

Honors Biology

Class Notes
(pp. 90 - 97)

North Salem High School

MISSION: *Engage students to continuously learn, question, define and solve problems through critical and creative thinking.*

Cell Transport

(The structure and functions of the cell membrane.)

This note packet covers the structure and function of the organelle mainly responsible for maintaining HOMEOSTASIS in the cell; the cell membrane. We will take a close look at the structure and many functions of the cell membrane along with the various ways materials get into and out of a cell.

Let's get to work!

If you have any problems – please sign up for extra help after school.

**Collea
Room W-19**

Key Words:

cell membrane	homeostasis	fluid-mosaic model
passive transport	diffusion	osmosis
active transport	endocytosis	exocytosis
pinocytosis	phagocytosis	monosaccharide
polysaccharide	glucose	starch
plasmolysis	Lugol's solution	receptors
Benedict's solution	contractile vacuole	

Objectives:

- ___ 1. **Name** the model used to represent the structure of the *cell membrane*.
- ___ 2. **Describe** the structure of the cell membrane.
- ___ 3. **List** and **describe** the 3 main functions of the cell membrane.
- ___ 4. **Describe** two specific examples of cell-to-cell communication.
- ___ 5. **List** 3 factors that affect movement of materials into and out of cells.
- ___ 6. **Define** *concentration gradient*.
- ___ 7. **Define** *semipermeable*.
- ___ 8. **Define** and give two examples of *passive transport*.
- ___ 9. **Define** and **describe** the difference between *diffusion* and *osmosis*.
- ___ 10. **State** one example of diffusion in the human body.
- ___ 11. **Define** *active transport*.
- ___ 12. **Explain** why a *contractile vacuole* is necessary for a paramecium to maintain homeostasis.
- ___ 13. **State** two differences between *passive* and *active transport*.
- ___ 14. **Define** and **describe** the differences between *endocytosis* and *exocytosis*.
- ___ 15. **State** the main difference between *pinocytosis* and *phagocytosis*.
- ___ 16. **Describe** two examples of *phagocytosis*.

Lab Objectives:

- ___ 17. **Define** *plasmolysis*.
- ___ 18. **Describe** and **explain** the effects salt water has on red onion cells. Red Blood Cells
- ___ 19. ~~**State** the difference between a monosaccharide (*glucose*) and polysaccharide (*starch*).~~
- ___ 20. **Predict** the diffusion of various molecules in different model membrane systems.
- ___ 21. ~~**Explain** the function of chemical indicators in a biology laboratory.~~
- ___ 22. ~~**Describe** how Lugol's solution (*iodine*) is used to detect the presence of *starch*.~~
- ___ 23. ~~**Describe** how Benedict's solution is used to detect the presence of *glucose*.~~
- ___ 24. ~~**State** two safety procedures that must be followed when detecting the presence of glucose in a laboratory.~~

