

BULK FLOW AND OTHER WAY OF TRANSPORT THROUGH THE CELL



Why is bulk transport important for cells?

There are materials that are too large to pass through the cell membrane using these methods.

Endocytosis and exocytosis are the bulk transport mechanisms used. As these transport processes require energy, they are known as active transport processes.

These materials are important and needed for the living and homeostasis
Mechanisms

Bulk transport :
Either include transport of very large particles or small molecules in very large quantity

Endocytosis : endo: inside
Cytosis: cell
Exocytosis : exo: out

Vesicle function in endocytosis and exocytosis

- The walls of vesicles are made up of a lipid bilayer, which is why they are capable of fusing with the cell membrane.
Because it is made of lipid bilayer , it can diffuse easily from inside to the out or vice versa .
- This fusion between vesicles and the plasma membrane facilitates bulk transport both into and out of the cell.

Bulk transport : needs a vesicles formation

Vesicle is either :

1. Separate from inside the cell and fuse with the cell membrane to release molecules out of the cell

Vesicle is either :

2. Separate from the outer surface of the cell membrane to the inside allowing molecules to get inside the cell

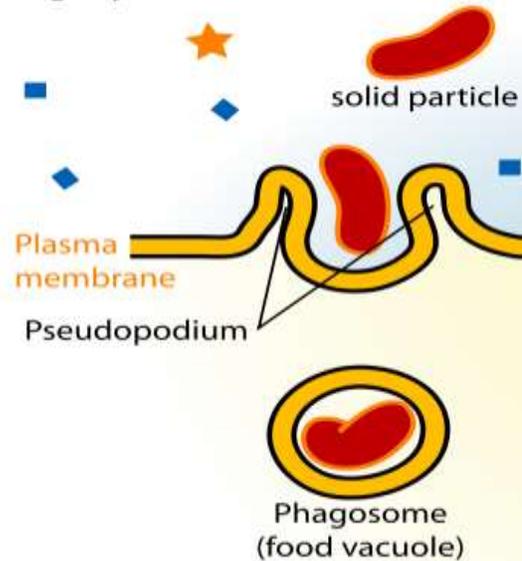
What is endocytosis ?

a particles will get into the cell by tacking a part of the cell membrane from out of the cell

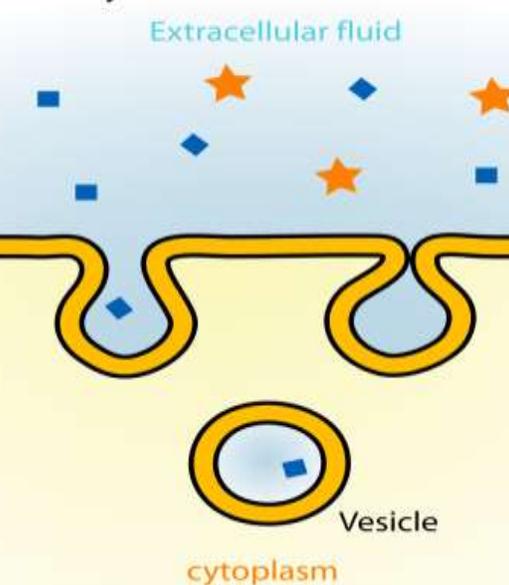
3 types :

Endocytosis

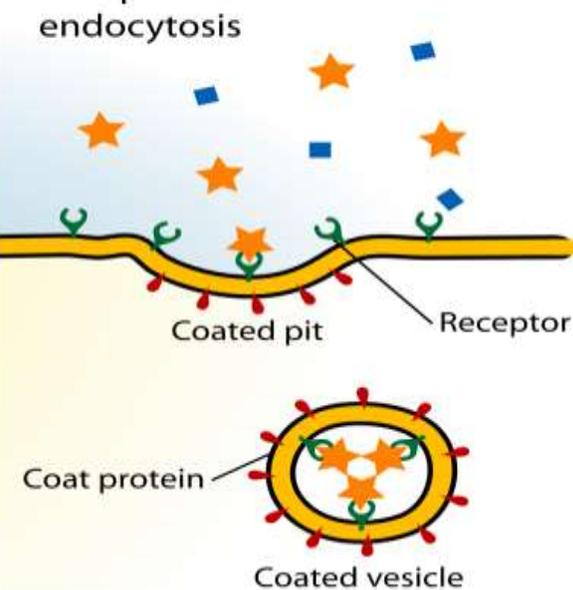
Phagocytosis



Pinocytosis



Receptor-mediated endocytosis



THE FUNCTION OF ENDOCYTOSIS?

