Cell-Cell Interactions

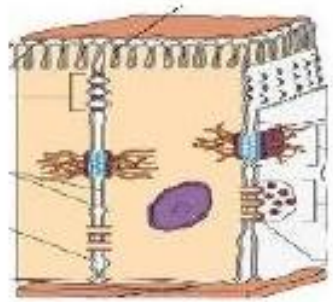
Dr. Ahmed Hasan Mohammed

Introduction

- Your cells touch and communicate with one another. Sending and receiving a variety of chemical signals, they coordinate their behavior so that your body functions as an integrated whole, rather than as a massive collection of individual cells acting independently.

CELL ORGANIZATION

Cells → Tissues → Organs → System

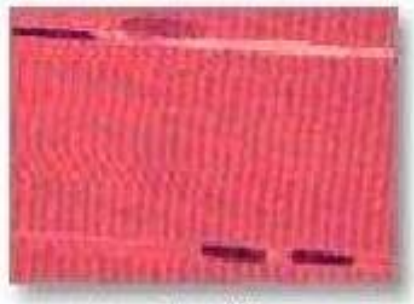


Epithelial cell

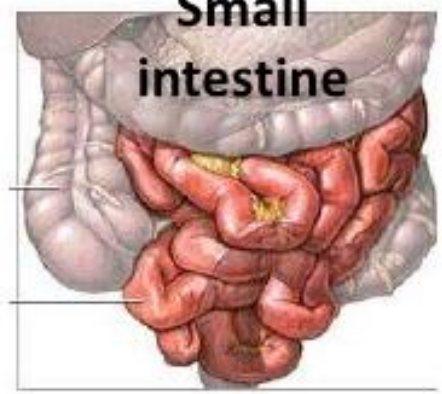
Epithelial tissue

Stomach

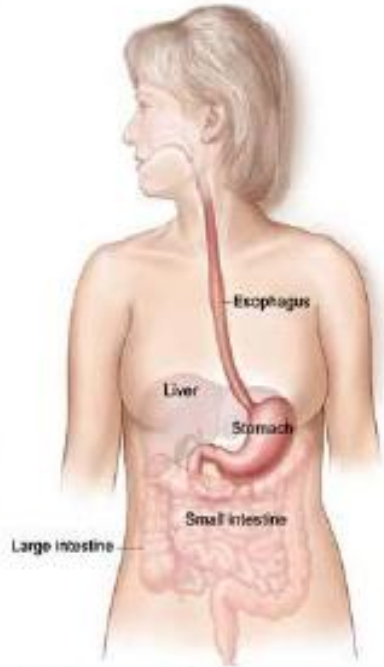
Smooth muscle cell



Epithelial tissue



Small intestine

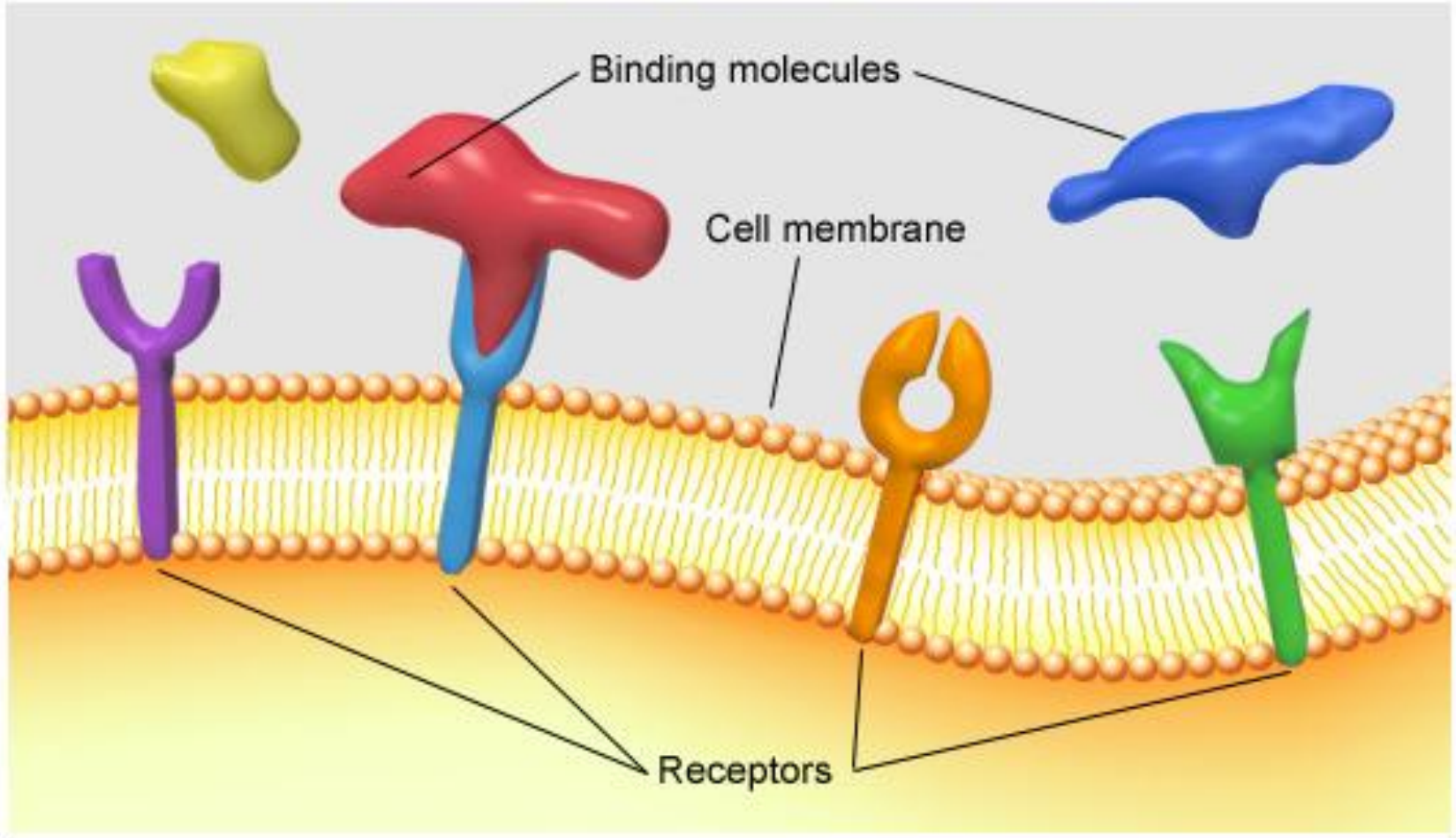


Digestive system

Receptor Proteins and Signaling between Cells

- Communication between cells is common in nature. Cell signaling occurs in all multicellular organisms, providing an indispensable mechanism for cells to influence one another.
- The cells of multicellular organisms use a variety of molecules as signals, including not only peptides, but also large proteins, individual amino acids, nucleotides, steroids and other lipids.

Receptors – the key to cellular communication



Like most systems in our body, the immune system is activated and controlled by receptors and the molecules that bind to them. Receptor proteins in cell membranes are shaped so that one particular molecule can fit exactly in them. When that molecule binds to the receptor, it sends a signal to the cell to switch something on or off. It's the same type of system we use to smell, taste and transmit nervous signals.