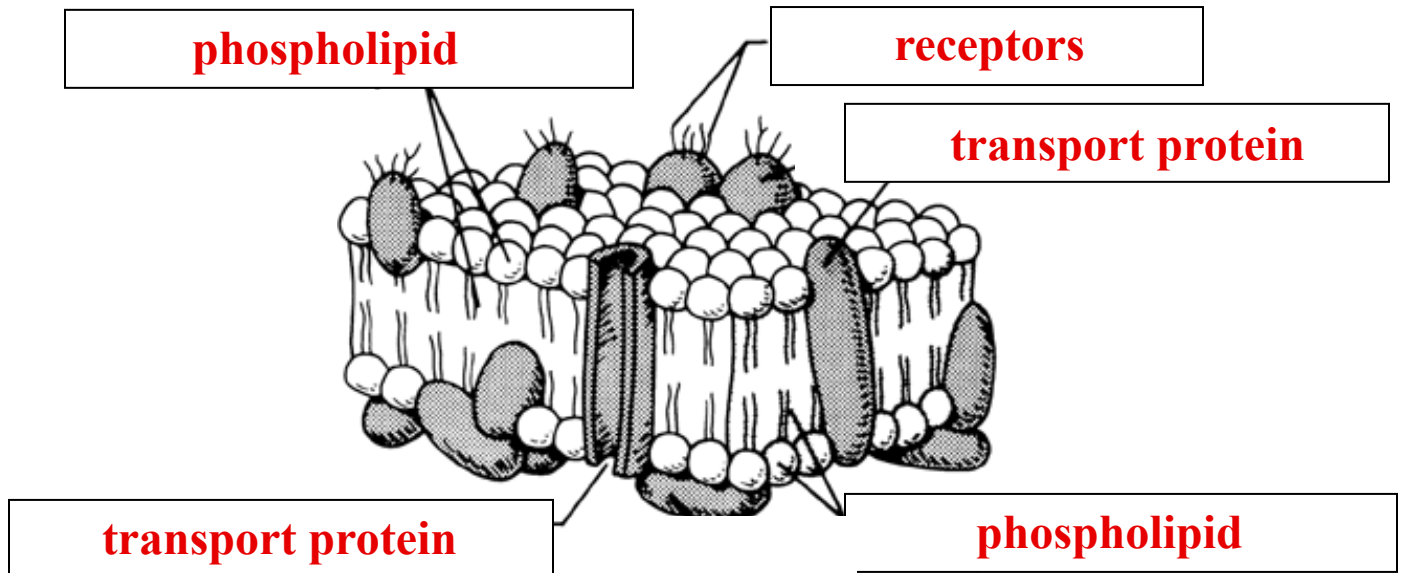
I. The Plasma Membrane

- The key structure that is involved with the maintenance of a constant environment or **homeostasis** within a cell and its organelles is the **cell membrane**.
- The function of the cell membrane is to **control** what enters and leaves the cell.
- Because not all substances or molecules can easily go into and out of the cell, the cell membrane is **semipermeable** or **selectively permeable**.

A. Structure of the Cell Membrane

1. The model used to describe the structure of the cell membrane is called the **fluid - mosaic** model.

Fluid Mosaic Model of the Cell Membrane:



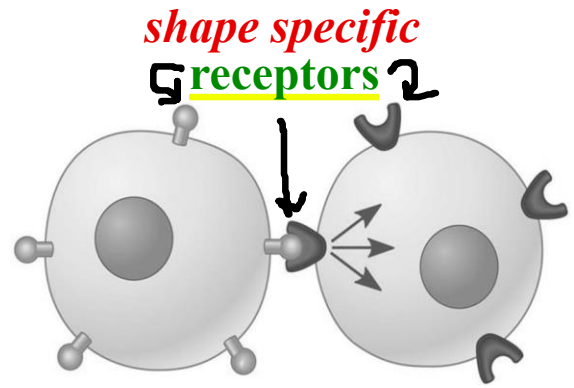
- Fluid because the double lipid layer is continually moving. A chemical compound called **cholesterol** helps keep the cell membrane nice and flexible.
- Mosaic because that is how it appears from the outside. A mosaic is a piece of art that is made up of lots of little pieces.

“Protein icebergs floating in a sea of lipids”

B. Functions of the Cell Membrane

1. Cell to Cell communication

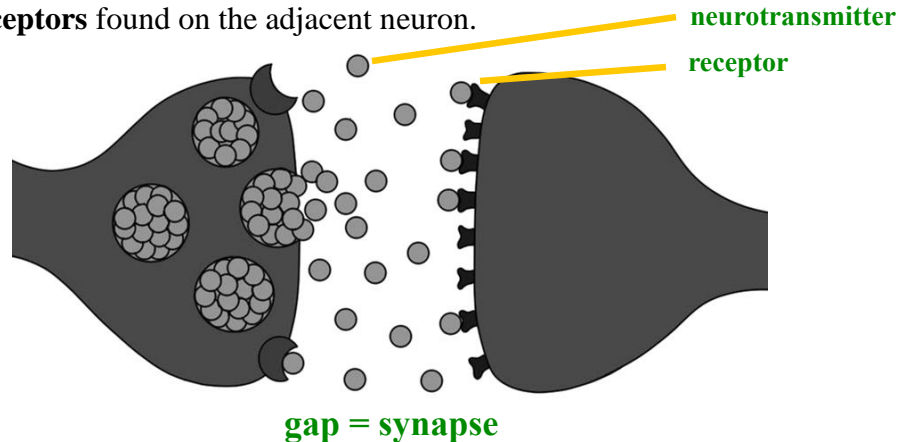
- (a) Two IMMUNE cells in an animal may communicate **DIRECTLY** by the interactions between molecules protruding from their cell membranes.



