

Chapter 16: Cellular Signaling Checklist

- There are four ways that signals are transmitted in cells. Can you explain each one?
- When cells are treated with various concentrations of growth factor A (a signal molecule that causes the recipient cell to divide), they do not divide at all. What happens?
- What signaling molecules do plasma membrane receptors and nuclear receptors, respectively bind to?
- Explain why Viagra works as a medicine for impotence. (Rhino horn doesn't work.).
- Why are intracellular signaling molecules called molecular switches? Also could you give me some examples?
- Why are many intracellular signaling molecules involved in a signal transduction?
- What is an ion channel-coupled receptor?

G-protein-coupled receptors: 7-transmembrane protein. They bind trimeric G proteins at the third intracellular loop and C-terminal region.

- Describe trimeric G proteins in detail. Structure, subunit, why G protein? and activation mechanism.

Small messengers (second messengers) : cAMP, cGMP, diacylglycerol and inositol triphosphate, Ca^{2+}

- What's a small messenger?

cAMP (cyclic AMP)

- How are they synthesized and degraded? (Relation to activation of G-protein-coupled receptors, key enzymes)

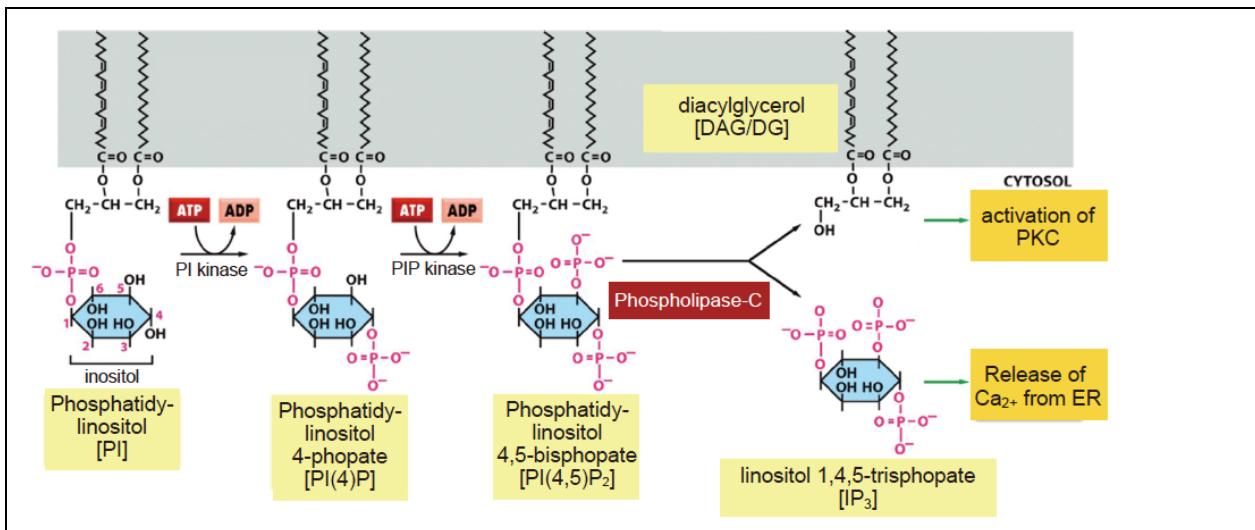
- How does it work? The function of PKA is also described.

Diacylglycerol (DAG or DG) and inositol triphosphate (IP3)

- How are they synthesized and degraded? (What is the relationship with phospholipase C?)

- How does it work? What's the target?

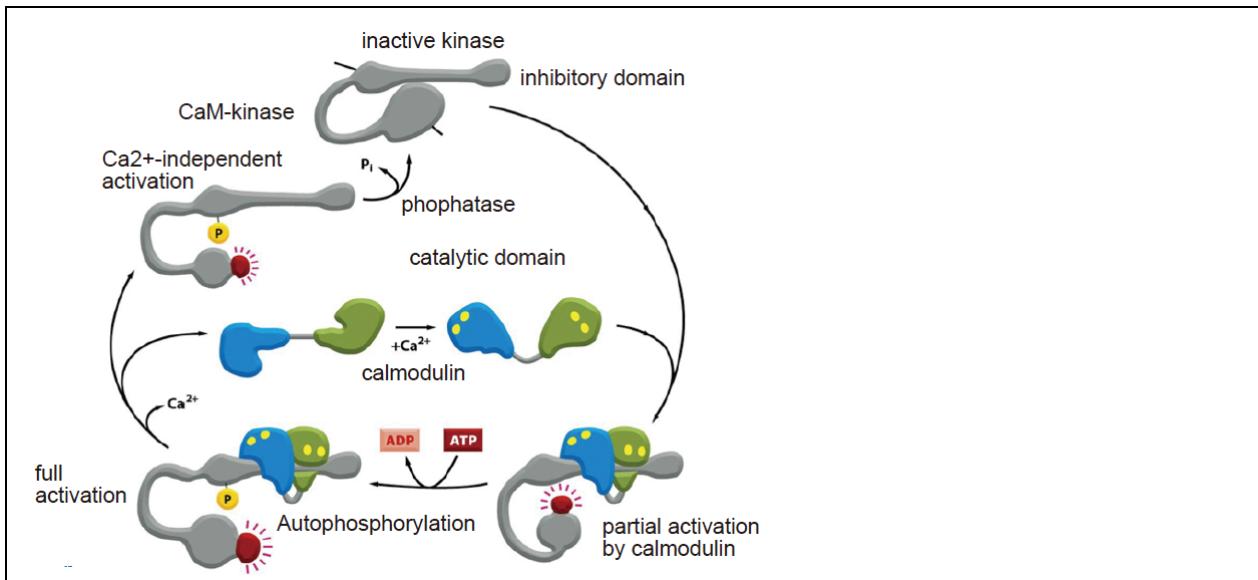
Reference: function of phospholipase C



- Where is Ca²⁺ stored? At that concentration?

15. What's calmodulin?

Reference: Mechanism of activation of CaM kinase



Enzyme-coupled receptors are single-pass transmembrane receptors. It has an extracellular ligand binding domain and intracellular enzyme activity domains. Enzymes include tyrosine kinases, serine threonine kinases, and guanylate cyclase.

16. Draw a typical receptor tyrosine kinase that binds to a growth factor (ligand) and activates a MAPK.
17. Describe how mutations in RAS cause cancer.
18. Draw the chemical structure of phosphorylated tyrosine?
19. Draw a picture of how receptor tyrosine kinases are activated and cells survive.