Cell Surface Receptors

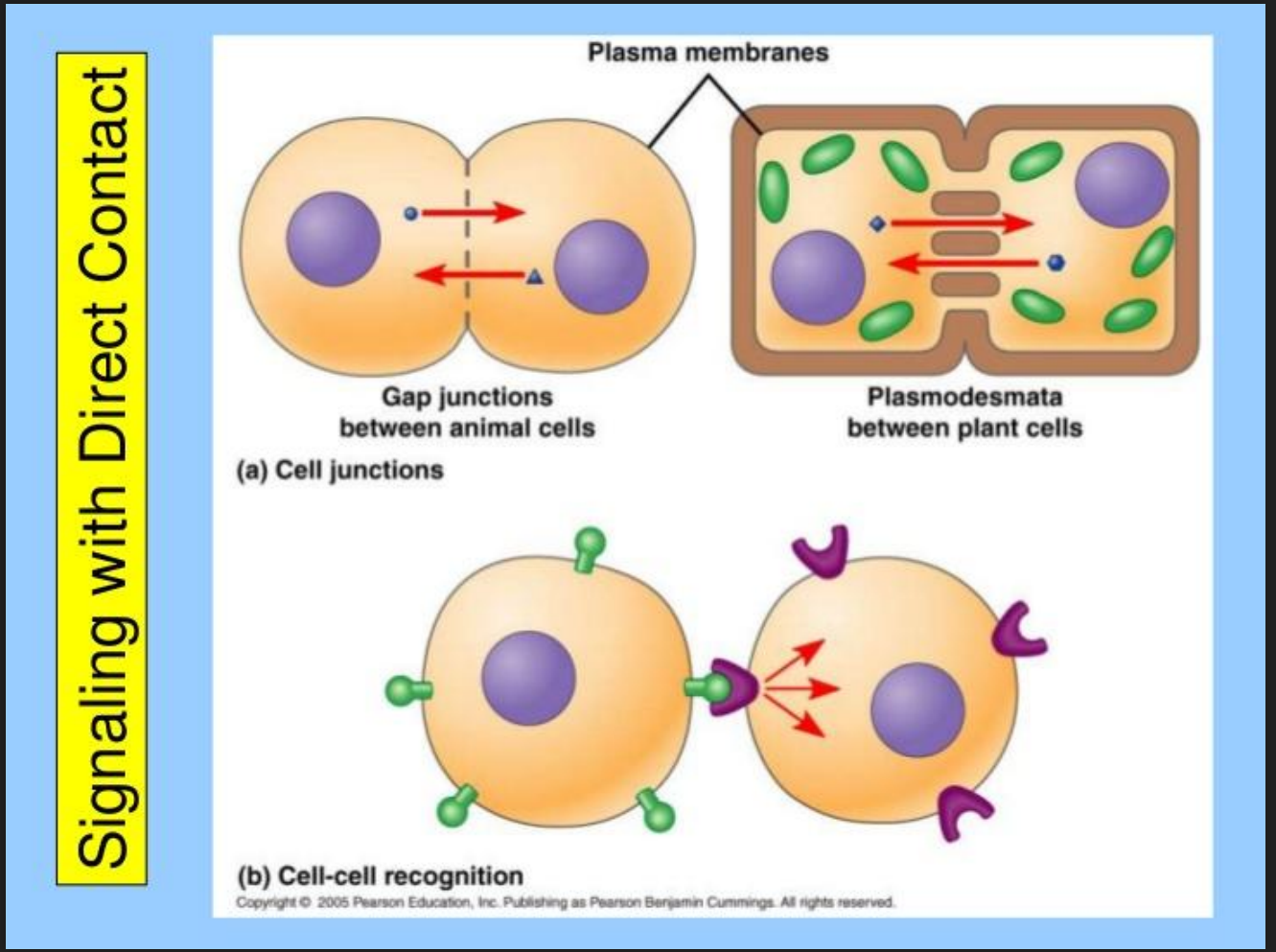
- Each cell responds only to certain signals and ignores the rest.
- How does a cell "choose" which signals to respond to? Located on or within the cell are **receptor proteins,** each with a three-dimensional shape that fits the shape of a specific signal molecule.
- When a signal molecule approaches a receptor protein of the right shape, the two can bind. This binding induces a change in the receptor protein's shape, ultimately producing a response in the cell.

