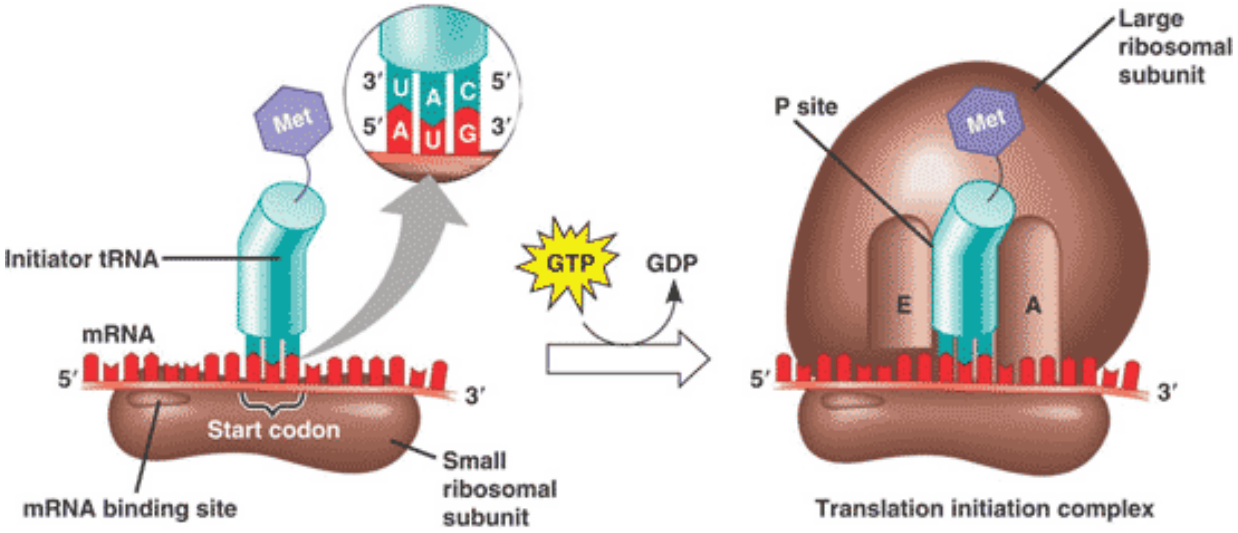
Understandings:

1. Explain initiation.

- This is the first step of translation. The regulated mRNA binds on a small section of the ribosome. The start codon AUG makes tRNA bind, forming methionine.

Basically, only two tRNA can be on the small section on the ribosome, and we have assigned it different names.