Immune role :

Invade of foreign particles (virus and bacteria).....> the cell will capture them through endocytosis> lysis inside the cell through lysosomes

Disposing of old cells :

The old cell will bind to the cell membrane and forms a vesicle and lysis it

- **Taking in nutrients for cellular growth, function and repair**
(cellular homeostasis)
- **Capturing pathogens or other unknown substances that may endanger the organism**
rule in immune system
- **Disposing of old or damaged cells**
Like disposing red blood cells

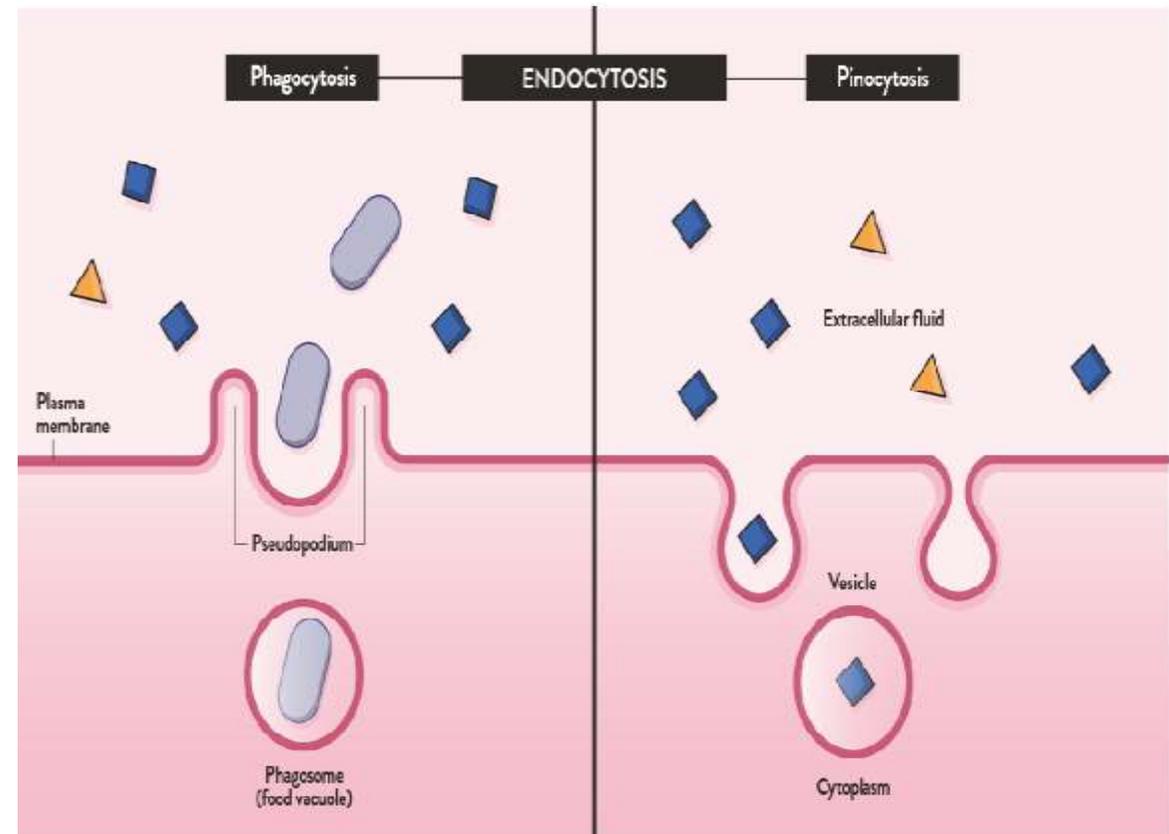
The types of endocytosis 1.

Phagocytosis: swallowing
it is a selective process (each receptor bind with specific particles)

- A particle or substance binds to receptors on the cell's surface, stimulating the release of pseudopodia (extensions of the plasma membrane filled with cytoplasm).
- Pseudopodia surround the object until their membranes fuse, forming a phagocytic vesicle.
- The phagocytic vesicle pinches off from the cell membrane, entering the cell.
- The phagocytic vesicle fuses with lysosomes, which recycle or destroy the vesicle's contents.

