جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم

قسم الانظمة الطبية الذكية

Molecular Biology

Lecture: (5)

First Stage

Post- transcriptional Regulation (Modification)

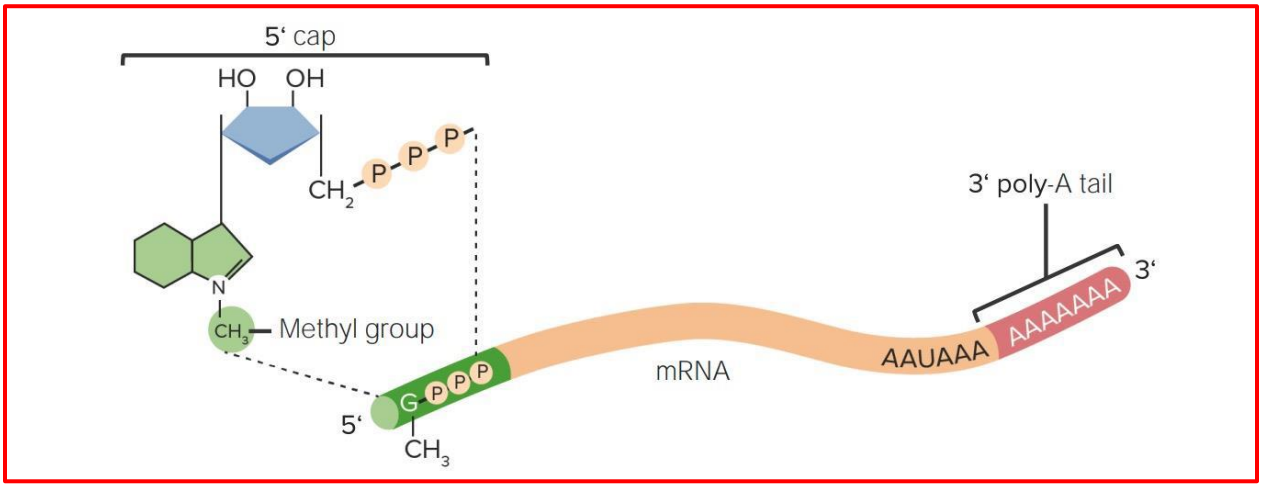
Post-transcriptional regulation can be used to regulate the active amount of RNA by modification . It occurs between the transcription phase and the translation phase of gene expression.

In prokaryotic cell, RNA transcripts are ready to act as mRNA s and get translated into proteins right away, but in Eukaryotic cell pre-RNA needs to go through a few more steps to become an actual mRNA (mature mRNA).

processing includes Additions of 5' cap and poly-A tail. Both the cap and the tail protect the transcript and help it get exported from the nucleus and translated on the ribosomes (protein-making "machines") found in the cytosol.

A-Adding cap structure:

B-Polyadenylation (poly Adenine residue):

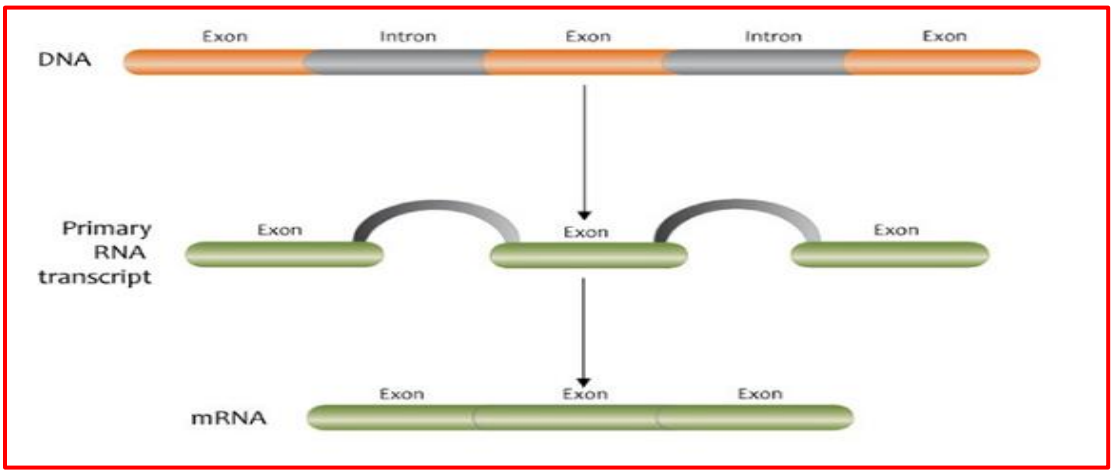


2- Splicing:

Eukaryotic genes are composed of **exons**, which correspond to protein-coding sequences, and intervening sequences called **introns** (sequences in mRNA do not encode functional proteins).

