

PROTEIN TRAFFICKING

Q.What is protein trafficking?

A special type of protein transferring process where golgi apparatus is involved in the sorting and trafficking of proteins produced within a cell. Proteins translated within the rough endoplasmic reticulum are transferred to the Golgi. From there they are modified and **packaged** into vesicles for distribution. Proteins can be targeted to the inner space of an organelle, different intracellular membranes, plasma membrane, or to exterior of the cell via secretion. This delivery process is carried out based on information contained in the protein itself. Correct sorting is crucial for the cell; errors can lead to diseases.

Q.What do you mean by carrier proteins?

Carrier proteins are proteins *involved in the movement of ions, small molecules, or macromolecules, such as another protein, across a biological membrane.* Carrier proteins are **integral membrane proteins**; that is, they exist within and span the membrane across which *they transport substances.*

The proteins may assist in the movement of substances by facilitated diffusion (i.e., **passive transport**) or active transport. These mechanisms of movement are known as carrier-mediated transport. Each carrier protein is **designed to recognize** only one substance or one group of very similar substances.

Q.How carrier proteins take part in protein trafficking?

Carrier proteins are used to transport proteins across cellular membranes such as the *plasma membrane, endoplasmic reticulum and nuclear envelope.* Proteins are also **trafficked** between membrane-bound organelles inside membrane vesicles.

A transport protein (variously referred to as a transmembrane pump, transporter, escort protein, acid transport protein, cation transport protein, or anion transport protein) is a protein that serves the function of moving other materials within an organism. Transport proteins are **vital to the growth and life** of all living things. There are several different kinds of transport proteins.

A vesicular transport protein is a transmembrane or membrane associated protein. It regulates or facilitates the movement by vesicles of the contents of the cell.

Q.What is TGN?

Proteins in the secretory pathway that are destined from compartments other than the ER or golgi eventually reach a complex network of membranes and vesicles termed the **trans golgi network (TGN).**

Q.Illustrate the major route for protein trafficking in the secretory pathway.

- i) Once newly synthesized proteins are incorporated into the ER lumen or membrane, they can be packaged into **anterograde** (forward-moving) transport vesicles. These vesicles fuse with each other to form a flattened membrane-bounded compartment as the cis-golgi **cistern**.
- ii) Certain proteins mainly ER-localized proteins, are retrieved from the cis-golgi to the ER via a different set of **retrograde** (backward-moving) transport vesicles.
- iii) A new cis-golgi cistern with its cargo of proteins moves from the cis position (nearest the ER) to the trans position (farthest from the ER) successively becoming first a medial-Golgi cistern and then a trans-golgi cistern.
- iv) This process known as **cisternal progression**. During this progression enzymes and other golgi-resident proteins are constantly being retrieved from later to earlier golgi cisternae by retrograde transport vesicles, thereby returning to the cis-medial or trans-golgi cisternae. (**Figure1**)

Q.Make a brief note on protein sorting prior to trafficking.