

# Endocytosis and Exocytosis

In diffusion, dissolved particles (solutes) move down a concentration gradient. Sometimes cells need to move non-dissolved particles, or large amounts of material, across the cell membrane. They can do this by two processes: endocytosis and exocytosis.

## Endocytosis

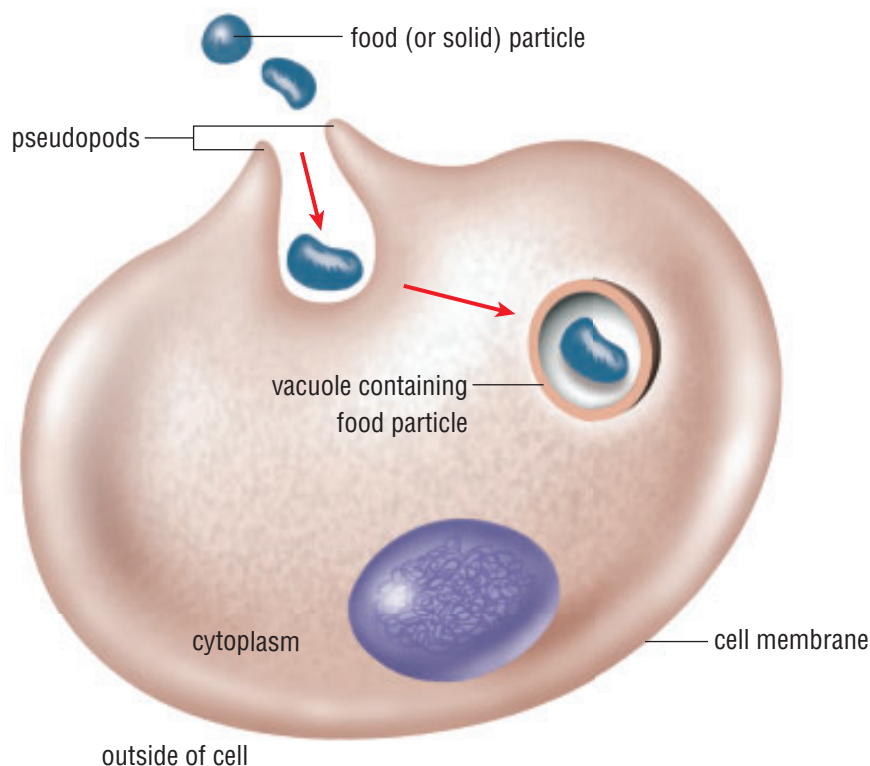
The process by which non-dissolved materials, or large amounts of material, are brought into a cell from the outside environment is called **endocytosis**. This process is used to transport solids or liquids that the cell can use as nutrients into the cytoplasm. **Phagocytosis** is one type of endocytosis that occurs when a cell uses its membrane to bring non-dissolved solid particles into its cytoplasm. In phagocytosis, the cell extends finger-like projections of its cell membrane, called pseudopods, around a piece of solid material outside of the cell. The pseudopods that surround the solid object eventually join to form a vacuole within the cell's cytoplasm (Figure 1). The cell then releases chemicals into the vacuole. The chemicals digest the solid particle into smaller particles that may be used for energy or building material. Phagocytosis is often called “cell eating.” This is because many cells use phagocytosis to obtain nutrients from their outside environment. Cells, such as white blood cells, also use phagocytosis to remove potentially harmful bacteria, dead tissue cells, and unwanted particles from the outside environment.

**endocytosis:** the process by which a cell moves large amounts of material, or non-dissolved particles, into its cytoplasm from the outside environment

**phagocytosis:** a type of endocytosis in which a cell uses pseudopods to move non-dissolved solid particles into its cytoplasm from the outside environment

To watch a video of endocytosis,

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**Figure 1** The cell membrane extends around large particles, or large amounts of material, that need to be ingested into the cell.

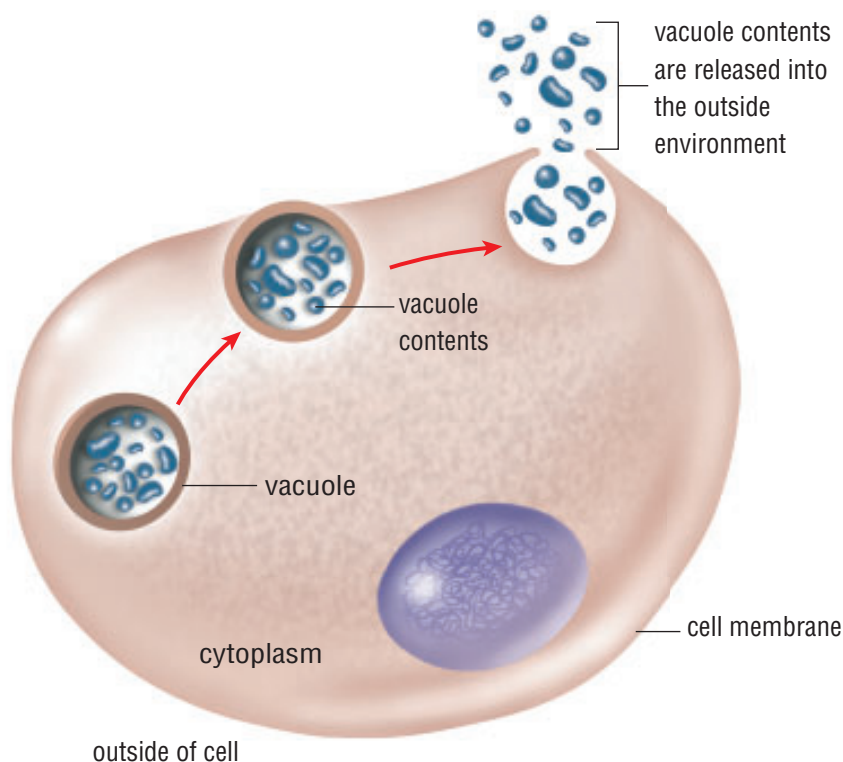
## Exocytosis

A cell may also need to move non-dissolved particles, or large amounts of material, from its cytoplasm to the outside environment. It does this using a process called exocytosis. **Exocytosis** is essentially the reverse of endocytosis. Recall that in addition to storing nutrients and water, vacuoles store wastes. In exocytosis, a vacuole containing wastes (or other materials) fuses with the cell membrane and releases its contents into the outside environment (Figure 2).

**exocytosis:** the process by which large amounts of material, or large non-dissolved particles, are moved from a cell's cytoplasm to the outside environment

To watch an animation of exocytosis,

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**Figure 2** When objects are too large to move through the cell membrane by diffusion, a cell can use exocytosis to move materials out of its cytoplasm.

Exocytosis also plays a role in other important biological processes. For example, cells in your body release helpful chemicals into your bloodstream using exocytosis. In many cases, the chemicals are proteins that travel through the bloodstream to other cells of the body. The proteins are packaged by the Golgi apparatus. Proteins are then released into the outside environment by exocytosis for transport to other cells within your body.

### LINKING TO LITERACY

#### Pausing and Reflecting

Effective readers pause and reflect on their understanding at different points throughout the text. As you read, pause and reflect by thinking aloud after definitions of bolded words, graphics, and each section of the text.



### CHECK YOUR LEARNING

1. Give two examples of situations where a cell might use
  - (a) phagocytosis
  - (b) exocytosis
2. A cell encounters a large piece of food. Use a simple diagram to show how it might move the food particles into the cell cytoplasm. Include labels in your diagram.
3. What is exocytosis? Explain using a diagram.