

Cellular Structure and Function

section 2 The Plasma Membrane

MAIN Idea

A cell's plasma membrane helps maintain homeostasis.

What You'll Learn

- how the cell's plasma membrane functions
- the role of proteins, carbohydrates, and cholesterol in the plasma membrane

Before You Read

A window screen in your home allows air to pass through while keeping insects out. In this section, you will learn about a cell structure that has the same basic function. On the lines below, list some things you think would be allowed to pass into a cell and some things that would be kept out.

Mark the Text

Make Flash Cards Make a flash card for each question heading in this section. On the back of the flash card, write the answer to the question. Use the flash cards to review what you have learned.

Picture This

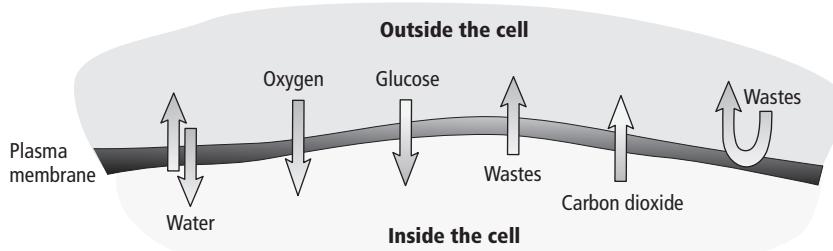
1. **Highlight** the items in the figure that enter the cell through the plasma membrane. Circle the items that exit the cell.

Read to Learn

Function of the Plasma Membrane

A cell's survival depends on maintaining balance, called homeostasis. The plasma membrane is the cell structure primarily responsible for homeostasis. It is the thin, flexible boundary between the cell and its watery environment. Nutrients enter the cell and wastes leave the cell through the plasma membrane.

Selective permeability (pur mee uh BIH luh tee) of the plasma membrane allows some substances to pass through while keeping others out. The figure below shows selective permeability of the cell's plasma membrane. The arrows show common substances that enter and leave the cell. The plasma membrane controls how, when, and how much of these substances enter and leave the cells.



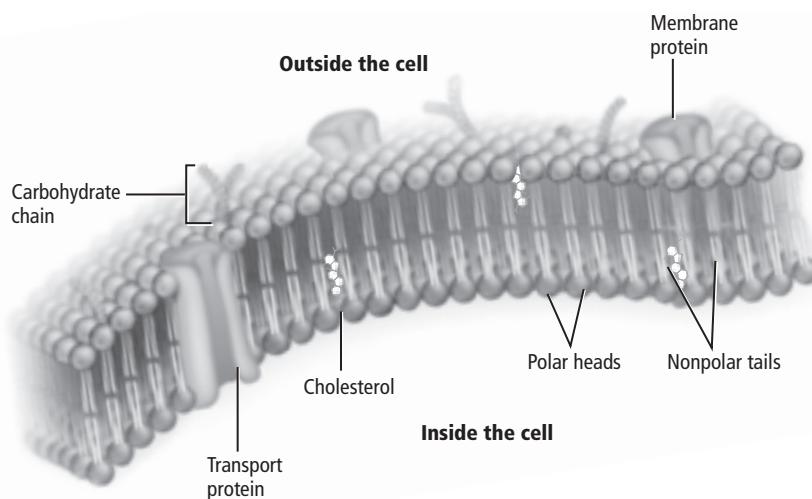
Structure of the Plasma Membrane

You have learned that lipids are large molecules made up of glycerol and three fatty acids. A phospholipid (fahs foh LIH pid) is made up of glycerol, two fatty acids, and a phosphate group. The plasma membrane is made up of two layers of phospholipids arranged tail-to-tail in what is called a **phospholipid bilayer**. The phospholipid bilayer allows the plasma membrane to survive and function in its watery environment. 

What is the structure of the phospholipid bilayer?

Each phospholipid has a polar head and two nonpolar tails. The phosphate group in the phospholipid makes it polar. The polar head is attracted to water because water is also polar. The nonpolar tails, made of the fatty acids, are repelled by water.

The phospholipid bilayer is arranged so that the polar heads can be closest to the water that is inside and outside the cell. Likewise, the nonpolar tails are farthest from the water because they are inside the phospholipid bilayer, as shown in the figure below. This bilayer structure is important for the formation and function of the plasma membrane.



How does the phospholipid bilayer function?

The phospholipid bilayer forms a barrier that is polar on the surface and nonpolar in the middle. Substances that can dissolve in water will not pass through the plasma membrane because they are stopped by the nonpolar middle. This allows the plasma membrane to separate the environment inside the cell from the environment outside the cell.

Reading Check

2. Explain the purpose of the phospholipid bilayer.

Picture This

3. Identify Circle one phospholipid. Label its head and tails.

What else is found in the plasma membrane?

Cholesterol, proteins, and carbohydrates move among the phospholipids in the plasma membrane. Proteins are found on both the inner surface and the outer surface of the plasma membrane. Proteins on the outer surface are called receptors because they send signals to the inside of the cell. Proteins on the inner surface anchor the plasma membrane to the cell's internal support structure. These proteins give the cell its shape.

What are transport proteins?

Proteins also create tunnels through the plasma membrane. These proteins, known as **transport proteins**, move needed substances or waste materials through the plasma membrane. Transport proteins contribute to the selective permeability of the plasma membrane.

Reading Check

4. **Define** the role of transport proteins.

How does cholesterol help cells?

Cholesterol molecules are nonpolar. They move among the tails of the phospholipids. Cholesterol helps prevent the fatty-acid tails from sticking together, keeping the plasma membrane fluid. Cholesterol also helps maintain homeostasis in a cell.

What substances help identify chemical signals?

Carbohydrates and proteins might stick out from the plasma membrane. They help the cell identify chemical signals from the environment. For example, carbohydrates in the plasma membrane might help disease-fighting cells identify and attack a potentially harmful cell.

What is the fluid mosaic model?

All the components of the plasma membrane are in constant motion. Phospholipids can move sideways within the plasma membrane. Proteins, carbohydrates, and cholesterol molecules move among the phospholipids.

The phospholipid bilayer creates a sea in which all the other molecules float. As the individual molecules move around, a pattern, or mosaic, is formed on the surface of the plasma membrane. This organization of the plasma membrane is called the **fluid mosaic model**. It is fluid because the molecules are moving and being rearranged. It is called a mosaic because scientists can observe clear patterns on the surface of the plasma membrane.

Reading Check

5. **Name** three substances that move among the phospholipids of the plasma membrane.
