CSIR NET Life Science Unit 2

Protein Glycosylation

Glycosylation is an important modification to eukaryotic proteins because the added sugar residues are often used as molecular flags or recognition signals to other cells than come in contact with them.

N- linked glycosylation is the attachment of a sugar molecule to a nitrogen atom in an amino acid residue in a protein.

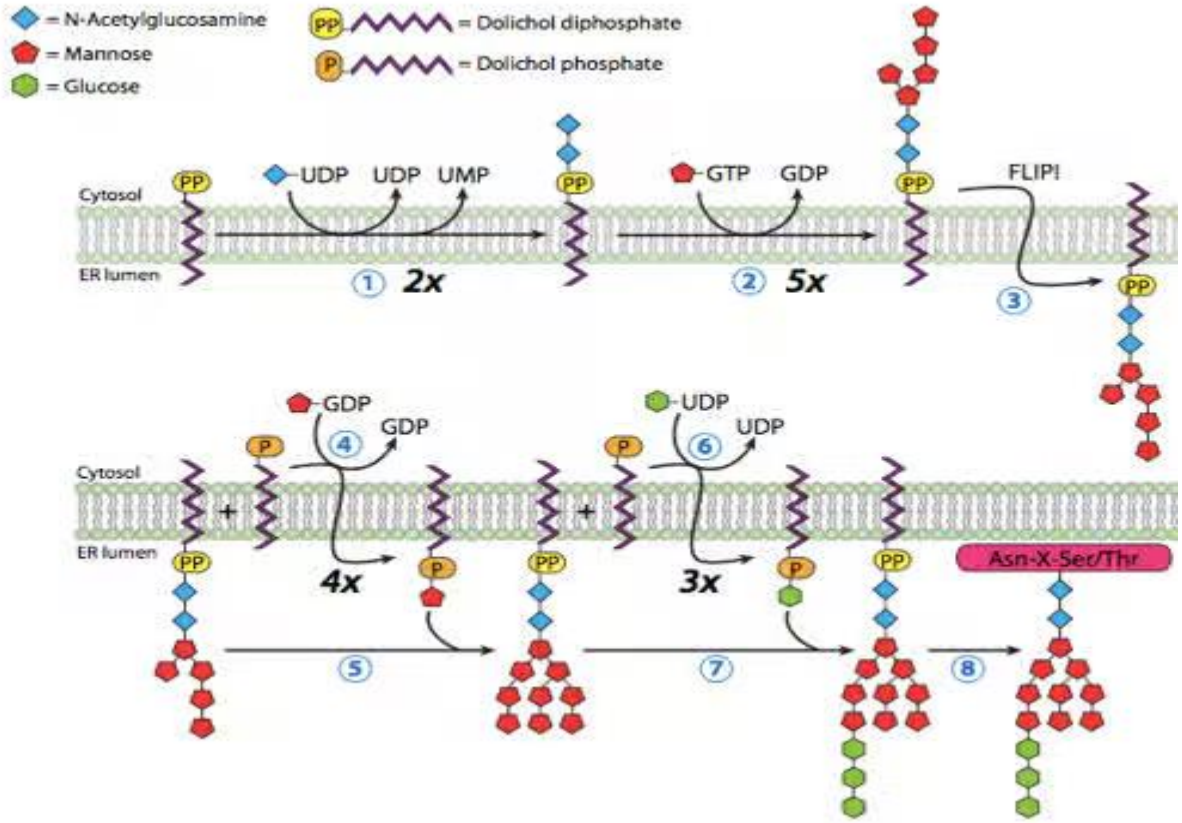
- In the rough endoplasmic reticulum, this process involves the addition of a large preformed oligosaccharide precursor to a protein.
- This precursor oligosaccharide is linked by a pyrophosphoryl residue to dolichol, a long-chain polyisoprenoid lipid that is firmly embedded in the rough endoplasmic reticulum membrane and acts as a carrier for the oligosaccharide.
- The structure of N-linked oligosaccharide is the same in plants, animals and single-celled eukaryotic a branched oligosaccharide containing three glucose, 9 mannose and 2 N- acetylglucosamine molecules which are written as Glc3-Man9-GlcNAc2.

There are two types of protein glycosylation, both of which require the import of the target polypeptide into the Endoplasmic reticulum.

N-linked glycosylation actually begins in the endoplasmic reticulum.

Therefore, it is also the case that N-linked glycosylation can (and is) usually beginning as a co-translational mechanism.

- N-linked glycosylation occurs on asparagine (N) residues within an N-X-S or N-X-T sequence (X is any amino acid other than P or D) (2) N-linked glycosylation begins with a “tree” of 14 specific sugar residues that is then pruned and remodeled, but remains fairly large,
- Technically, N-glycosylation begins before a protein is even being translated, as the dolichol pyrophosphate oligosaccharide (i.e. the sugar “tree” - not an official term, by the way) is synthesized in the ER without being triggered by translation or protein entry.


= N-Acetylglucosamine
= Mannose
= Glucose
= Dolichol diphosphate
= Dolichol phosphate
Cytosol
ER lumen
UDP
UDP
UMP
1
2x
GTP
GDP
2
5x
FLIP!
3
GDP
GDP
4
4x
UDP
UDP
6
3x
5
7
8
Asn-X-Ser/Thr