Difference Between Symport and Antiport

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Key Difference - Symport vs Antiport

The cell membrane is a selectively permeable membrane which separates the cell from the external environment. It acts as a barrier for many molecules and regulates the molecules which pass across the membrane. The concentration of the molecules inside and outside the cell membrane differs widely. Some molecules are passively transported across the membrane along the concentration gradient without consuming energy. However, certain molecules and ions are transported across the cell membrane from a region of low concentration to a region of high concentration against the concentration gradient. It requires an energy input, and it is powered by the chemical breakdown of ATP to ADP. Secondary active transport is the transport of molecules across the cell membrane, using energy in other forms than ATP. During secondary active transport, molecules are transported due to an electrochemical gradient generated by moving another molecule across the membrane along with the molecule of interest. Symport and antiport are two types of proteins involved in secondary active transport. The key difference between symport and antiport is that **in symport, two molecules or ions are transported in the same direction across the membrane** while **in antiport, two molecules or ions are transported in opposite directions across the membrane.**

What is a Symport?

There are transmembrane proteins in the cell membrane to facilitate membrane transportation. These proteins span across the lipid bilayer of the membrane and function as gateways to permit the transport of specific substances across the membrane. Symport is a type of transmembrane protein involved in secondary active transport. Transporting two type molecules or ions in the same direction at once across the membrane is a specialty of the symporter. Small molecules such as sugar, Na^+ are transported across the membrane by symporters in the membrane. Sugar molecules move from a low concentration to a high concentration due to symport proteins. Sugar molecules are cotransported with sodium ions or protons.

In symporter, one molecule moves down along the electrochemical gradient while the second type of molecule moves against the concentration gradient.

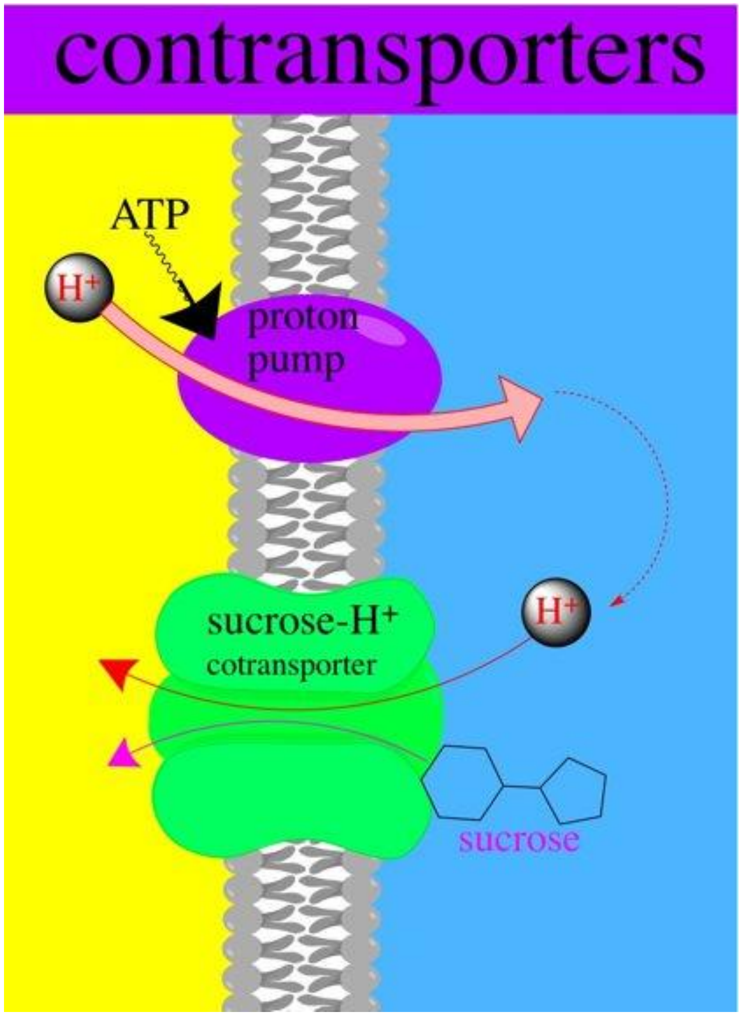

Figure 01: Symporter

What is an Antiport?

Antiport molecules or Antiporter is a transmembrane protein in the cell membrane. It is involved in the secondary active transport of molecules across the cell membrane. Antiport proteins are able to cotransport two different molecules or ions across the membrane in opposite directions at once. When one molecule enters the cell, the other molecule exits the cell. Hence, antiporters are also known as **exchangers** or **counter transporters** as well. There are many different antiporters located in the cell membrane.

