Tikrit University
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Transporter system across the cell membrane

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Transporter system across the cell membrane:

1. Passive Transport Across the Cell Membrane

Passive transport describes the movement of substances down a concentration gradient and does not require energy use.

•Bulk flow is the collective movement of substances in the same direction in response to a force, such as pressure. Blood moving through a vessel is an example of bulk flow.

•Simple diffusion, or diffusion, is the net movement of substances from an area of higher concentration to an area of lower concentration. This movement occurs as a result of the random and constant motion characteristic of all molecules, (atoms or ions) and is independent from the motion of other molecules.

•Facilitated diffusion is the diffusion of solutes through channel proteins in the plasma membrane. Water can pass freely through the plasma membrane without the aid of specialized proteins (though facilitated by aquaporins.(

•Osmosis is the diffusion of water molecules across a selectively permeable membrane. When water moves into a body by osmosis, hydrostatic pressure or osmotic pressure may build up inside the body.

• Active Transport Across the Cell Membrane

Active transport is the movement of solutes against a gradient and requires the expenditure of energy, usually in the form of ATP. Active transport is achieved through one of these two mechanisms:

Protein Pumps

•Transport proteins in the plasma membrane transfer solutes such as small ions (Na+, K+, Cl-, H+), amino acids, and monosaccharides.

•The proteins involved with active transport are also known as ion pumps.

•The protein binds to a molecule of the substance to be transported on one side of the membrane, then it uses the released energy (ATP) to change its shape, and releases it on the other side.

•The protein pumps are specific, there is a different pump for each molecule to be transported.

•Protein pumps are catalysts in the splitting of ATP , ADP + phosphate, so they are called ATPase enzymes.

•The sodium-potassium pump (also called the Na+/K+-ATPase enzyme) actively moves sodium out of the cell and potassium into the cell. These pumps are found in the membrane of virtually every cell, and are essential in transmission of nerve impulses and in muscular contractions.

Vesicular Transport

•Vesicles or other bodies in the cytoplasm move macromolecules or large particles across the plasma membrane. Types of vesicular transport include:

1. Exocytosis, which describes the process of vesicles fusing with the plasma membrane and releasing their contents to the outside of the cell. This process is common when a cell produces substances for export.

2. Endocytosis, which describes the capture of a substance outside the cell when the plasma membrane merges to engulf it. The substance subsequently enters the cytoplasm enclosed in a vesicle

There are three 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. When the channel is closed, the liquid is encircled within a pinocytic vesicle.

•**Receptor-mediated endocytosis** occurs when specific molecules in the fluid surrounding the cell bind to specialized receptors in the plasma membrane. As in pinocytosis, the plasma membrane folds inward and the formation of a vesicle follows.

Cell Metabolism

Cell metabolism is the total energy released and consumed by a cell. Metabolism describes all of the chemical reactions that are happening in the body. Some reactions, called anabolic reactions, create needed products. Other reactions, called catabolic reactions, break down products. Your body is performing both anabolic and catabolic reactions at the same time and around the clock, twenty four hours a day, to keep your body alive and functioning. Even while you sleep, your cells are busy metabolizing.

•**Catabolism**: The energy releasing process in which a chemical or food is used (broken down) by degradation or decomposition, into smaller pieces.

•**Anabolism**: Anabolism is just the opposite of catabolism. In this portion of metabolism, the cell consumes energy to produce larger molecules via smaller ones.

Cell Building Blocks

What major classes of molecules are found within cells?

Lipids

The term is more-specifically used to refer to fatty-acids and their derivatives (including tri-, di-, and mono-glycerides and phospholipids) as well as other fat-soluble sterol-containing metabolites such as cholesterol. Lipids serve many functions in living organisms including energy storage, serve as structural components of cell membranes, and constitute important signaling molecules.

Carbohydrates

Carbohydrates are chemical compounds that contain oxygen, hydrogen, and carbon atoms, and no other elements. They consist of monosaccharide sugars of varying chain lengths.

Certain carbohydrates are an important storage and transport form of energy in most organisms, including plants and animals. Carbohydrates are classified by their number of sugar units: monosaccharides (such as glucose and fructose), disaccharides (such as sucrose and lactose),

oligosaccharides, and polysaccharides (such as starch, glycogen, and cellulose).

Proteins

All proteins contain carbon, hydrogen, oxygen and nitrogen. Some also contain phosphorus and sulfur. The building blocks of proteins are amino acids. There are 20 different kinds of amino acids used by the human body. They unite by peptide bonds to form long molecules called polypeptides. Polypeptides are assembled into proteins.

Enzymes

A biological molecule that catalyzes a chemical reaction, Enzymes are essential for life because most chemical reactions in living cells would occur too slowly or would lead to different products without enzymes. Most enzymes are proteins and the word "enzyme" is often used to mean a protein enzyme. Some RNA molecules also have a catalytic activity, and to differentiate them from protein enzymes, they are referred to as RNA enzymes or ribozymes.