CONCEPT: INTEGRATION OF MULTIPLE SIGNALING PATHWAYS

● Signaling pathways do not work independently of other signaling pathways and are not _____ pathways

□ **Signaling networks** are pathways that are connected via crosstalk between individual signaling molecules

- Numerous extracellular signals

- Protein kinase overlapping in multiple pathways

- Cross-talk between second messenger

□ There can be positive and negative interactions

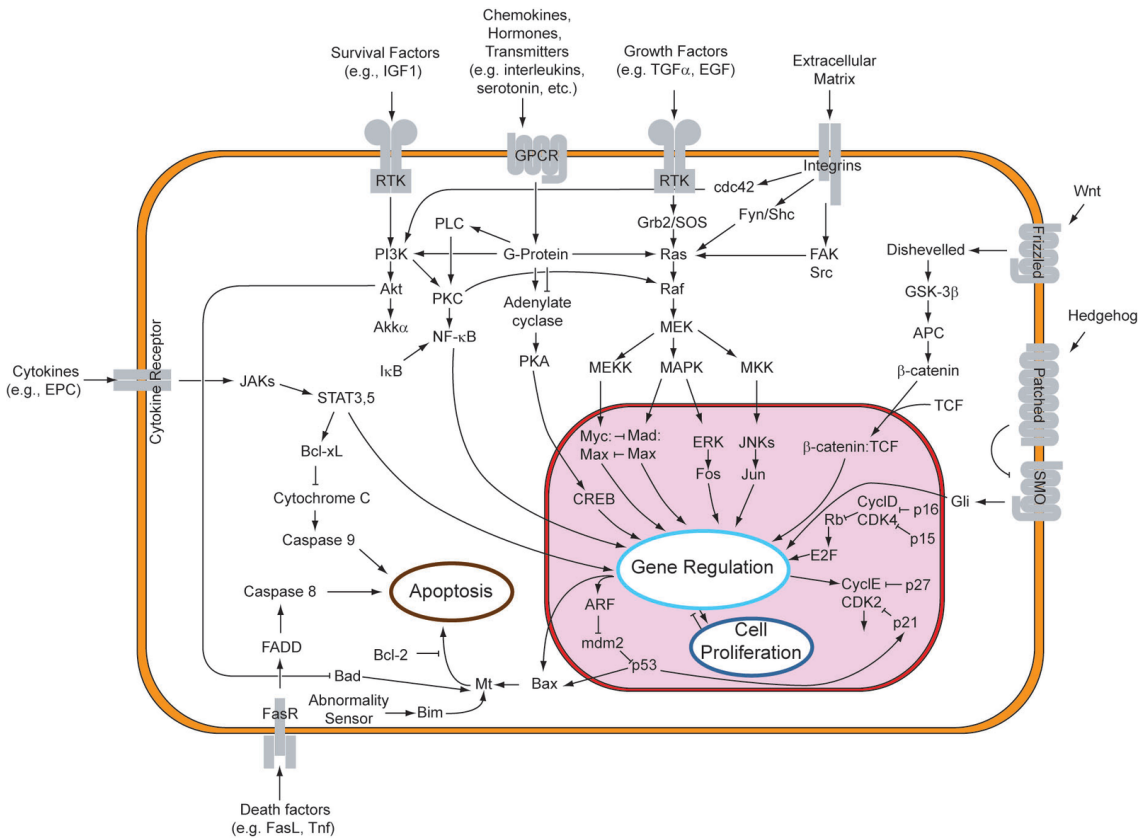
- Feedback loops – when the end product mediates activity of an early product

- *Feedfoward relays* – activity of one component stimulates a distant downstream component

□ The signaling networks in the cell are _____

- 1500 receptors, 700 kinases/phosphatases, and 2000 transcription factors

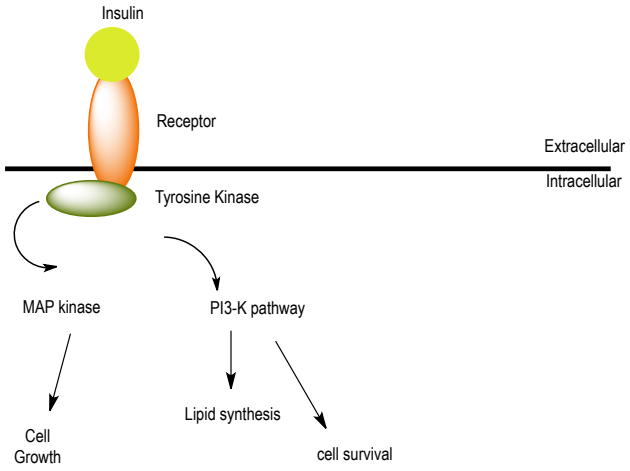
EXAMPLE: Complexity of signaling networks



Insulin Signaling

- Insulin and glucagon work together to maintain stable blood _____ level in the cells
  - □ Two hormones: insulin and glucagon
  - □ After a meal – there is lots of glucose in the blood stream
    - Triggers the cell to create and release insulin
    - Insulin binds to insulin receptors
  - □ Insulin binding triggers a variety of pathways including:
    - Protein kinase B phosphorylation – triggers intracellular vesicle fusion, and import of glucose into the cell
  - □ When blood glucose levels drop – insulin receptors stop being activated
    - triggers the cells to increase secretion of glucagon
    - Glucagon binds its receptors and stimulates a variety of other signaling pathways

EXAMPLE: Variety of insulin signaling pathways



PRACTICE:

1. True or False: A signaling network is usually linear, with little interaction with other signaling pathways.
    a. True
    b. False

2. When insulin binds to insulin receptors what happens to glucose?
    a. Glucose is brought into the cell
    b. Glucose is created by the cell
    c. Glucose is exported into the bloodstream
    d. Glucose is degraded