2.17: Exocytosis and Endocytosis

What does a cell “eat”? Is it possible for objects larger than a small molecule to be engulfed by a cell? Of course it is. This image depicts a cancer cell being attacked by a cell of the immune system. Cells of the immune system consistently destroy pathogens by essentially "eating" them.

Vesicle Transport

Some molecules or particles are just too large to pass through the plasma membrane or to move through a transport protein. So cells use two other active transport processes to move these macromolecules (large molecules) into or out of
the cell. Vesicles or other bodies in the cytoplasm move macromolecules or large particles across the plasma membrane. There are two types of vesicle transport, endocytosis and exocytosis (illustrated in Figure below). Both processes are **active transport** processes, requiring energy.

Illustration of the two types of vesicle transport, exocytosis and endocytosis.

**Endocytosis and Exocytosis**

**Endocytosis** is the process of capturing a substance or particle from outside the cell by engulfing it with the **cell membrane**. The membrane folds over the substance and it becomes completely enclosed by the membrane. At this point a membrane-bound sac, or vesicle, pinches off and moves the substance into the cytosol. There are two main kinds of endocytosis:

- **Phagocytosis**, or **cellular eating**, occurs when the dissolved materials enter the cell. The **plasma membrane** engulfs the solid material, forming a phagocytic vesicle.

- **Pinocytosis**, or **cellular drinking**, occurs when the **plasma membrane** folds inward to form a channel allowing dissolved **substances** to enter the cell, as shown in Figure below. When the channel is closed, the liquid is encircled within a pinocytic vesicle.
Transmission electron microscope image of brain tissue that shows pinocytotic vesicles. Pinocytosis is a type of endocytosis.

**Exocytosis** describes the process of vesicles fusing with the plasma membrane and releasing their contents to the outside of the cell, as shown in Figure below. Exocytosis occurs when a cell produces substances for export, such as a protein, or when the cell is getting rid of a waste product or a toxin. Newly made membrane proteins and membrane lipids are moved on top the plasma membrane by exocytosis. For a detailed animation of cellular secretion, see [http://vcell.ndsu.edu/animations/constitutivesecretion/first.htm](http://vcell.ndsu.edu/animations/constitutivesecretion/first.htm).

Illustration of an axon releasing dopamine by exocytosis.

**Summary**

- Active transport is the energy-requiring process of pumping molecules and ions across membranes against a concentration gradient.
- Endocytosis is the process of capturing a substance or particle from outside the cell by engulfing it with the cell membrane.
membrane, and bringing it into the cell.

- Exocytosis describes the process of vesicles fusing with the plasma membrane and releasing their contents to the outside of the cell.
- Both endocytosis and exocytosis are active transport processes.

Explore More

Use this resource to answer the questions that follow.


1. What is bulk transport?
2. Describe how exocytosis occurs?
3. What are the types of endocytosis?
4. Some types of endocytosis are non-specific processes. What does this mean?
5. Describe the process of receptor-mediated endocytosis.

Review

1. What is the difference between endocytosis and exocytosis?
2. Why is pinocytosis a form of endocytosis?