

## 7.013 Recitation 11 - 2013

### Summary of Lectures 18:

**Protein Trafficking and Localization:** The proteins undergo different types of post-translational modification i.e. cleavage of signal peptide, glycosylation (addition of carbohydrate moiety that occurs in golgi bodies), phosphorylation (addition of phosphate group) and lipid addition. Each protein contains an inherent signal sequence that serves as a zip code for the translocation of a protein to its specific destination. Proteins going to the specific organelles have a short stretch of amino acids that allows them to bind to docking protein receptors present on the membranes of appropriate organelles (i.e. nuclear localization signal for nuclear proteins). The proteins in the cytosol have no signal sequence. The transmembrane proteins have a stretch of 15- 20 hydrophobic amino acids as their signal sequence. This signal sequence is bound by a signal recognition particle (SRP), the SRP aids in the docking of the nascent polypeptide to the ER receptor. The signal sequence then enters the ER lumen by passing through a channel in the receptor. The signal sequence is then removed and the protein synthesis once again resumes. The protein is transported to the membrane via ER, golgi body and vesicles that fuse with membrane. Protein localization can be determined by techniques such as fluorescence imaging or by creating a fluorescent protein.

### **Questions**

1. You are interested in four different proteins in a yeast cell: protein 1 is a cytosolic protein, protein 2 is a secreted protein, protein 3 is a nuclear protein and protein 4 is a transmembrane protein. You plan to study how the proteins are localized to their specific destination by creating the following mutations in the genes encoding proteins 1-4.

- i. Mutation A inactivates the SRP (signal recognition particle). Indicate how the localization of each protein (1-4) will be affected by this mutation. In addition, state whether each protein will function as it does in a wild-type cell.
- ii. Mutation B removes the signal sequence from protein 2. Indicate how the localization of each protein (1-4) will be affected by this mutation. In addition, state whether each protein will function as it does in a wild-type cell.
- iii. Mutation C removes the signal sequence from protein 4. Indicate how the localization of each protein (1-4) will be affected by this mutation. In addition state whether each protein will function as it does in a wild-type cell.
- iv. Mutation D prevents the fusion of vesicles to the golgi body membrane. Indicate how the localization of each protein (1-4) will be affected by this mutation. In addition, state whether each protein will function as it does in a wild-type cell.

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