

Cell Communication

Cell Communication → process in which a cell detects and acts in response to these signals

#1) - **Signal Reception**: A molecule from outside the cell is detected; called a ligand

#2) - **Signal Transduction**: Binding of ligand changes shape of the receptor, causing an amplification within the cell
↳ Phosphorylation Cascades

#3) - **Cellular Response**: This is the activity that performs to respond to the signal
↳ Second Messenger

G-Coupled Receptor - 7 alpha helices

works in conjunction w/ the G-protein which binds to G-DP (ADP but guanine instead of adenine)

#1) Ligand binds to protein receptor, causing shape transformation and activating G-protein

#2) - G-protein dissociates from receptor and activates other proteins

Receptor Tyrosine Kinase

RTK is a protein kinase, an enzyme that transfers phosphate from ATP to activate another protein

#1) Monomers of RTKs create dimers by fusing into units of 2 when a ligand binds

#2) RTK dimer is phosphorylated (activated) by ATP

#3) The protein is activated, starting the cellular response

Gated Ion Channels

gated ion channel: receptor embeds into membrane that acts as a valve, enabling certain ions to cross into the cell when entering

#1): Channel is usually closed, two major mechanisms can open

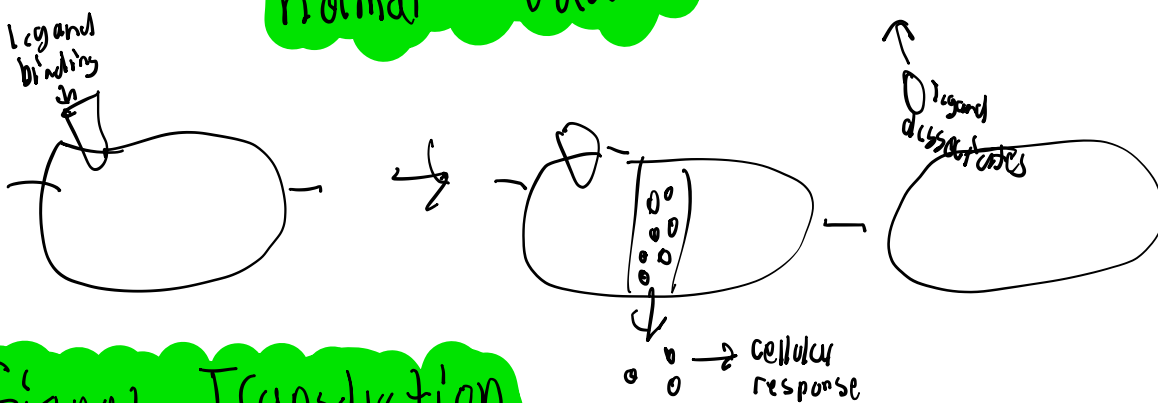
Voltage-gated: certain voltage (caused by ion gradient) opens the gated ion channel

Ligand-gated: ligand binds to the ion channel, which causes it to open

#2): Specific ions flow into the cell, changing the concentration of the ion inside the cell

↳ The abnormal concentration itself is a signal for cellular response

#3) - Ligand dissociates, voltage returns to the normal value



Signal Transduction

Phosphorylation Cascade: Chain of phosphorylations between enzymes that amplify the signal

Kinase: adds a phosphate to proteins to activate them

Phosphatase: Removes a phosphate from proteins, de-activating them

Scaffolding Proteins: Holds together multiple Kinases, improves the efficiency of phosphorylation Cascade

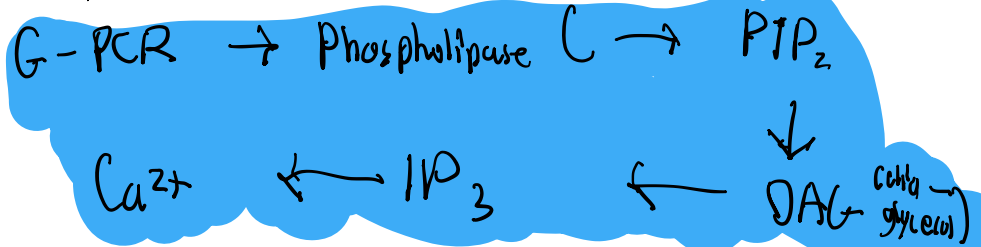
Signal transduction can also occur through **Secondary Messengers**

↳ Low intracellular concentration

- cAMP: Works as an intermediate in many phosphorylation cascades, A derivative of ATP

- Ca^{2+} : The pathway is more complicated,

Chain reaction:



Some **ligands** can **diffuse** across the **membrane** and bind to intracellular receptors

include → Steroid & nonpolar molecules only
→ Thyroid hormones & I_2
→ NO (nitric oxide)