**Cell Communication**

**Big Questions:**

How are activities coordinated within an organism?   
How do cells communicate to carry out life functions and respond to their environments?  
How does a response actually work on a cellular level?

**Cell-to-cell communication and messaging**

* **External signals are converted to responses within the cell 🡨**

Yeast Sex

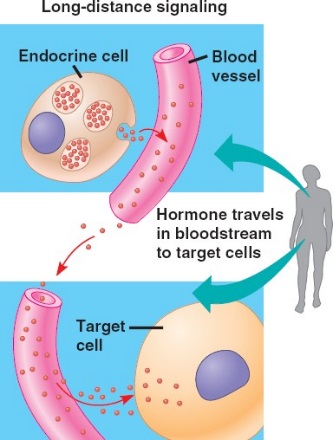
* The yeast, *S. cerevisiae*, has two mating types, **a** and **α**
* different mating types locate each other by the factors they secrete

Evolution Connection:

* Pathway similarities suggest that signaling molecules evolved in prokaryotes and were modified later in eukaryotes

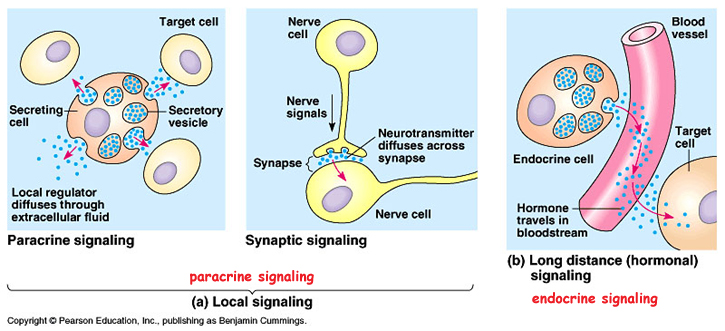
**What is a Signal Transduction Pathway?**

Local and Long Distance Signaling

* 

Local Regulators –

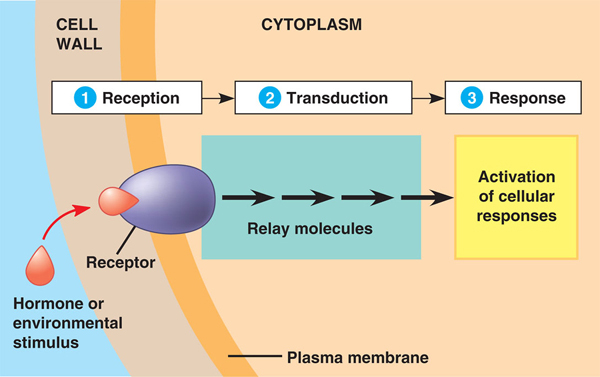
*Paracrine*



*Synaptic*

Long Distance Signaling

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!

**The ability of a cell to respond to a signal depends on whether or not it has a receptor specific to that signal**

**How does the cell signal get turned into a response? 3 steps:**

**Step One: Reception**

3 Main Types of Membrane Receptors:

1.

2.

3.

G Protein Coupled Receptor

Receptor Tyrosine Kinases

Ligand Gated Ion Channels

* .

***Intra***cellular Receptors

An activated hormone-receptor complex can act as a transcription factor, turning on specific genes

**Step Two: Transduction**

Multi-step Pathways – can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a signal so \_\_\_\_\_\_\_\_ molecules can produce a \_\_\_\_\_\_\_\_\_\_ response

How do STPs work?

* At each step, the signal is ***transduced*** into a different form, usually \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How is the signal transmitted?

**Phosphorylation**: Protein \_\_\_\_\_\_\_\_\_\_\_\_ transfer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from ATP to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Dephosphorylation**: Protein \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ remove \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Output Response**

May occur in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signaling pathways can also affect the overall behavior of a cell

🡪 changes in cell shape

**Four Steps of Fine-Tuning a Response:**

1.

2.

3.

4.