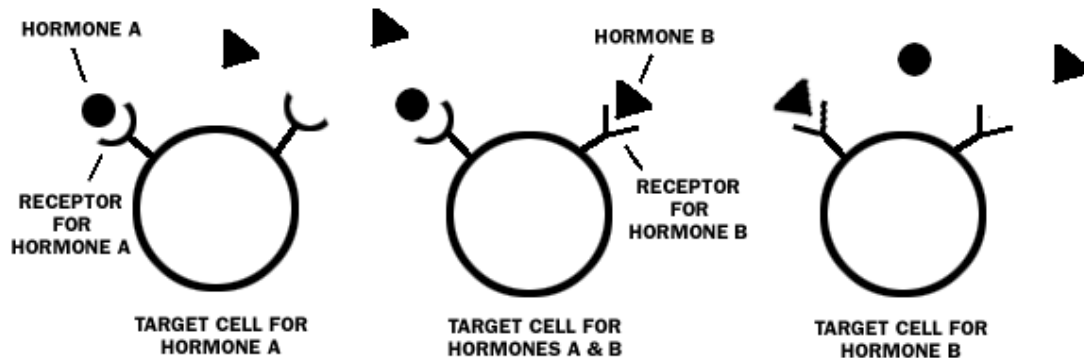
2. Chemical to Cell communication

([Video](#))

- (a) Two NERVE cells (*neurons*) may communicate **INDIRECTLY** by the use of special proteins called NEUROTRANSMITTERS that cross the gap (*synapse*) between two nerve cells and are detected by the **receptors** found on the adjacent neuron.

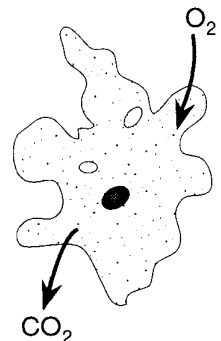


- (b) Endocrine glands secrete *chemical messengers* called **hormones** that are detected by the cells of our body because of the specifically shapes **receptors** on their cell membranes.



"You can't fit a square peg in a round hole."

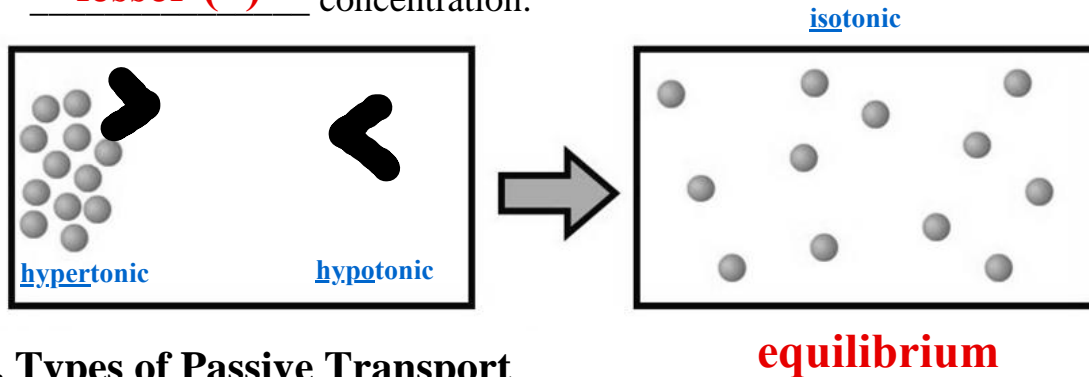
3. Maintains a stable internal environment (homeostasis) by controlling what goes in and out of the cell.



II. How materials move into and out of cells?

A. Passive Transport

- The natural movement of molecules from a greater (>) concentration to a lesser (<) concentration.



1. Types of Passive Transport

(a) diffusion

(b) osmosis - The diffusion of water.