1. Allow large molecules to get into the cell
2. WBCs function (capture of pathogens)
3. It starts when bacteria, dead cell Bind with the receptors on the surface of the phagocyte

1. Often large solid molecules
2. Called cell eating
3. the vesicle is cytoplasmic extension called pseudopodia

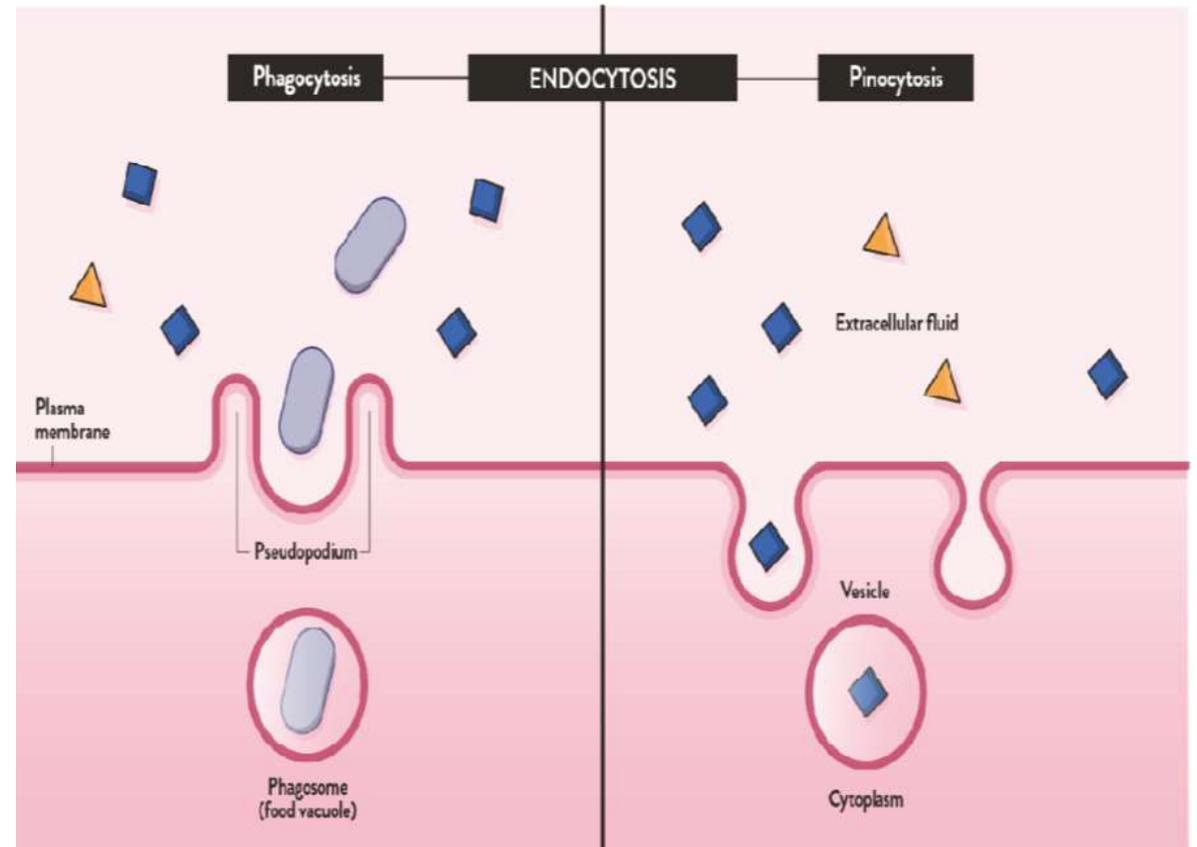


2. Pinocytosis (Cellular drinking):

Named like this because the particles will dissolve in the vesicle and become suspension (like the solution)

- Molecules bind to receptors located along the surface of the cellular membrane.
- The plasma membrane folds in, forming a pinocytic vesicle that contains the molecules and the extracellular fluid.
- The pinocytic vesicle detaches from the cell membrane inside the cell.
- The vesicle fuses with early endosomes where the contents found within are sorted.

1. Allow small molecules in very large quantity to get into the cell
2. (water and small molecules)
3. Vesicles form at the plasma membrane
4. Often fluid molecules



Receptor Mediated Endocytosis

■ A selective process

■ **Involves formation of vesicles at surface of membrane**

- Vesicles contain receptors on their membrane
- Vesicles contain specific target molecule in high concentration