Types of Cell Signaling

- Direct Contact
- Paracrine Signaling
- Endocrine Signaling
- Synaptic Signaling

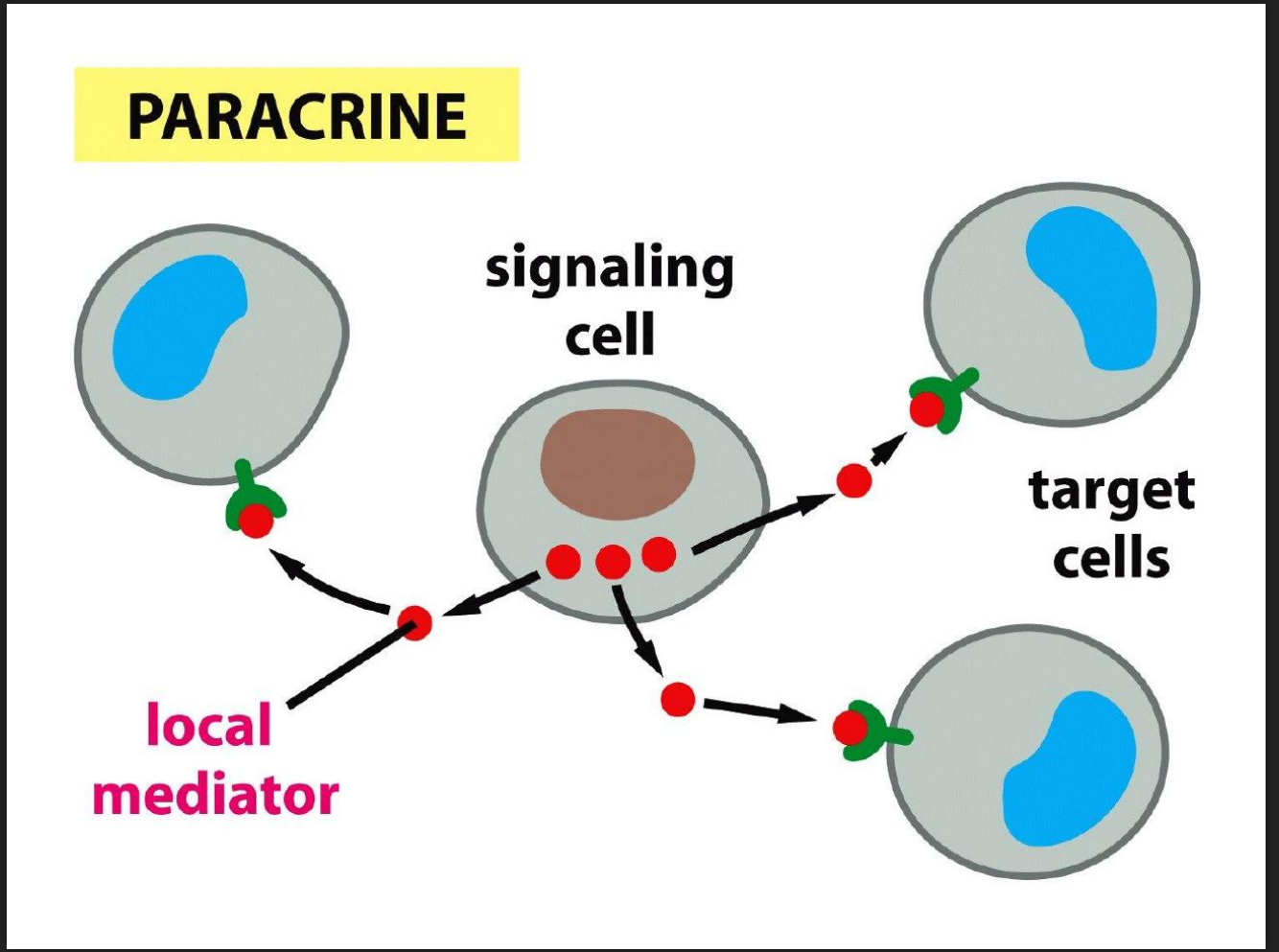
Direct Contact

When cells are very close to one another, some of the molecules on the cells' plasma membranes may bind together in specific ways.



