Translation of membrane and excretory proteins

Targeting

- **Sending new proteins to their destination.**
- The basic orientation of polypeptides is determined by their place of synthesis on free ribosomes in the cytosol or on ribosomes in the GER:
  - free ribosomes – remain in the cytosol
  - GER ribosomes – secreted from the cell, possibly directed to GK, lysosomes or are incorporated as integral proteins into membranes
- The direction of polypeptides is determined by a sequence of about 75 bases at the 5' end of mRNA = the so-called **topogenic sequence**.
- The basic direction of protein transport is: cytosol – GER – transport vesicles – GK – secretory vesicles – exocytosis.
- Proteins intended for secretion have a so-called **leader sequence [16–30 AMK]** at the beginning of translation - made up of hydrophobic AMKs with a positive charge (Phe, Leu, Ser, etc.).
- Translation of excretory proteins is initiated by the binding of mRNA to the ribosome in the cytosol.
- Translation is stopped after about 70 AMK and SRP (Signal Recognition Particle) binds to the leading sequence of the nascent polypeptide and this entire complex binds to the SRP receptor on the GER.
- The leader sequence enters the GER membrane where it is bound by a specific SSB protein.
- Transmembrane proteins create a transmembrane channel around the polypeptide, protein translation continues, SRP and the SRP receptor are released from binding by the energy of GTP.
- The so-called **Bip protein** (binding) binds to the nascent protein in the lumen of the GER, which prevents premature degradation of the nascent polypeptide and, together with other proteins, moves the translated linear polypeptide through the channel into the GER.
- In the absence of Bip, elongation is blocked.
- The leading sequence is cleaved by signal peptidase and degraded, the emerging polypeptide is immediately modified (glycosylation) and conformed in the GER.
- Only after the completion of post-translational modifications does the C-terminus of the protein pass through the channel and the transmembrane channel disintegrates.
- Mutation truncated or mismodified polypeptide is degraded in GER.
- Newly synthesized proteins are transported to GK by transport vesicles, to the cell membrane by transport and secretion vesicles.

Transmembrane proteins

- Functions of receptors, transmembrane channels, surface antigens.
- They are synthesized in GER, released and transported to membranes.
- Their incorporation and anchoring is enabled by the anchoring topogenic sequence, creates an α-helix and anchors the protein in the phospholipid bilayer.
- **Transmembrane proteins thus have 2 signal sequences - leader and anchor**
  - the leading sequence becomes part of the GER membrane and fixes the nascent protein in the membrane;
  - the location of the sequences on the polypeptide determines the length of the extra- and intracellular part of the protein.

Links

Related Articles

- Translation
- Cell production system

Source

- ŠTEFÁNEK, Jiří. *Medicína, nemoci, studium na 1. LF UK* [online]. [cit. 11/02/2010]. <http://www.stefajir.cz>.