■ **Clathrin-coated vesicle in cytoplasm**

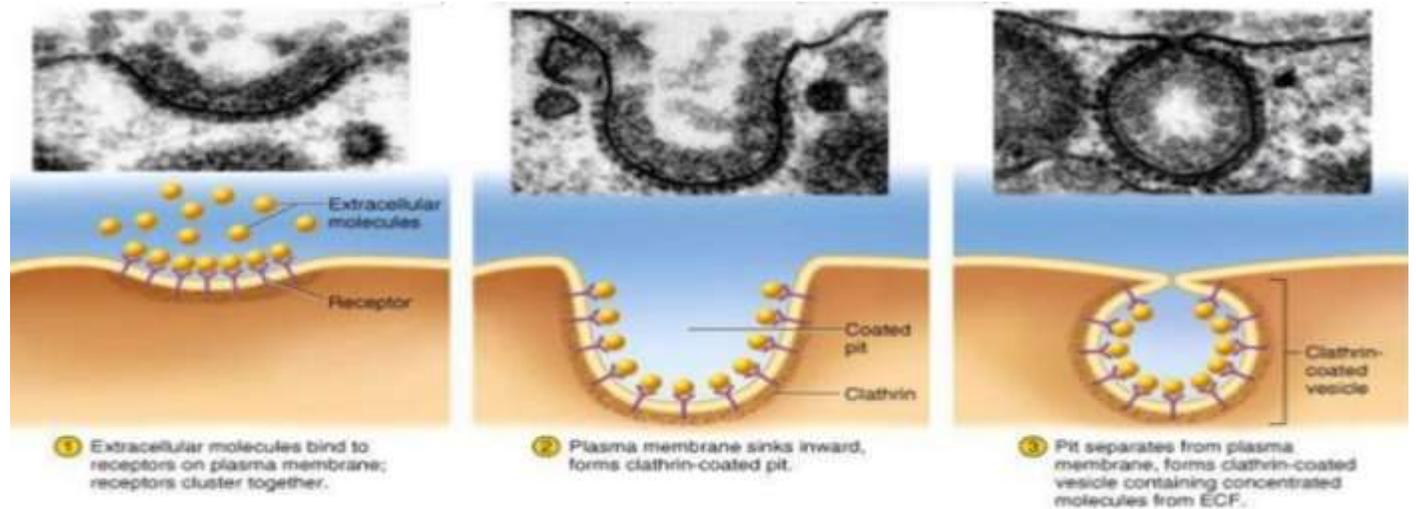
- uptake of LDL from bloodstream
- If receptors are lacking, LDL's accumulate and *hypercholesterolemia* develops

1. A specific extracellular molecule will bind to the receptor usually (iron ions and cholesterol LDL low density lipids)

2. After the molecules bind to the receptor The coated pit will form (is a part of cell membrane has specific receptors binding to specific molecules)

3. The coated pit pinches to the inside and forms a vesicle to inside the cell

Note : called clathrin coated plasma membrane becomes coated with a protein called clathrin