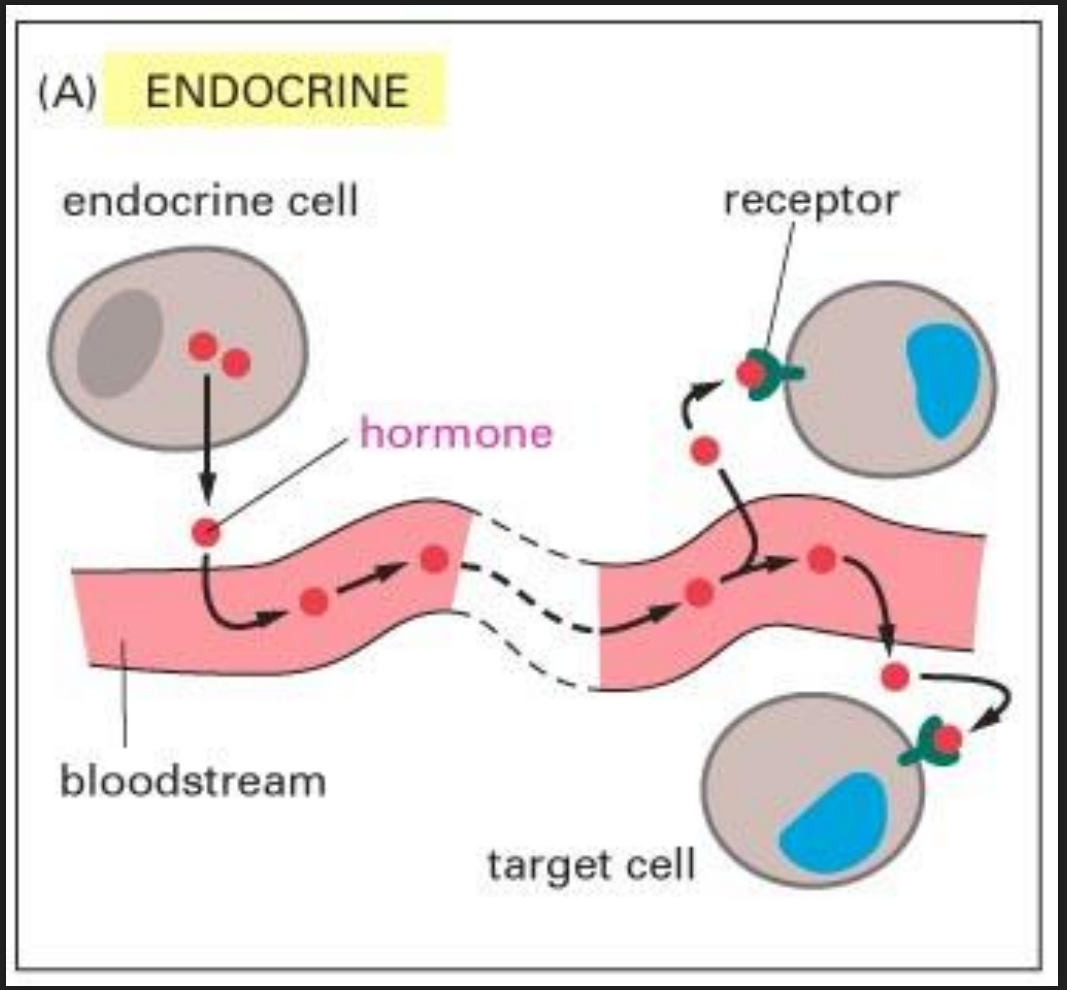
Paracrine Signaling

Signal molecules released by cells can diffuse through the extracellular fluid to other cells. If those molecules are taken up by neighboring cells, destroyed by extracellular enzymes, or quickly removed from the extracellular fluid in some other way, their influence is restricted to cells in the immediate vicinity of the releasing cell.



Endocrine Signaling

If a released signal molecule remains in the extracellular fluid, it may enter the organism's circulatory system and travel widely throughout the body. These longer lived signal molecules, which may affect cells very distant from the releasing cell, are called **hormones,** and this type of intercellular communication is known as **endocrine** signaling.



Synaptic Signaling

In animals, the cells of the nervous system provide rapid communication with distant cells. Their signal molecules, **neurotransmitters.** Rather, the long, fiberlike extensions of nerve cells release neurotransmitters from their tips very close to the target cells. The narrow gap between the two cells is called a **chemical synapse.**