The process of removing introns and reconnecting exons is called splicing.

Introns are removed and degraded while the pre-mRNA is still in the nucleus.

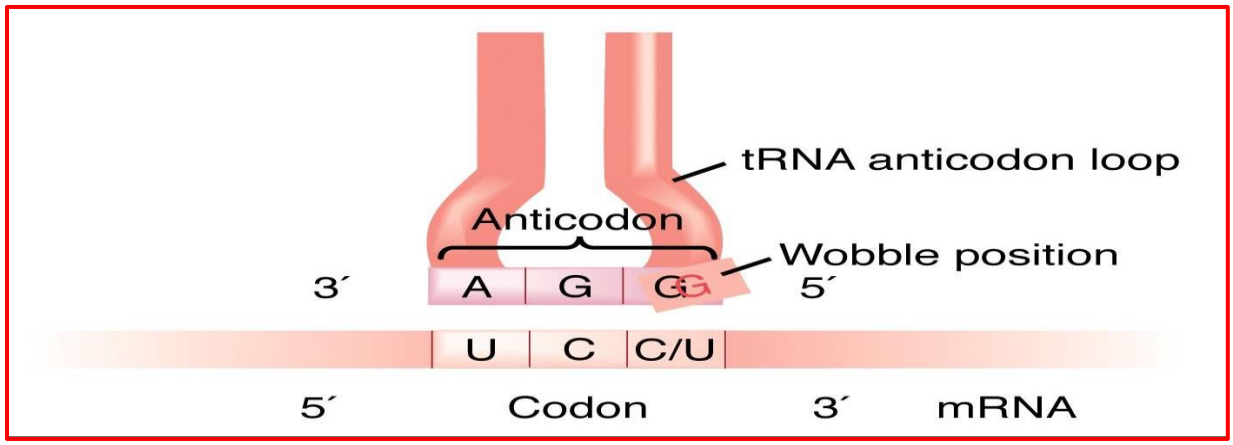


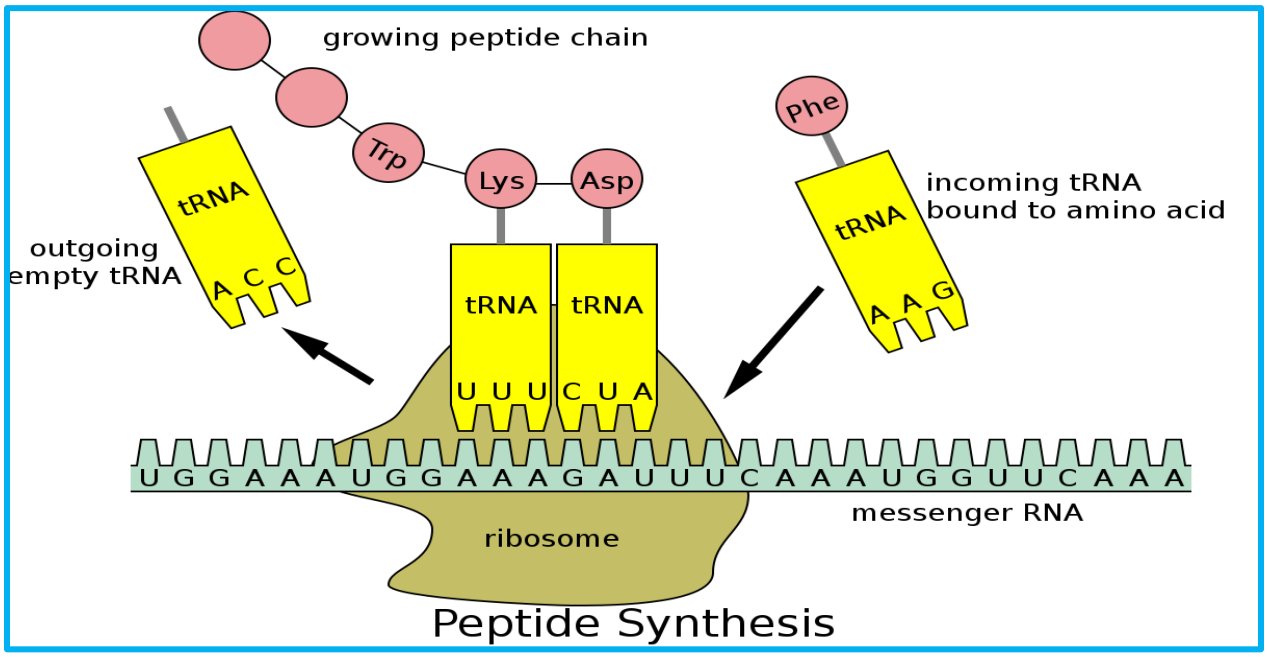
RNA translation:

Translation is the process by which a protein is synthesized from the information contained in a molecule of messenger RNA (mRNA). During translation, a mRNA sequence is read using the genetic code.