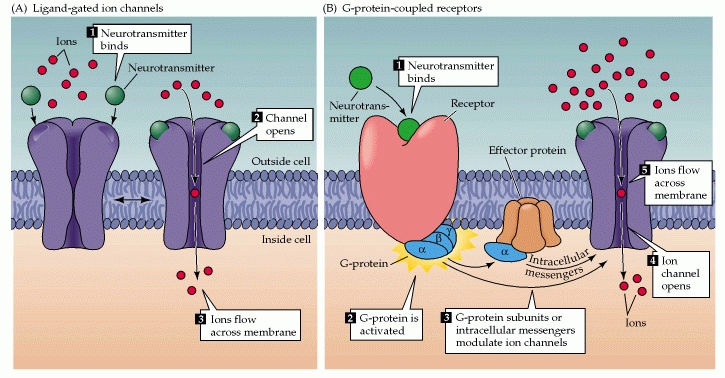
Signal Amplification

Enzyme cascades \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the cell’s response

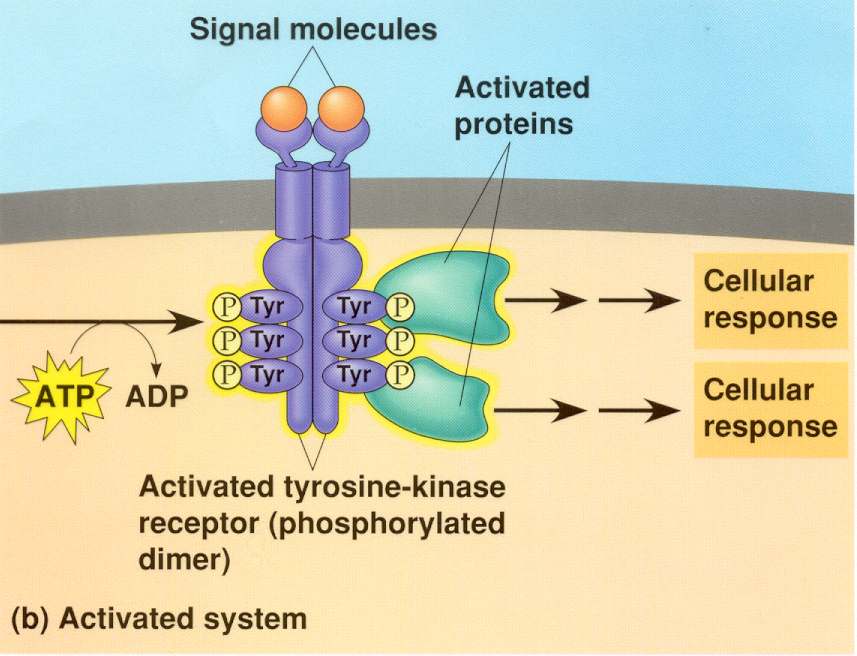
* At each step, the number of activated products is much \_\_\_\_\_\_\_\_\_\_\_\_\_ than in the preceding step

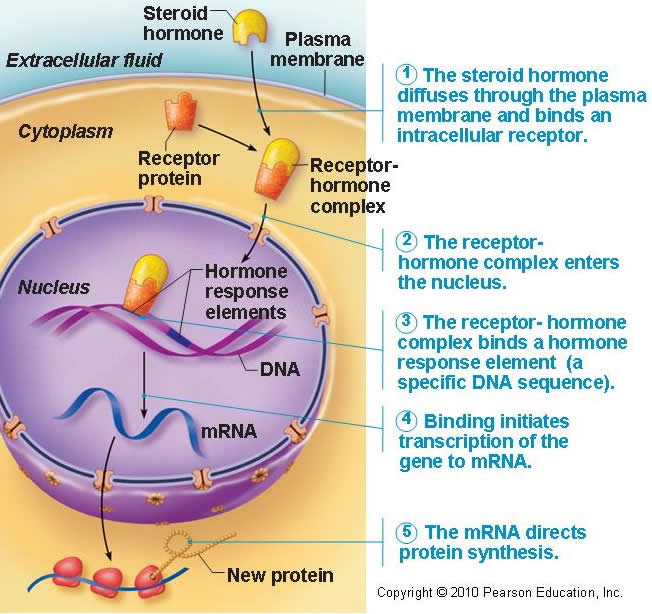
**Termination of the Signal**

Ligand gated channels G-protein-coupled receptors



Tyrosine-Kinase Receptors





Intracellular Receptors