Exocytosis serves the following purposes : it is an organized process

From one cell to another not randomly

Moves of signals from cell 1 to cell2 according to the cell needs

- **Removing toxins or waste products from the cell's interior**

Outputs from the cell's metabolism process and in excess of its need

- **Facilitating cellular communication :**

hormones and neurotransmitters

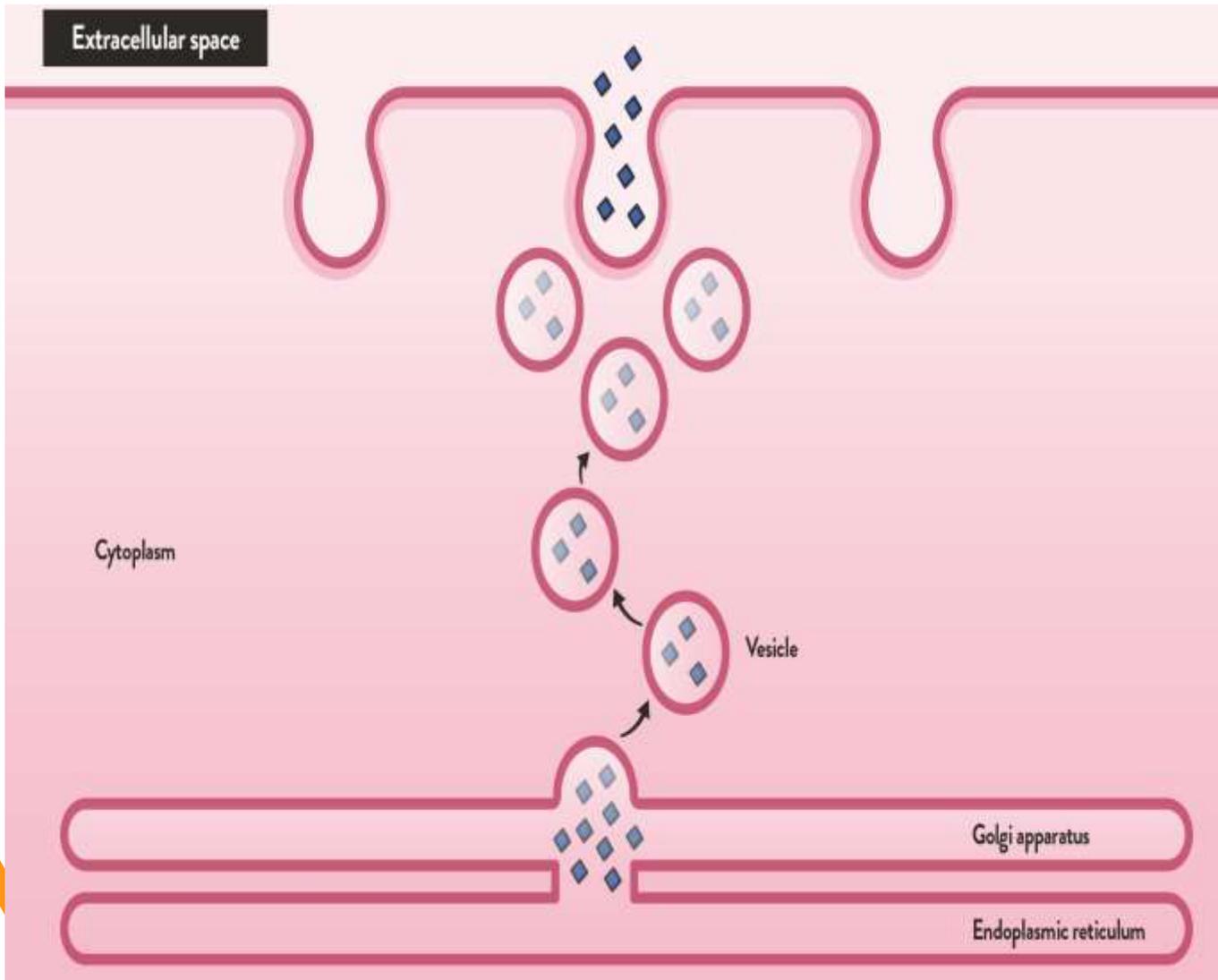
- **Facilitating cellular membrane growth, repair, signaling and migration :**

The defect that occurred in the plasma membrane after endocytosis is compensated for by applying a new layer of the membrane

Signaling>
hormones affects
the target cell>
bind to specific
receptor>
specific function is
done

Example 1 : the
glucose increase in the
blood> specific
cell produces signals
through exocytosis
.....> signals
stimulating the
production of insulin to
reduce the glucose in
the blood

