Active Transport, Endocytosis & Exocytosis

The cell membrane encloses the cell, forming a barrier that separates the interior and the exterior environments. The membrane may be relatively permeable or impermeable, prohibiting the passage of most molecules. It can also be selectively permeable, allowing certain substances to pass, but not others. We have discussed passive transport methods that do not require energy: diffusion, osmosis and facilitated diffusion. Now we will discuss active transport methods, requiring energy.

The process of active transport requires energy because the molecules being moved are travelling from a region of low concentration to a region of high concentration. That is, they are being transported against their concentration gradient.

ACTIVE TRANSPORT

The first process is called active transport. Within the cell, the number of molecules (amino acids for example) is higher than on the outside. The amino acids will need to move against the concentration gradient to get into the cell. Special proteins in the cell membrane called transport proteins assist these amino acids. The amino acid is enclosed within the transport protein while an ATP molecule (energy) supplies energy and is consumed during this transportation. The amino acid is moved in to the cell’s interior.

Active Transport Examples: Movement of Na\(^+\) out of cells and K\(^+\) ions in to cells through sodium-potassium pumps, the uptake of glucose in the intestines in humans and the uptake of mineral ions into root hair cells of plants.

Answer these questions in your notebook:

1. In what directions do molecules move in active transport?
2. What does it mean to move against a concentration gradient?
3. What form of energy is used by the cell during active transport?
**ENDOCYTOSIS**

Larger molecules such as polypeptides, polysaccharides and DNA are too large to be transported into the cell by carrier proteins so they must be endocytosed. Particles suspended in extracellular fluid are incorporated by the membrane through inward folding. A bubble is formed around the molecule and eventually pinches off as a vesicle. The vesicle is broken down by enzymes from lysosomes and digested by the cell.

**Endocytosis Examples:** There are two types of endocytosis: phagocytosis-taking in particular matter for digestion such as white blood cells for engulfing and destroying bacteria and pinocytosis-taking in nutrients.

**EXOCYTOSIS**

Exocytosis is the process in which the contents of an intracellular vesicle are secreted out of the cell membrane and into the extracellular space. The vesicle moves to the cell’s surface and fuses with the cell membrane. Nerve cells release neurotransmitters through exocytosis.

**Exocytosis examples:** secretion of waste, enzymes or release of proteins

**Answer these questions in your notebook:**

1. When a molecule is too large to be transported into a cell through a transport protein, what happens?
2. What is a vesicle? How are vesicles broken down?
3. What is phagocytosis? Give an example.
4. What is pinocytosis? Give an example.
5. Which direction are contents of the vesicle moving during exocytosis (into or out of the cell)?