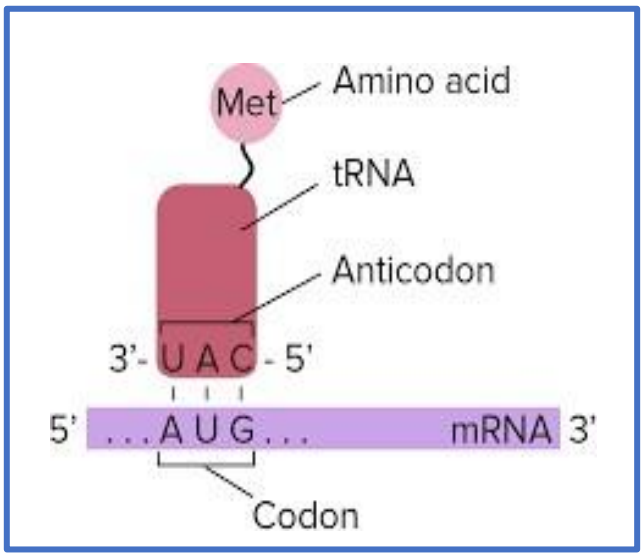
- RNA translation is a process that produces a protein from an mRNA template via the genetic code.
- The process takes place in the cytoplasm.
- Requires another RNA, called tRNA , rRNA.
- Protein synthesis is operated by cell organelle called ribosome.

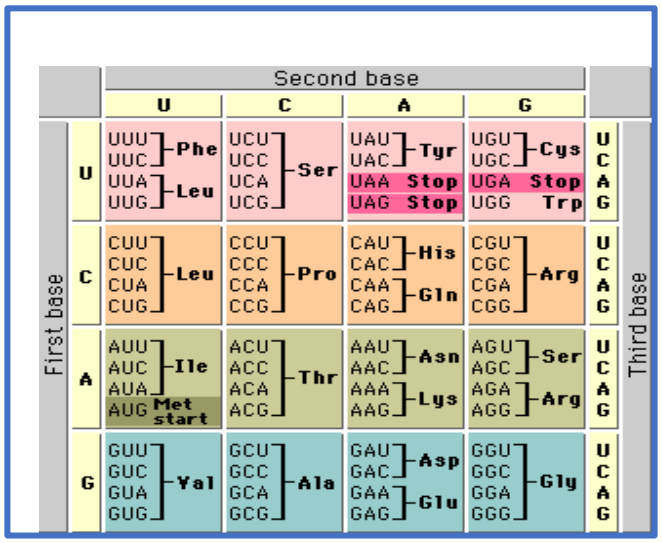
- The genetic code = triplets of RNA bases (called codons)
- Each codon encodes 1 amino acid.
- mRNA is read from 5' to 3'.
- The protein is made from the -NH2 end to the COOH end.





- **For example:**
- mRNA codon 5’ AUG 3’
- tRNA anticodon 3’ UAC 5’
- After codon-anticodon matching, the tRNAs covalently binds the
- Correct amino acid and carries it to the ribosome for the protein synthesis.
- the mRNA codon 5’AUG3’ encodes for the amino acid methionine





- 1. Read mRNA sequence: 5’ AUGAAAACU……3’
- 2. Identify codons: 5’ AUG/AAA/ACU/……3’
- 3. Match codons with amino acids
- • AUG = Met (M)
- • AAA = Lys (K)
- • ACU = Thr (T)
- 4. Continue until you find the stop codon (UAA or UAG or UGA)
- Note: stop codons **do not code** for any amino acid; they just stop translation

Question / Complete the following sequence and give the resulting amino acid chain?

ATGGGACATCCTTATCCATGA

DNA1		ATG	GGA	CAT	CCT	TAT	CCA	TGA	
DNA2		TAC	CCT	GTA	GGA	ATA	GGT	ACT	
mRNA		AUG	GGA	CAU	CCU	UAU	CCA	UGA	
tRNA		UAC	CCU	CUA	GGA	AUA	GGU	ACU	
A.A		Met.	Gly	His	Pro.	Tyr.	Pro.	Stop