E – exit

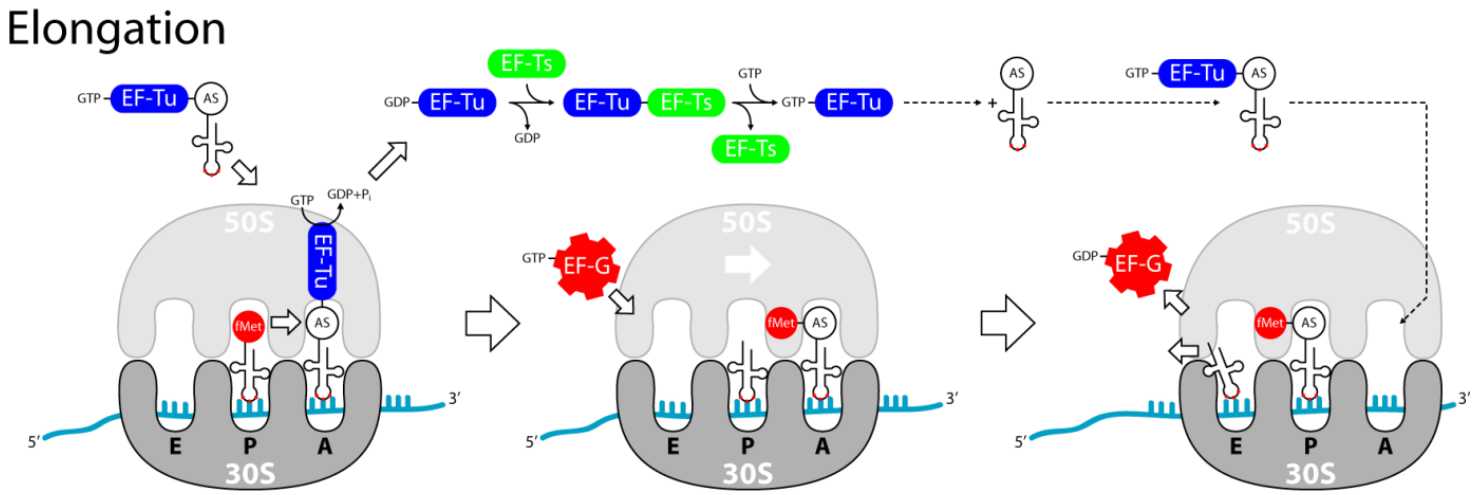
P – where the initiator binds

A – think this as “acceptor”, which is the site where new tRNA enters constantly.

2. Explain elongation.

- The next step is to accept a tRNA with the corresponding amino acid to the A site. Once it is bound amino acid from P is linked to A. The ribosome then moves to the right to accept the next tRNA. Then the tRNA can constantly fill in. The polypeptides bind and get longer and longer for every tRNA.

Notice that the direction that ribosomes move is 5' to 3', like almost everything.



3. Explain termination.

- Elongation happens until mRNA reaches a stop codon. Then the accumulated polypeptide is released!

4. Explain the use of free ribosomes.

- This translation can happen in two places. It can happen in either free ribosome in cytosol, or in bound ribosomes on ER.

The use of polypeptide is what decides the location of translation. If the polypeptide is for cytoplasm, mitochondria or chloroplast, then it is translated in the free ribosome.

5. Explain the use of bound ribosomes.

- If the use of polypeptide is for Golgi apparatus, lysosomes, cell membrane, or extracellular, then mRNA is translated in ribosomes bound to ER.

The next question is "how does the ribosome know where to translate?" Well, initially, all mRNA binds to a free ribosome. But as it is translated, the first parts of amino acids act as a signal to where to bind. Therefore, if it receives a signal to bind in free ribosome, it just continues.

However, if it receives a signal to bind in the ER, then a protein temporarily stops the translation, transfers the ribosome to ER, and then translation may continue.

Thus the overall route of a translated protein in ER is rough ER → Golgi apparatus → Plasma membrane or somewhere else.

6. Explain why prokaryotes may translate directly after transcription, while eukaryotes must modify.

- This is mentioned earlier in 7.2 or 7.1. Since prokaryotes do not have introns, they do not have to modify their sequence. In addition, their genetic material is in the cytoplasm, hence no transport is needed.

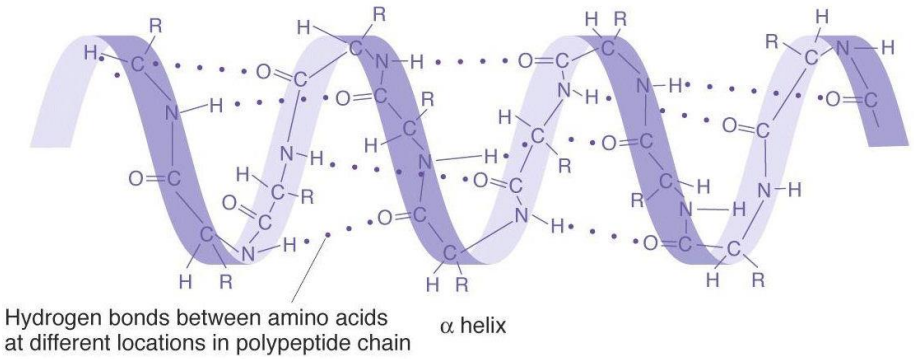
7. Explain primary, secondary, tertiary and quaternary structure.

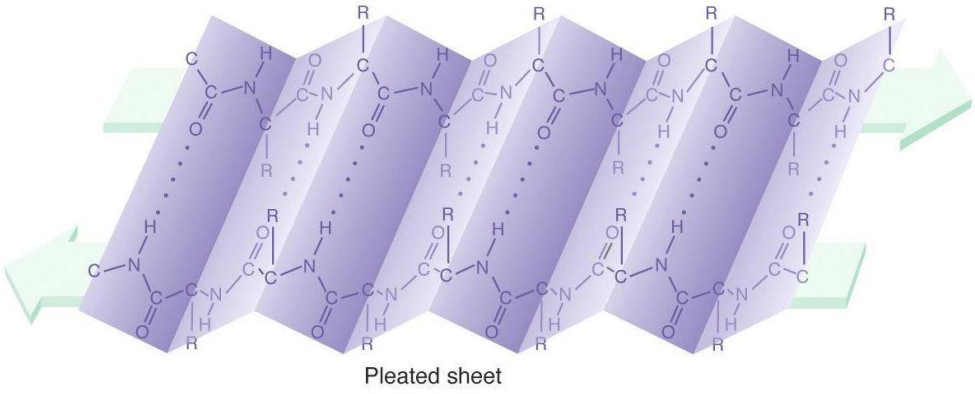
- When we describe an amino acid complex, we divide into 4 "layers".

