EUKARYOTIC TRANSLATION

Eukaryotic translation occurs in the cytoplasm where ribosomes are located. It begins with the activation of tRNA wherein aminoacyl synthetase combines an amino acid to tRNA using ATP producing an aminoacyl-tRNA, a charged tRNA. Initiation then begins when the initiator tRNA, which usually carries methionine, is recruited to the small ribosomal subunit and forms a complex with eIF2. This complex recognizes the mRNA's 5′ cap end, and tracks along the strand in a 5′ to 3′ direction searching for the AUG start codon. Afterwards, elongation proceeds as the methionine-carrying tRNA occupies the P (peptidyl) site of the ribosome. eEF-1B recharges eEF-1A to bring the next charged tRNA, whose anticodon is a complementary for the exposed codon, to the A (aminoacyl) site. A peptide bond is then formed between the amino acids in the P site which is catalyzed by peptidyl transferase. After the bond is formed, the first amino acid is detached from its tRNA, and the ribosome is translocated as facilitated by eEF-2. The first tRNA is moved to the E (exit) site and is released from the ribosomal complex to be recharged with free amino acids again. The second tRNA is moved to the P site, and another peptide bond is formed, while eEF-1A brings a new charged tRNA to the A site, continuing the cycle. Termination follows when a stop codon (UAA, UAG, or UGA) in mRNA enters the A site, and is recognized by release factors. RF1 for UAG and UAA; RF2 for UGA and UAA; while RF3 stimulates their actions. The RF attaches to the last tRNA and hydrolyzes the ester linkage between tRNA and the last amino acid, releasing the polypeptide chain. The polypeptide chain then undergoes post-translational modification such as N- or C-terminal trimming, oxidation of cysteine residues and incorporation of coenzymes.