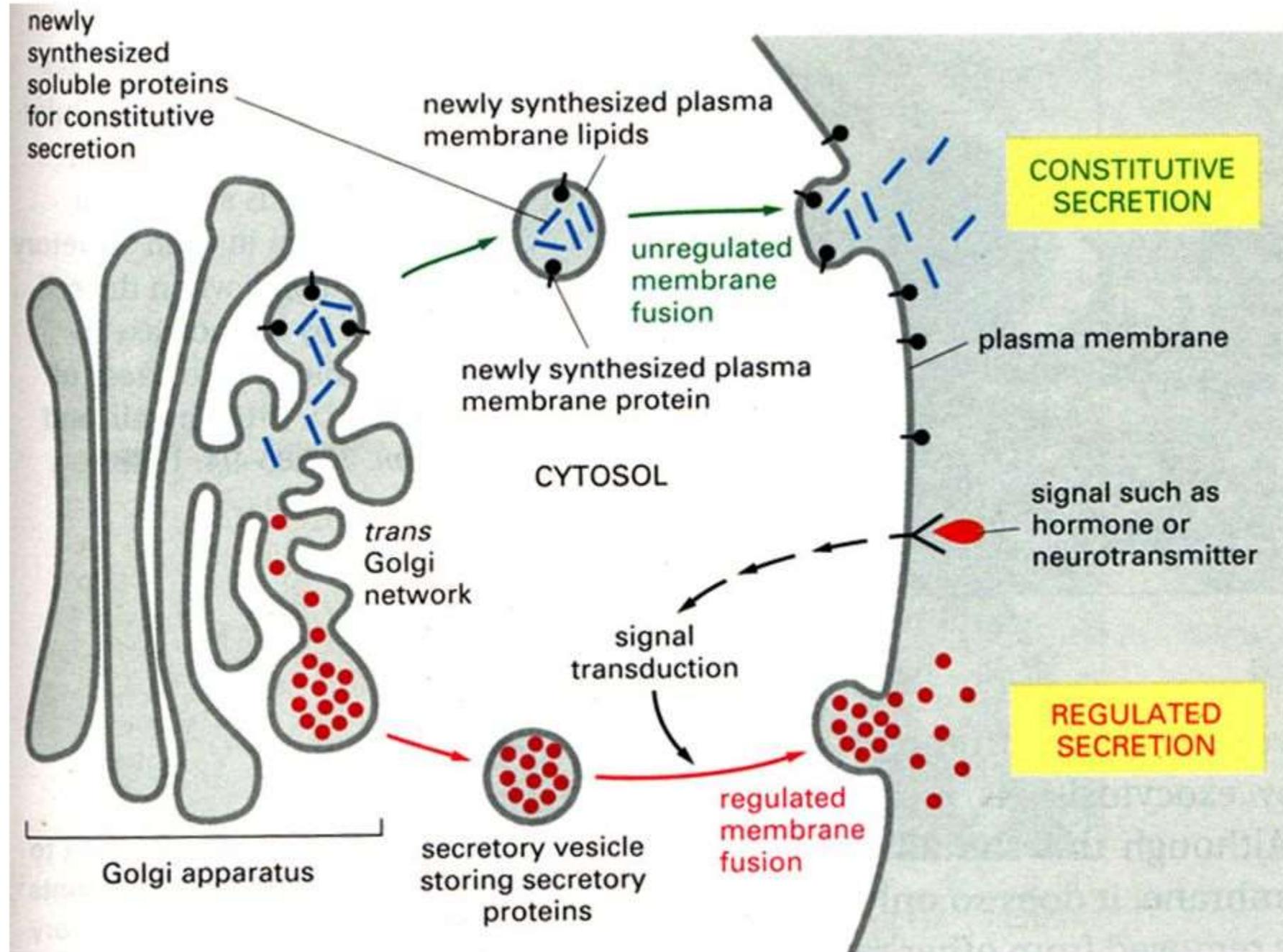
Example 2 :
contraction
.....>exocytosis of
specific
neurotransmitter
(acetyl colin)
.....> to target cell
(skeletal muscle)



- The steps of exocytosis

The steps of exocytosis.

- A vesicle is formed, typically within the endoplasmic reticulum and the Golgi apparatus or early endosomes.
- The vesicle travels to the cell membrane.
- The vesicle fuses to the plasma membrane, during which the two bilayers merge.
- The vesicle's contents are released into the extracellular space.
- The vesicle either fuses with or separates from the cell membrane.