Primary structure – this is the sequence of amino acids.

Secondary structure – the polypeptides will form hydrogen bonds with the O from C=O and the H from N-H. We have two possibilities for that to be fulfilled.

Alpha helix and Beta pleated sheet.





Tertiary structure – this is further folding of the alpha helix or beta pleated sheet. This happens due to the R groups. The interactions can be due to difference of charges, polarity, and hydrophobic and hydrophilic characteristics. Up to now, it is only one polypeptide.

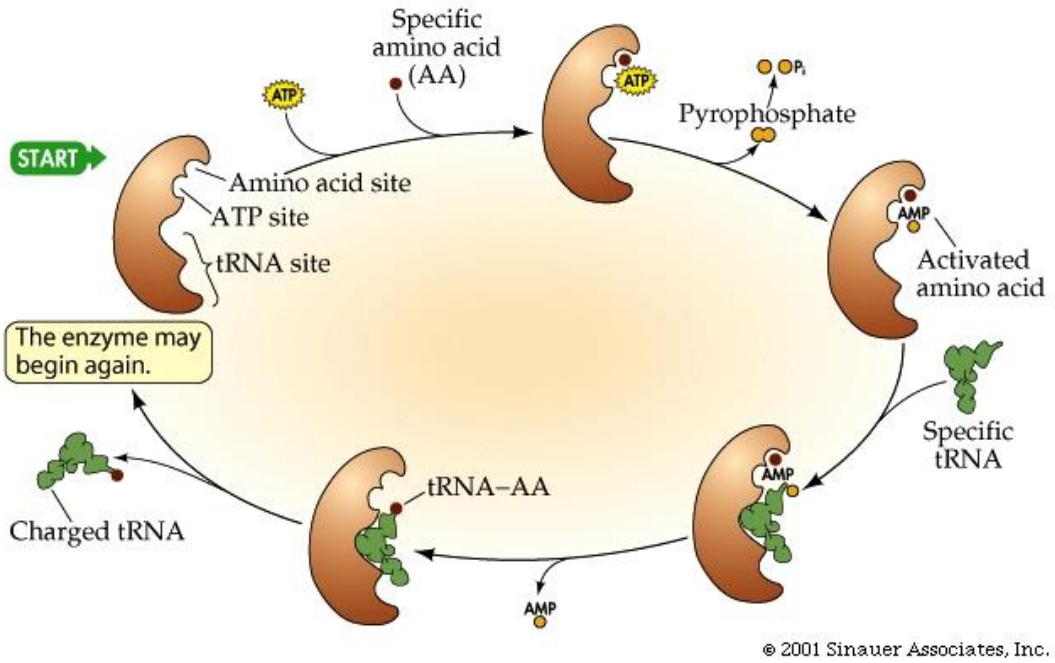
Quaternary – now, the polypeptide can bind with other polypeptides forming proteins.

Applications and skills:

1. Explain specifically how tRNA works.

- First of all, the tRNA must bind to its corresponding codon. It does that with help of tRNA-activating enzyme. This process requires ATP.

Note the terminology here. The codon is what sits on the mRNA, while the anticodon is what sits on the tRNA. So tRNA first combines with an amino acid and then binds to a codon.



2. Be able to identify polysomes in an electron micrograph.

- What are polysomes? Obviously, it is something in a big quantity since it contains the word poly, which is translated into “much” or “many”. It is basically, many ribosomes on an mRNA! It will appear as beads attached to a string.

But don’t you only need 1 ribosome for each mRNA? If you have many ribosomes at once, translation becomes time-efficient!

3. Analyse the structure of eukaryotic ribosomes and a tRNA using Jmol.

- Ok.