HCl is secreted into the lumen in the stomach by an anion transport protein which is an antiporter that transports HCO_3^- and Cl^- in opposite directions. Sodium potassium pump is another antiporter in the membrane. It helps in maintaining a low concentration of sodium ions inside the cell. When the sugar concentration of the cell is low, it is required to uptake sugar molecules inside. For that, sodium ion concentration should be maintained at a low concentration inside the cell in order to generate an electrochemical gradient. Hence, sodium ions are co-transported with potassium ions by the sodium potassium antiport system. Sodium calcium exchanger is another antiporter located in the cell membrane. Calcium ions are removed from the cell by this antiporter while allowing sodium ions to enter the cell.

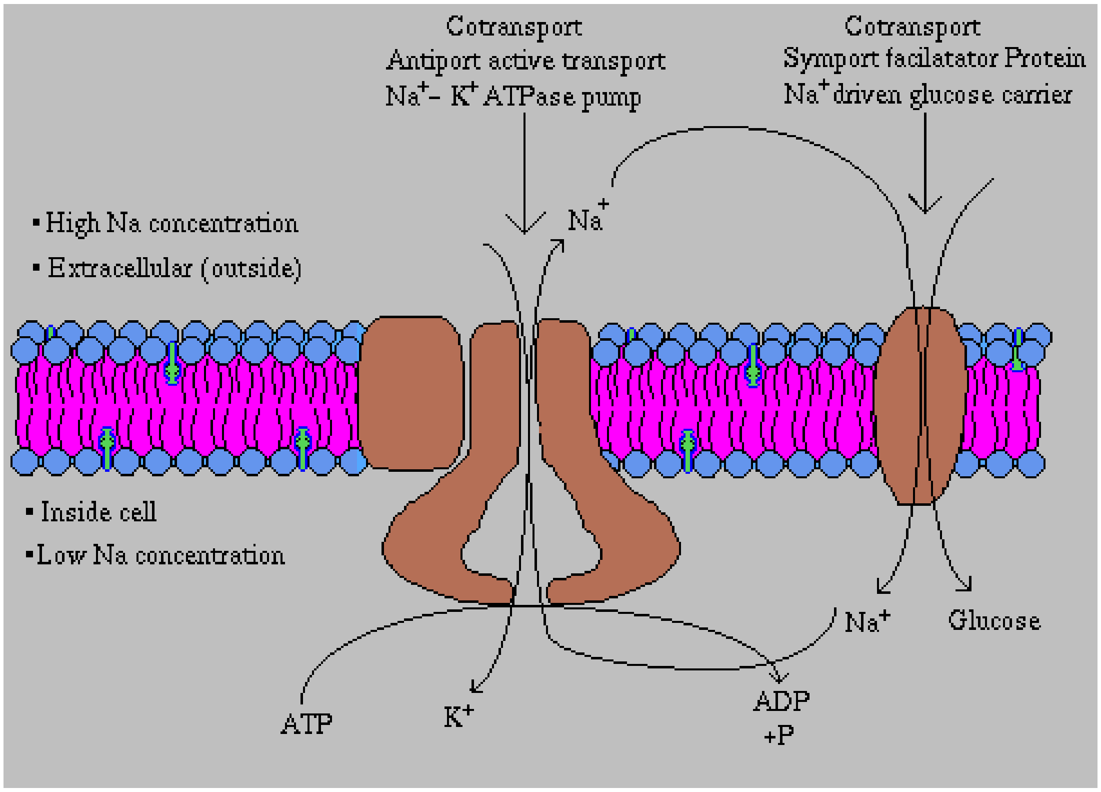

Figure 02: Sodium Potassium Antiporter and Sodium Glucose Symporter

What are the similarities between Symport and Antiport?

- Symporter and antiporter are integral membrane protein
- Both proteins transport molecules and ions across the cell membrane.
- Both types are involved in secondary active transport.
- Both proteins span across the entire cell membrane.

What is the difference between Symport and Antiport?

Symport vs Antiport	
Symport is a transmembrane protein molecule in the cell membrane which transports two types of molecules or ions in the same direction across the membrane.	Antiport is a transmembrane protein in the cell membrane which transports two types of molecules or ions in opposite directions across the membrane.
Molecules Direction	
In symport system, two molecules move in the same direction.	In antiport system, two molecules move in opposite directions.
Examples	
Examples of symport systems include sodium sugar pump and hydrogen sugar pump.	Examples of antiport systems include sodium potassium pump, sodium calcium exchanger, bicarbonate chloride pump, sodium hydrogen antiporter, etc.

Summary - Symport vs Antiport

Molecules and ions are transported across the cell membrane through several mechanisms. Passive diffusion, facilitated diffusion, active transport and secondary active transport are different types among them. Membrane transport is facilitated by different proteins associated with the cell membrane. Symporters and antiporters are two types of transmembrane proteins involved in secondary active transport. Symporters simultaneously transport two different molecules in the same direction across the cell membrane. Antiporters simultaneously transport two different molecules in opposite directions across the cell membrane. This is the difference between symport and antiport.

References:

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2. "Symporter." Wikipedia. Wikimedia Foundation, 19 Apr. 2017. Web. Available here. 23 June 2017.

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