Types of exocytosis

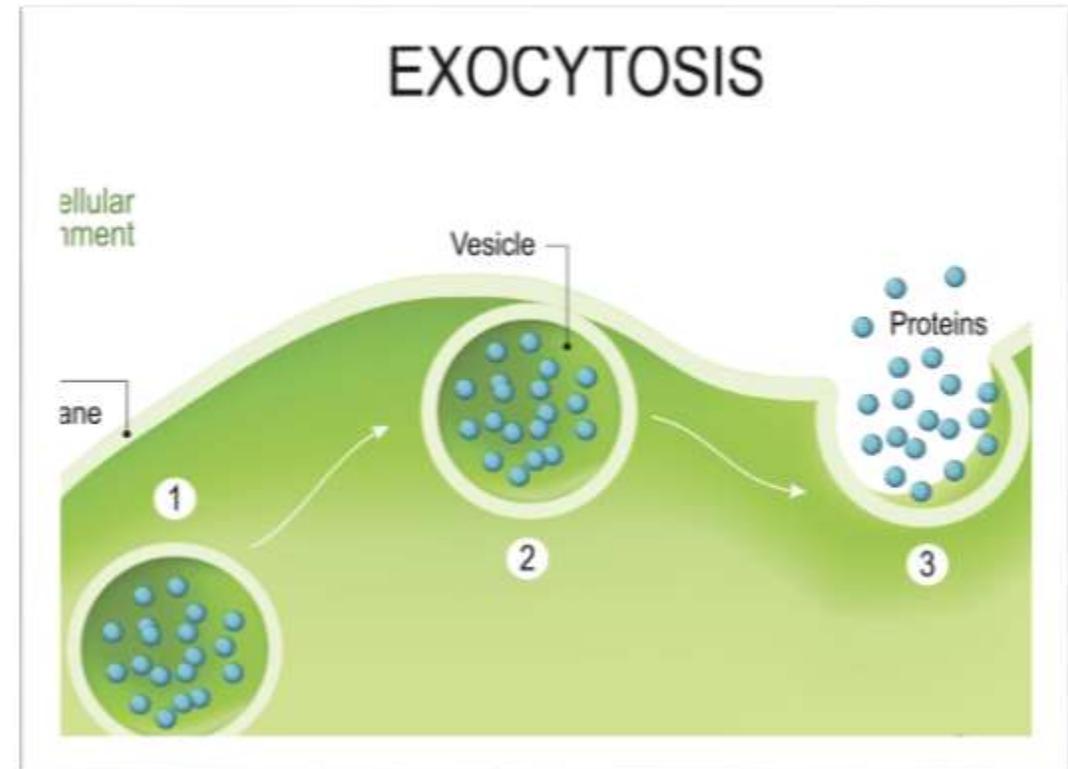
- **Regulated Exocytosis**

- Such as neurotransmitters or hormones.
- Once excreted from the endoplasmic reticulum, these vesicles are transported to the Golgi apparatus (also known as the Golgi complex) for further modification.

- The expulsion of the materials is controlled, or regulated, by extracellular signals that cause membrane depolarization.

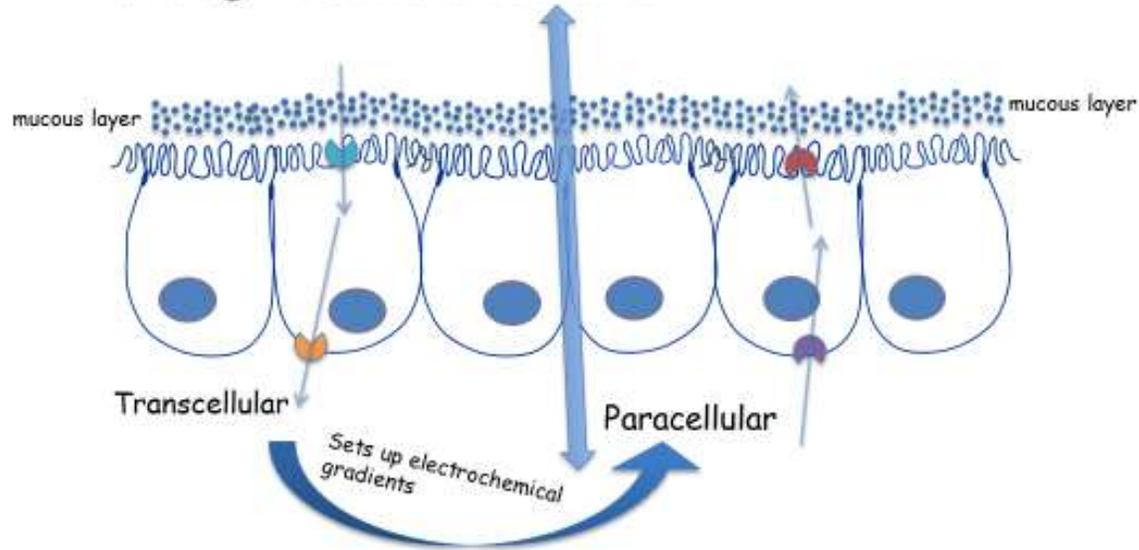
- **Constitutive Exocytosis**

- doesn't require any extracellular signals. Most molecules traveling to the plasma membrane do so using this pathway.
- some exocytotic vesicles are incorporated into the plasma membrane (full vesicle fusion)
- while others return to the interior of the cell after their contents have been released .
- Others remain docked to the membrane, where they can be used multiple times

