Transport Proteins Encyclopedia Article

Transport Proteins

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Transport Proteins

Transport **proteins** are proteins that aid the movement of materials, either across **plasma** membranes in cells or through the circulatory system. Some transport proteins form channels through the membrane to allow passive flow of a substance down its **concentration** gradient. Others act as carriers, binding to a substance on one side of the membrane or in one region of the body, and releasing it on the other side or in another region. Some carrier proteins simply allow a material to move down its concentration gradient, equalizing concentrations of the material across the membrane. Others use **energy** to function, and act to create concentration gradients.

The chloride channel is an example of a channel protein. This protein allows the movement of chloride ions from one side of the membrane to the other. Movement of chloride ions often occurs when the cell deliberately transports positive ions, such as **sodium** or **potassium**. The chloride ions move in response to changes in charge within the cell, and allows the cell to minimize charge build- up.

The Na^+/K^+ ATPase uses cell energy, in the form of adenosine triphosphate (ATP), to move sodium ions into the cell, and potassium ions out. This allows the cell to create concentration gradients across the membrane for these two ions. These gradients can be used for a variety of purposes. Neurons (nerve cells) use these gradients for transmitting nerve signals down their length. In the resting state, the gradients are built up and maintained. When the nerve cell is stimulated, channel proteins open to allow the gradients to decay. This wave of gradient breakdown is called depolarization, and is the chemical change that underlies the functioning of the nervous system.

The sodium-glucose antiport is a passive co-transporter, meaning it moves sodium and glucose in opposite directions across the membrane without directly using ATP. It employs the sodium gradient built up by the Na^+/K^+ ATPase to drive glucose transport into the cell, against its concentration gradient.

The circulatory system also employs transport proteins. Hemoglobin is an **oxygen** transporter. Packed into red blood cells, it picks up oxygen in the lungs, and deposits it in the tissues. Hemoglobin allows the blood to carry much more oxygen than would dissolve in the blood plasma. HDL and LDL (high and low-density lipoprotein) are **cholesterol** transporters within the blood plasma. These transporters allow the otherwise insoluble cholesterol to be dissolved in the plasma.