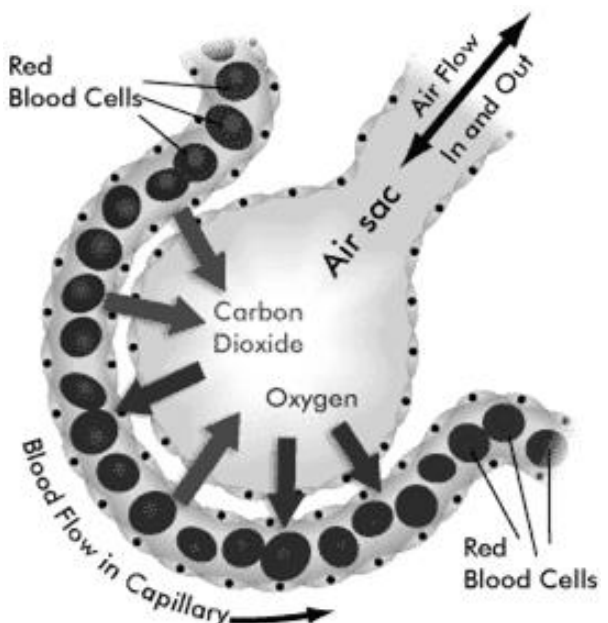
All osmosis is diffusion BUT not all diffusion is osmosis.

2. Example of Diffusion in the Human Body. [\(Video\)](#)

The diffusion of oxygen from the lungs into the bloodstream.

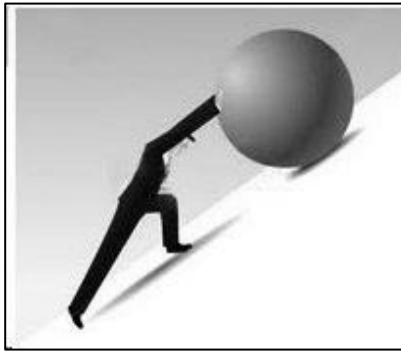
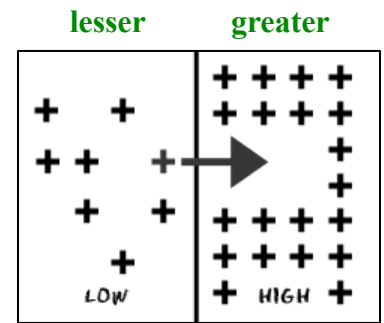
The diffusion of carbon dioxide from the bloodstream into the lungs

[\(Human Respiratory System - Gas Exchange\)](#)



B. Active Transport

- The use of *energy* or **ATP** to **move** molecules from a **lesser** concentration to a **greater** concentration.
- Active transport is like rolling a ball **uphill**.



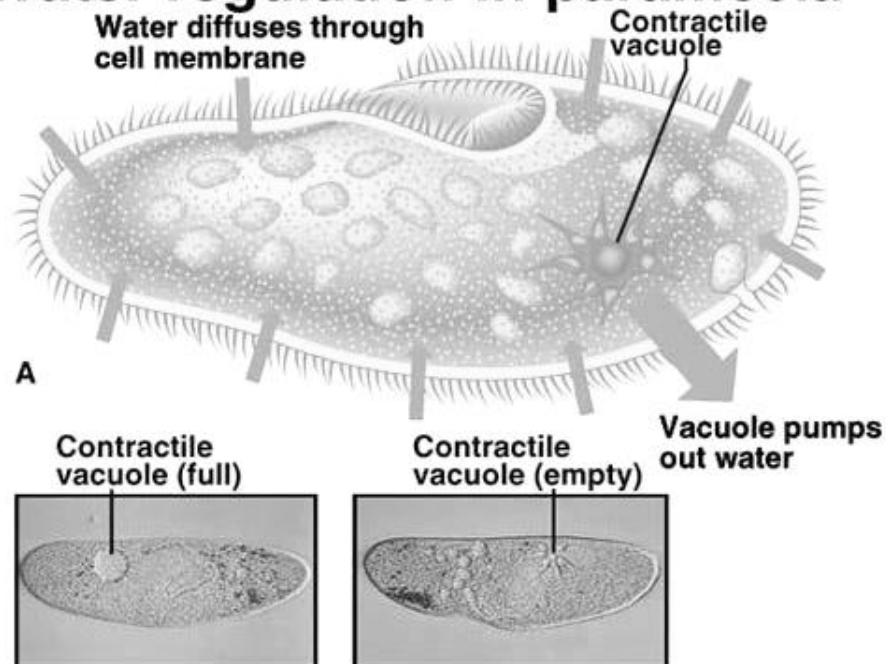
It requires no energy or ATP to roll a ball down a hill. It happens naturally just like diffusion which is a form of passive transport. However, pushing the ball up the hill, against the gradient, requires the input of energy or ATP.



