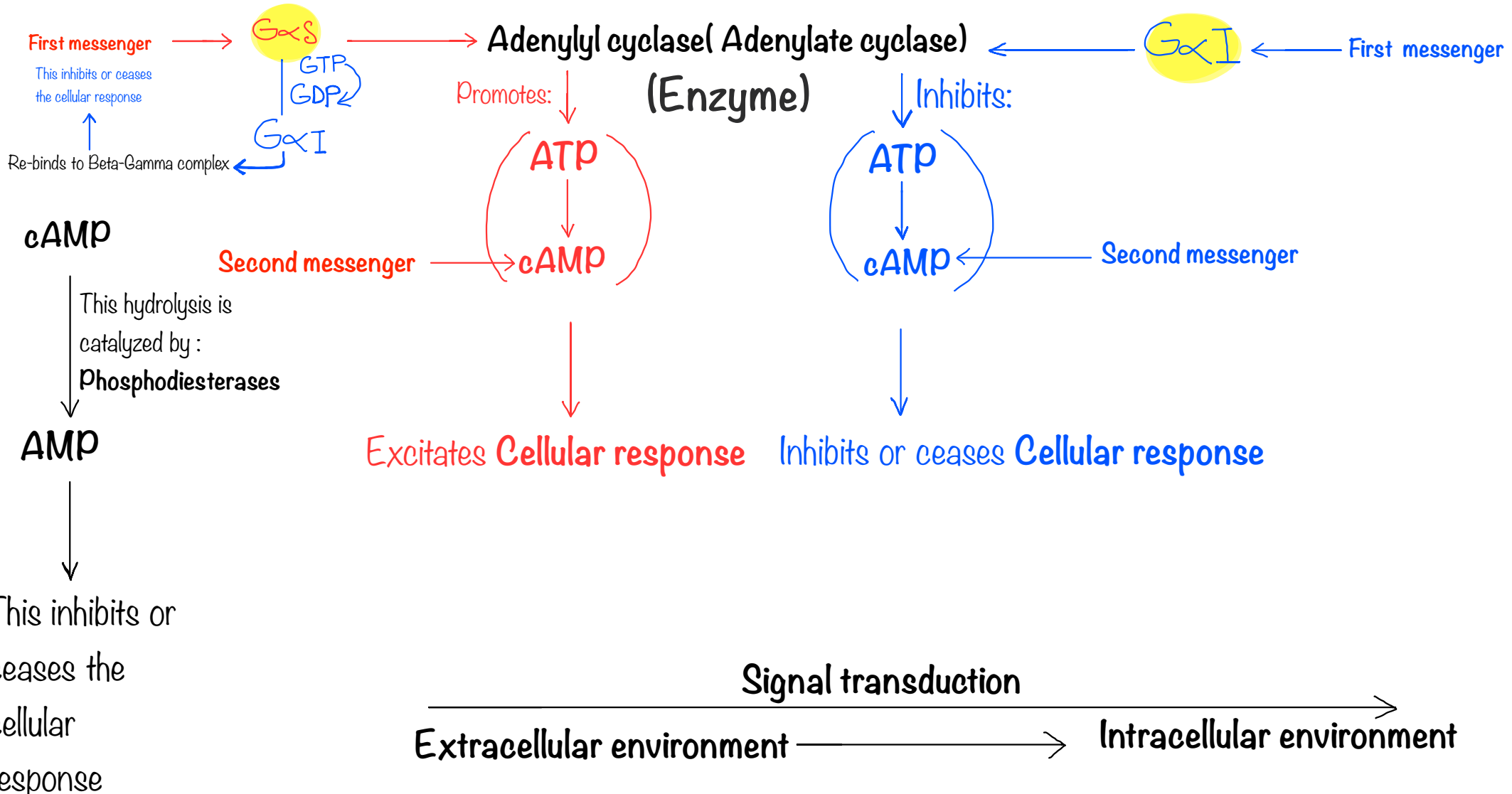
This complex can activate or inactivate many proteins , for example : It inhibits Adenylyl cyclase so this causes rapid turn-off of the signal

Alpha subunit binds to:

- **GDP** — **Inhibitory Alpha subunit(Gαi)** — Still gathered with Beta-Gamma complex — **Inactive G-Protein**
- or
- **GTP** — **Stimulatory Alpha subunit(GαS)** — Becomes separated from Beta-Gamma comples — **Active G-Protein**

It may cause:

- Close or open ion channels
- Activate or deactivate enzymes or proteins in the cytoplasm
- Activate the gene transcription


First messenger
This inhibits or ceases the cellular response
Gα S
GTP
GDP
Gα I
Re-binds to Beta-Gamma complex
Adenylyl cyclase(Adenylate cyclase)
(Enzyme)
Gα I
First messenger
Promotes:
Inhibits:
ATP
cAMP
Second messenger
ATP
cAMP
Second messenger
cAMP
This hydrolysis is catalyzed by :
Phosphodiesterases
AMP
This inhibits or ceases the cellular response
Excitates Cellular response
Inhibits or ceases Cellular response
Signal transduction
Extracellular environment
Intracellular environment

C-Enzymes-Linked receptors

Ligand may bind to :

Tyrosine kinase pathway

Receptor which itself enzyme so this binding forms: **Receptor-Enzyme**

It has three parts:

- Extracellular part with binding site/s
  - For:
    - **Insulin**
    - **Growth factors**
- Single transmembrane part
- Intracellular part -Enzymatic part(Protein kinase(Tyrosine kinase))

Autophosphorylation for the protein kinase occurs once the ligand binded to the binding site until the receptor-enzyme complex becomes phosphorylated so this activates the designated protein once it binds to the protein kinase

JAK/STAT pathway

No-Autophosphorylation

Receptor that hasn't enzymatic portion but it binds to enzymes at its cytoplasmic part and those enzymes called :**Janus familiy tyrosine kinases (JAKs)**

Both receptor and attached enzymes act as one unit so once the liagand binded to the receptor this cause conformational change in the receptor so this leads to activate the attached enzymes then those enzymes phosphorylate **STAT**(signal transducers and activators of transcription) then those STAT go to the nucleus to promote synthesis of new proteins and this is caused : **Cellular response**

This receptor for :

- Immune cytokines
- Prolactin
- Leptin