# Free term paper on answers to questions on transcritption and translation

Education, Discipline

- Heterogeneous nuclear ribonucleoproteins is a protein that comprises of RNA binding proteins. It is a complex made up of RNA & proteins that is characterized by binding of premRNA. This occurs in the nucleus during the transcription and post transcriptional stages of preMRNA. The protein has different roles which include; prevent formation of secondary structures by preventing folding of pre-mRNA, inhibit the interaction with other proteins, usually has a link with the splicing apparatus and transportation of the mRNA away from the nucleus. This type of protein is a multidomain protein with multiple RNA binding proteins. RNA recognition Motif which is the commonest form of the RNA binding domains is present in about 1-4 proteins. Motifs has-80 amino acids with structure made up of RNP1 (octamer) & RNP2 (hexamer).

- Post-transcriptional regulation occurs is a kind of gene expression regulation which occurs between the transcription and the translation of gene. This is usually at the RNA level. Those regulation include: mRNA transcript stabiization, localization, translation and splicing control. Others which also occur during regulation are: alternative splicing, RNA editing, control of exit, protein interactions, RNA processing and localization.

RNA editing: This process involves the changing of RNA or editing for it to be able to encode different gene. İt entails insertion/deletion or modification of the single nucleotides. Editing occurs from A to I and C to U. It entails enzymatic changes to the pre-mRNA sequences.

## The types of mechanism involves or mediate the process of editing are: substitution editing & guide RNA-directed uridine insertion or deletion

- polyadenylation is a process of adding poly(A) to RNA molecule. AMP residues are eukaryotes properties. Poly(A) polymerase helps in adding poly(A) posttranscriptionally. The step involves CPSF cleavage and polyadenylation. mRNA is produced during polyadenylation. Polyadenylation begins at the ends of gene transcription.

- Heat shock proteins (HSP) are expressed in response to various biological stresses, including heat, high pressures, and toxic compounds. It is also one of the most abundant cellular proteins found under non-stress conditions . HSPs are involved in the folding and unfolding of other proteins. Hsp90 is known as " chaperones," is one example to this type of proteins which are dedicated to helping other proteins fold and assume their proper functions. Example of the mechanism ; Sudden transcription factor (HSF) present in the monomeric, non-DNA binding form in unstressed cells when there is stress this transcription factor is activated to tromeric form which then binds to protmoters of heat shock genes. As the stress increases (ex: temperature ) , their expression is increased

- (heteronuclear RNA) hnRNA: The fraction of nuclear RNA which contains primary transcripts of the DNA prior to processing to form messenger RNA. ( hnRNA /premRNA precursor RNA). It is transcribed as heterogeneous nuclear RNA (hnRNA) in the nucleus. hnRNA contains introns and exons. The introns are removed by RNA splicing leaving the exons, which contain the information, and exons finally joined together.

snRNA -Small nuclear RNA (snRNA)

-Short chains of RNA (100-300 nucleotides long) . important in RNA splicing (removal of the introns from hnRNA) . They are abundant in the nucleus and usually complexed with proteins in snRNPs (RIBONUCLEOPROTEINS, SMALL NUCLEAR). Many snRNA function in the processing of messenger RNA precursors and participate in splicing and transfer of hnRNA inculudes splisomal RNA.

the snoRNAs (RNA, SMALL NUCLEOLAR)— A large group of snRNAs

- involved with the processing of ribosomal RNA precursors.

-These are small RNA molecules that play an essential role in RNA biogenesis and guide chemical modifications of ribosomal RNAs (rRNAs) and other RNA genes (tRNA and snRNAs).

-They are located in the nucleolus and the Cajal bodies of eukaryotic cells (the major sites of RNA synthesis

6. RNA contains both exons( coding sections of the primary RNA transcript) and introns( the non-coding sections of the primary RNA transcript). Introns are also RNA sequences between exons that are removed by splicing. RNA splicing is carried out by a large complex called spliceosome. The primary transcripts(pre-mRNA) must have their introns removed before they can be translated into protein. RNA Splicing converts the pre-mRNA into mature messanger RNA. Splice-sites are the intron-exon junctions in the precursor mRNA of eukaryotes. The process by which introns are removed from the pre-mRNA called RNA splicing.

7. Nascent pre-mRNA is modified by splicing which take place concurrently with its transcription. In splicing, introns (non coding regions ) are removed

and exons(coding regions ) are joined togeather. Splicing is catalyzed by the spliceosome which is a large RNA-protein complex composed of five small nuclear ribonucleoproteins (snRNPs). Beside the pre-mRNA splicing mediated by Spliceosome, there are groupland group Ⅱ introns self splicing. In self splicing , they can remove themselves from RNAs in the tube in the absence of any proteins or other RNA molecules The chemistry of splicing , and the RNA intermediates produced, are the same as for nuclear pre-mRNAs.

- Processing of RNA always occurs in the nucleus and modification of it can occur during process when it pass via the nuclear membrane. The process of transcription occurs in the nulceus but once the RNA has been modified, it leaves the nucleus via the nulclear pores. İt then the cytoplasm where protein synthesis takes place. RNA modification or processes needs certain enzymes and proteins which are located also in the nucleus. Eukaryotic nuclei are not homogeneous but contain a variety of subnuclear structures often referred to as nuclear bodies. Most are involved in the synthesis, processing, and modification of RNA. Eukaryotic mRNA processing involvrs three major processes: 5′ capping, 3′ cleavage/polyadenylation, and RNA splicing.

- Nuclear envelope is the outermost covering of the nucleus. This membrane is made up of NPCs. This is the channel for transport of molecules and macromolecules between the nucleus and the cytoplasm . Uncharged molecules smaller than 100 Daltons can pass through the membranes of the nuclear envelope. Molecules and macromolecules larger than 100 Daltons cross the nuclear envelope by moving through NPCs. Nuclear pore complexes are constructed from proteins called nucleoporins Export of

proteins from the nucleus is receptor-mediated.

- Eukaryotic mRNA produced in nucleus and then localized to a specific region of the cytoplasm. Later translated into proteins with eventual degradation. Processing which inculudes splicing , poly A adenylation and capping are also associated with the mRNA. mRNA localization is widely used in eukoryotes since protein synthesis specifically occurs at the places where they function. So basicly mRNA can be localized to specific regions of the cytoplasm in eukaryotic cell depending on where that specific protein needed.(local production of protein).
- RNA processing is to generate a mature mRNA for protein genes or a functional tRNA or rRNA from the primary transcript. They basicly form functional forms of RNA after they processed.

## For eukaryotes; 3 RNA polymerases.

RnA polymerase I transcribes -rRNA

RNA polymerase II transcribes mRNA precursurs

RNA pol III transcribes small RNA-5srRNA, tRNA etc

Approximately 80 percent of total RNA is rRNA , 15 percent is tRNA , leaving very little percent of mRNA.