C. Example of Active Transport

- Singled-Celled organisms called **paramecium** live in freshwater ponds and lakes and maintain **homeostasis** through the use of a **contractile vacuole** that **pumps** water OUT.

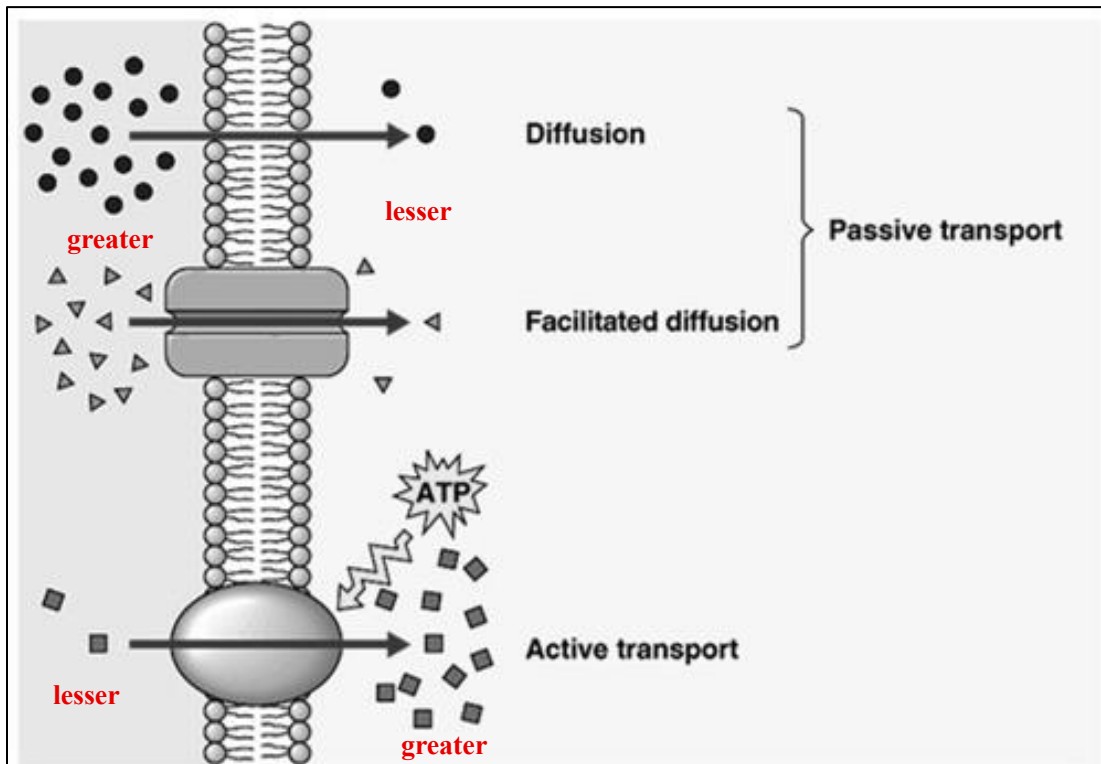
Water regulation in paramecia



([Video](#))

([Paramecium Exploding](#))

D. Summary of Passive and Active Transport



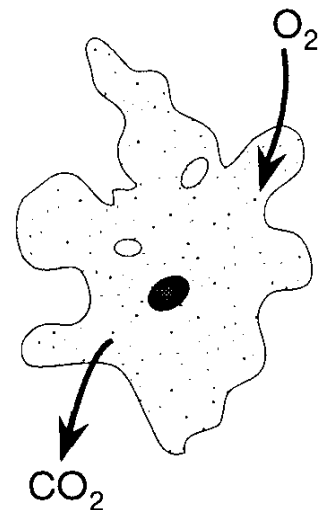
Factors that affect movement of materials into and out of cells.

