RAMA UNIVERSITY

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FACULTY OF ENGINEERING &TECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

Group Translocation

Group translocation is a distinct type of active transport, using energy from an energy-rich organic compound that is not ATP.

A mechanism utilized by bacteria to transport a compound into their cell by first allowing the compound to bind with protein on the cell surface followed by altering its chemical structure during its passage across the membrane.

Two pathways for group translocation

phosphotransferase system: A distinct method used by bacteria for sugar uptake where the source of energy is from phosphoenolpyruvate (PEP).

Tat pathway: A protein export or secretion pathway found in plants, bacteria, and archaea.

Phosphotransferase system

Phosphoenolpyruvate: sugar phosphotransferase system (PTS), which uses energy from the high-energy molecule **phosphoenolpyruvate (PEP)** to transport sugars into the cell.

A phosphate is transferred from the PEP to the incoming sugar during the process of transportation.

The phosphotransferase system is involved in transporting many sugars into bacteria, including glucose, mannose, fructose and cellobiose.

PTS sugars can differ between bacterial groups, mirroring the most suitable carbon sources available in the environment every group evolved.

In *Escherichia coli*, there are 21 different transporters (i.e. IIC proteins, sometimes fused to IIA and/or IIB proteins) which determine import specificity. Of these, 7 belong to the fructose (Fru) family, 7 belong to the glucose (Glc) family, and 7 belong to the other PTS permease families.

Mechanism

The actual carrier in the membrane is a protein channel fairly specific for glucose.

Glucose specifically enters the channel from the outside, but in order to exit into the cytoplasm, it must first be phosphorylated by the phosphotransferase system.

The PTS derives energy from the metabolic intermediate phosphoenol pyruvate (PEP).

PEP is hydrolyzed to pyruvate and glucose is phosphorylated to form glucose-phosphate during the process.

Thus, by the expenditure of a single molecule of high energy phosphate, glucose is transported and changed to glucose-phosphate.