

SLIDE 1 - Untranslated region (UTR) of mRNA - intro

Hello everyone

My topic for the presentation is the UTR of mRNA.

UTR stands for Untranslated region

mRNA stands for messenger Ribonucleic acid

So we have got the DNA strand here which is actually a gene structure, we have 3(prime) UTR, we have promoter, exons and introns and we have 5(prime) UTR.

First I will be explaining what the UTR is and the messenger RNA (mRNA) which comes after the splicing and editing process, that means removing introns out of the DNA strand continuing with the protein synthesis process until we get to the protein.

SLIDE 2 - What is UTR?

So, let's start with UTR, what is UTR?

It's a replication that is present on each side of the mRNA sequence. Therefore, there are two UTRs. One is present on the 5' side, and it is known as 5'UTR while the other is found on the 3' side and it is known as 3'UTR. 5'UTR is also known as a leader sequence, while 3'UTR is known as a trailer sequence.

The five prime UTR is usually before the start codon and it influences the translation rate of mRNA through its length. The three prime UTR influences the rate at which the mRNA decays, meaning that protein concentration can be altered through modification of the three prime UTR. The three prime UTR is usually found after the stop codon, which signals when to stop translation. When the mRNA sequence is translated into an amino acid sequence, these two UTRs remain untranslated.

Untranslated regions play a crucial role in post-transcriptional regulation of gene expression. They participate in controlling translation, degradation, and localization of mRNA.

That's probably all for UTR, now let's move to the next slide.

Here you can see we have mRNA structure and UTR versus Intron, we have to differentiate them since it's so important to understand how the mRNA is formed from the process of Splicing.

SLIDE 3 - What is mRNA? UTR vs Intron?

The mRNA is initially transcribed from the corresponding DNA sequence and then translated into protein. However, several regions of the mRNA are usually not translated into protein, including the 5' and 3' UTRs.

An intron, simply put, is junk DNA (during translation), that is cut out during translation. A process called RNA processing helps to remove the introns that were removed and helps to splice the exons together.

Introns are the nucleotide sequences of a gene which do not code for proteins. Hence, they are termed as non-coding sequences. They are located between exons. Introns, together with exons, transcribe into pre mRNA molecules. However, since they are not involved with the genetic code of the protein, they are excluded from the RNA molecule through a process called RNA splicing. The remaining RNA sequence is known as mRNA or the mature mRNA molecule. Therefore, the mRNA molecule does not contain sequences of introns. RNA splicing occurs in two ways as cis-splicing and trans-splicing. Cis-splicing occurs when a single intron is present in a gene. Trans-splicing occurs when there are two or more introns within a gene.

UTR and intron are two types of non-coding sequences. But intron is not included in the mature mRNA sequence since introns are spliced off by the RNA splicing mechanism. UTRs are included in the mRNA sequence. Thus, this is the key difference between UTR and intron.

Exons: Discrete units of DNA within the coding segment that contain genetic code and are expressed. They are found in the mature transcript (messenger RNA). An exon, in its simplest form, is an area where the DNA is translated, and RNA splicing is the term given when the mRNA introns are removed and the exons are all linked together.

SLIDE 4 - Summary (if exists)

UTRs regulate translation during physiological stress conditions.

Functionally, UTRs are important in the post-transcriptional regulation of gene expression, while introns are not important in that process. These sequences can be seen in both DNA and RNA. Hence, the term intron could be used to refer to both non-coding sequences of DNA and RNA. But similar to DNA transcription, when rRNA and tRNA genes transcribe, these non-coding sequences are excluded from the final RNA molecule. Therefore, these are called untranslated sequences of DNA.

Alright, that's all, thanks for watching!

. It is important to notice that ribosomal RNA (rRNA) and transfer RNA (tRNA) also contain genes with introns.

Introns: Non-coding units of DNA interposed between exons within the coding segment. They are transcribed but not included in mature mRNA and are not expressed. The introns are removed from the primary transcript by a process called splicing.

Coding region : A mosaic of exons (E) and introns (I).

Trimming: removing 5' UTR and 3'UTR

Capping : addition of methylated G at 5' end .

Tailing : addition of poly A tail at 3' end

Splicing : removing of introns sequence

Recourses:

<https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470015902.a0005009.pub2>

https://en.wikipedia.org/wiki/Untranslated_region

<https://genomebiology.biomedcentral.com/articles/10.1186/gb-2002-3-3-reviews0004>

<https://www.sciencedirect.com/topics/neuroscience/untranslated-region>