

BIO 104

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Stages of Translation (Polypeptide Synthesis)

Initiation

- 1) Proteins called **initiation factors** bind to an aminoacyl-tRNA carrying methionine. This **initiation complex** facilitates the binding of mRNA to the small ribosomal subunit. When the subunit and the complex recognize the mRNA start codon (AUG), the aminoacyl-tRNA anticodon pairs with that codon.
- 2) The aminoacyl-tRNA binds to the “P” (for peptide) site of the large ribosomal subunit, uniting all the components needed for translation.

Polypeptide Elongation

- 1) Proteins called **elongation factors** facilitate binding of the next aminoacyl-tRNA to the “A” (for amino acid) site of the ribosome. Only an aminoacyl-tRNA carrying the anticodon for the next mRNA codon, and the amino acid specified by that codon, can bind there.
- 2) A ribozyme catalyzes formation of a bond between the amino acid at the “P” site and the amino acid at the “A” site. This results in a chain of amino acids attached to the tRNA at the “A” site, and leaves the tRNA at the “P” site “unloaded.”
- 3) The ribosome moves three nucleotides along the mRNA in the 5’ to 3’ direction, to the next codon. This releases the unloaded tRNA from the “P” site of the ribosome and **translocates** the tRNA from the “A” site to the “P” site. Accordingly, this movement is referred to as **translocation**. The “A” site is now available for another aminoacyl-tRNA.
- 4) Elongation repeats as specified by the mRNA instructions.

Termination

- 1) Elongation ends when the ribosome reaches a stop codon.
- 2) An enzyme called a **release factor** binds there.
- 3) This catalyzes cleavage of the bond between the last tRNA and the polypeptide, releasing them from the ribosome.
- 4) The ribosome dissociates into its subunits and the mRNA molecule is released.
- 5) All components are free to begin the process again.