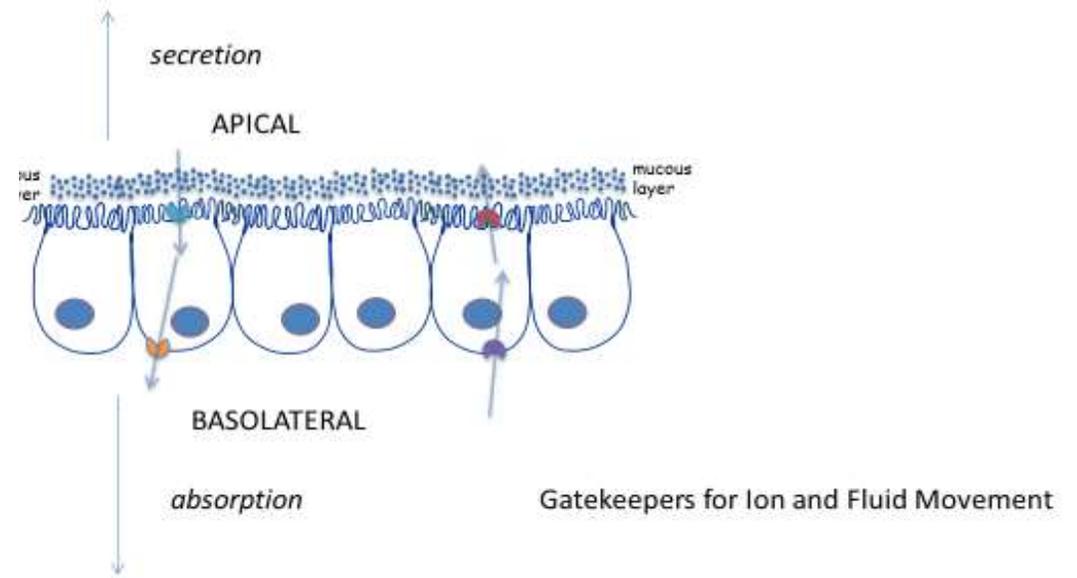


Transepithelial Transport: Summary

MEMBRANE TRANSPORT drives
TRANSCELLULAR transport of ions, which
sets up ELECTROCHEMICAL GRADIENT to
allow PARACELLULAR transport of fluid
through TIGHT JUNCTIONS



Intestinal Epithelial Cells

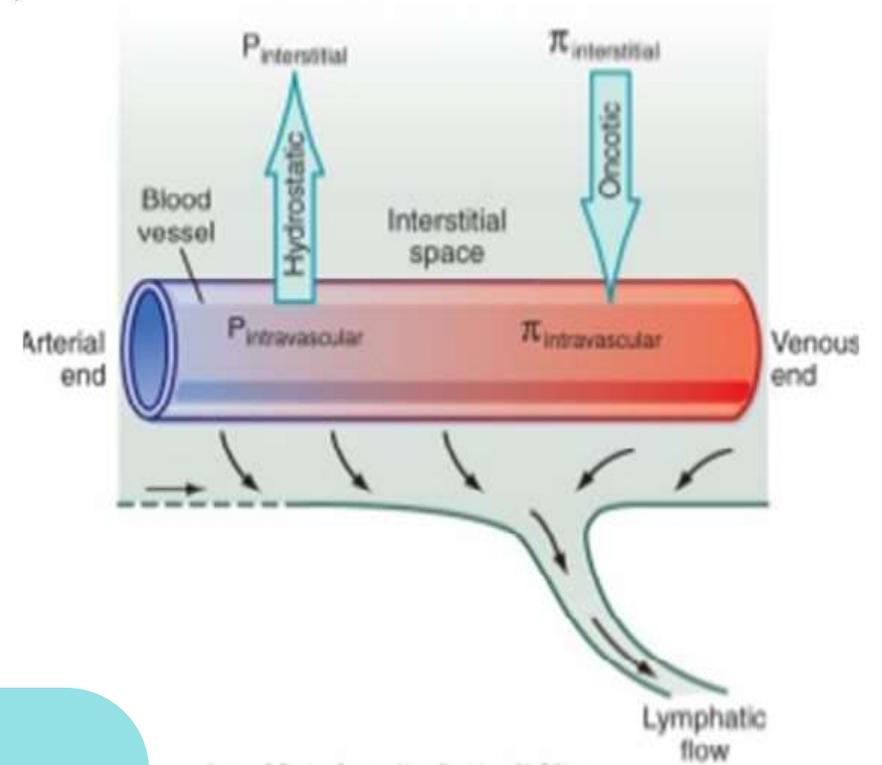


1. Secretion : release of the substance inside the body lumen
2. Absorption : release of material into the blood
3. Excretion : release of substance out of body

■ NET filtration.

STARLING'S FORCES- at the capillary level

- Plasma osmotic pressure
- Hydrostatic pressure



Hydrostatic pressure :

- 1) More water molecules inside and less solutes
- 2) Causing movement of water to outside

Oncotic pressure :

- 1) More solute inside the capillary than outside
- 2) Causing movement of water to the inside

Question :

<https://quizizz.com/admin/quiz/5740ea29220f74ee1c43208b/endocytosis-exocytosis>