

Chapter 16: Cellular Signaling Checklist

1. There are four ways that signals are transmitted in cells. Can you explain each one?
2. 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 happen?
3. What signaling molecules do plasma membrane receptors and nuclear receptors, respectively bind to?
4. Explain why Viagra works as a medicine for impotence. (Rhino horn doesn't work.).
5. Why are intracellular signaling molecules called molecular switches? Also could you give me some examples?
6. Why are many intracellular signaling molecules involved in a signal transduction?
7. 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.

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

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

9. What's a small messenger?

cAMP (cyclic AMP)

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

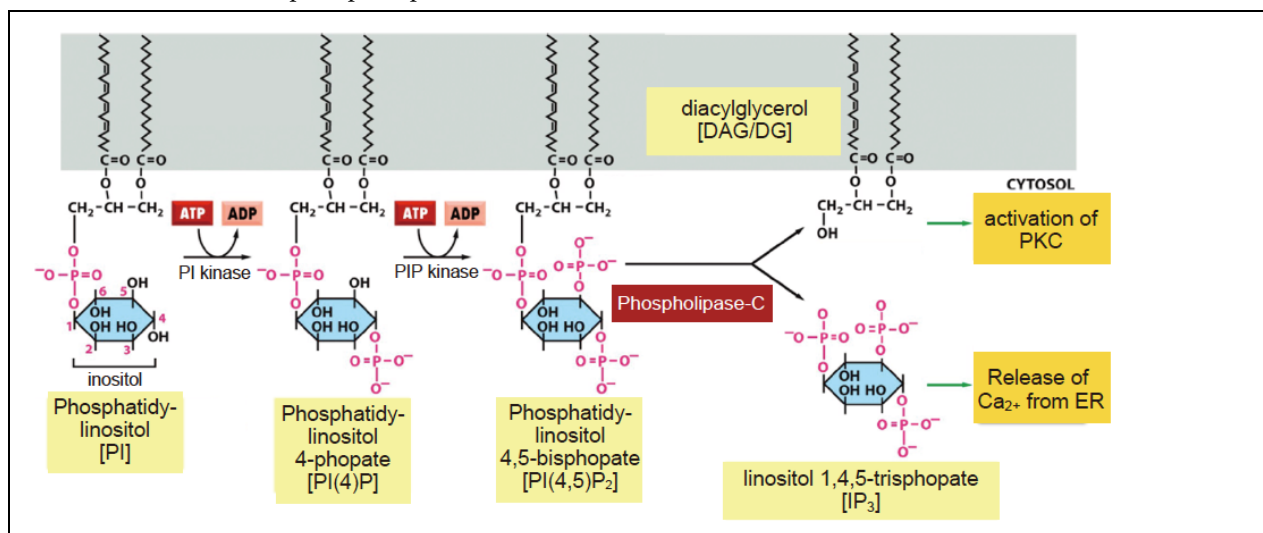
11. How does it work? The function of PKA is also described.

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

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

13. How does it work? What's the target?

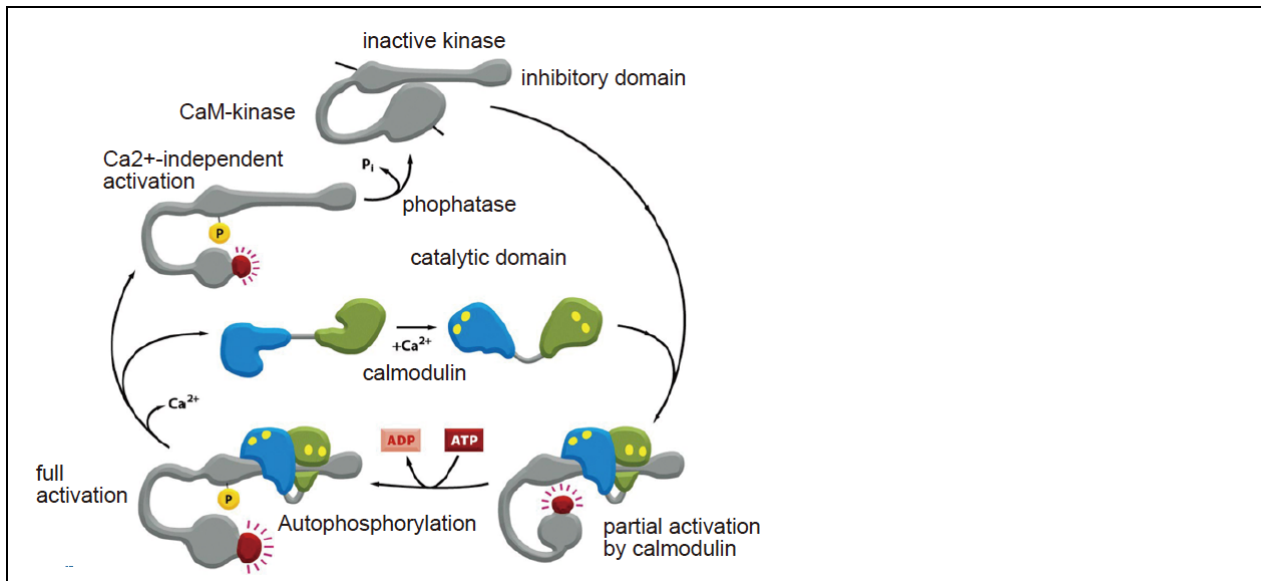
Reference: function of phospholipase C



14. Where is Ca^{2+} 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.