(a) **membrane permeability - will the cell membrane allow it**

(b) **concentration gradient - difference in concentration**

(c) **size of the molecule**

Smaller molecules diffuse easier and faster than larger ones.



III. How to get BIG stuff in and out of cells?

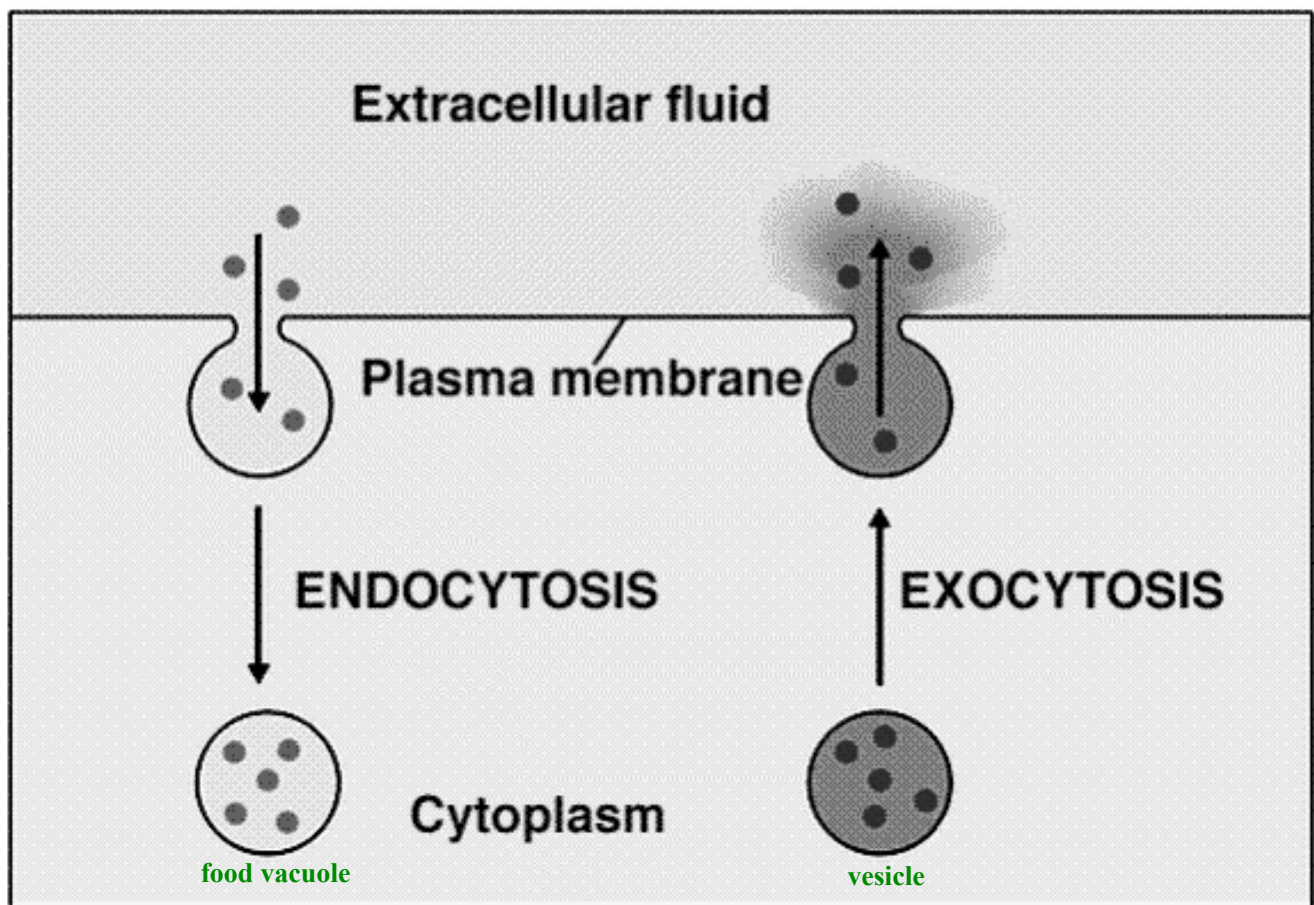
A. Exocytosis - **the movement of materials OUT of a CELL**
out cell

This stuff (*usually waste*) is just too big to diffuse out through the cell membrane.

B. Endocytosis - **the movement of materials INTO a CELL**
in

This stuff is just too big to be absorbed in through the cell membrane.

Comparison of Endocytosis and Exocytosis

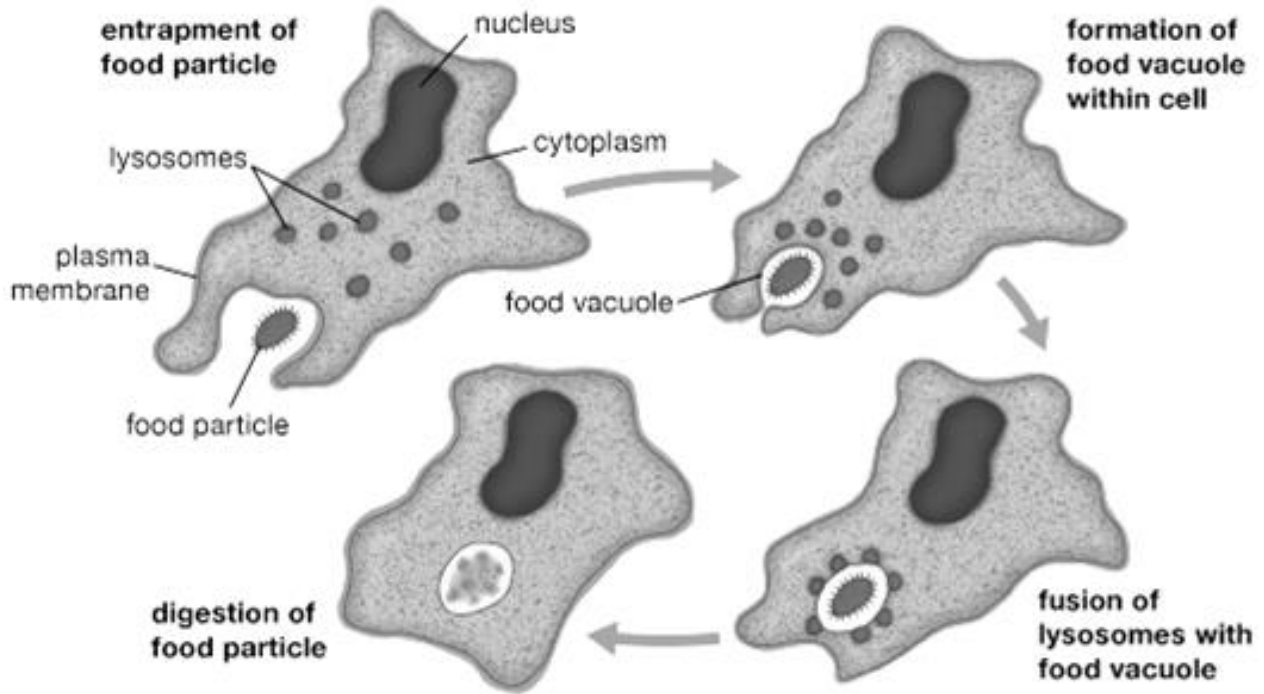


1. There are 2 kinds of endocytosis:

- ^(to drink) ^(cell) **PINOCYTOSIS** = **the ingestion of LIQUIDS into a cell**
the absorption of small molecules still too big to diffuse through the cell membrane.
- ^(to eat) ^(cell) **PHAGOCYTOSIS** = **the ingestion a larger materials into a cell**
the absorption of molecules much **TOO BIG** to diffuse through the cell membrane.

[\(Video\)](#)

Diagram of Phagocytosis



2. Examples of Phagocytosis.

- (a) Single-celled organisms called **ameba** use **phagocytosis** to ingest food. They accomplish this task through the use of “false feet” called **pseudopods**
false feet
- (b) White Blood Cells called **phagocytes** use **phagocytosis** to ingest bacteria and other foreign invaders in an effort to keep your body clean and healthy.
- Large Phagocytes are called **macrophages**.