Commentary
Volume 16:3, 2022

Journal of Molecular and Genetic Medicine

ISSN: 1747-0862 Open Access

Protein Translation in Mammalian Cells

Chris Ivana*

Department of Internal Medicine, St. John's Research Institute, Spain

Description

13 proteins are produced during protein synthesis in mammalian mitochondria and are key constituents of the oxidative phosphorylation complexes. In mammals, the inner membrane receives all the results of mitochondrial protein production. Mitochondria use oxidative phosphorylation to produce nearly 90% of the energy required by mammalian cells. They also do haeme biosynthesis, a part of the urea cycle, and play a role in apoptosis. Mitochondria are oblong-shaped organelles with two membranes surrounding them. The Outer Membrane (OM) defines the general structure and produces an envelope that acts as a barrier to small molecules passing through. The Inner Membrane (IM) surrounds the interior soluble component, the matrix, and is heavily invaginated, generating cristae. The IM is made up of two regions. The Inner Membrane Border (IMB) is intimately linked to the OM, with which it has several contact sites. The majority of the IM's surface is made up of Cristal Membranes (CM). Narrow, ring-like structures connect the IMB with the CM, forming a barrier between the intracristal and intermembrane spaces. For the sake of clarity, we shall refer to the inner membrane (IM) as including both the IMB and the CM throughout this book. The IM is where aerobic cells create the majority of their ATP through oxidative phosphorylation. Mammalian mitochondria have their own genome, which is made up of around 16,000 base pairs of DNA and encodes two rRNAs, 22 tRNAs, and 13 polypeptides.

In animal mitochondria, for example, UGA, which is ordinarily a stop codon, is interpreted as tryptophan. The AUA codon for isoleucine is interpreted as methionine in addition to AUG. While it was previously considered that the AGA and AGG codons for arginine served as stop codons, new evidence reveals that they are used in 1 frameshifting. The mitochondrial translational system produces all of the proteins in the IM, which serve as components in the electron transfer and ATP synthase complexes. Complex I (NADH:ubiquinone oxidoreductase) has seven subunits, Complex III (ubiquinone: cytochrome c oxidoreductase) has one, Complex IV (cytochrome c:oxygen oxidoreductase) has three, and Complex V has two (ATP synthase).

The genes are usually right next to one other or separated by just a few nucleotides. There are almost no non-coding regions in the genome. Of comparison to the universal code, the genetic code in animal mitochondria has been slightly modified. Nuclear genes produce the remaining 2,000 or so proteins in mammalian mitochondria, which are generated in the cell cytoplasm and then transported into the organelle. Coordinate expression of genes in both the nuclear and mitochondrial genomes is required for the formation of oligomeric respiratory chain complexes. It is still unknown how this process is regulated. Despite years of research, no in vitro translation system capable of accurate initiation and synthesis of a mitochondrially encoded protein has been created from mammalian mitochondria, and much more research is needed. However, several particular processes in mammalian mitochondrial protein synthesis have been successfully carried out in vitro, providing insight into the system's specific characteristics.

The mitochondrial genome codes for 13 proteins, which are translated by 9 monocistronic and 2 dicistronic mRNAs. There are overlapping reading frames in both dicistronic mRNAs. The remaining 11 start sites are all at or near the 5′ end of each mRNA, except for the two internal start sites found in dicistronic mRNAs. As a result, mitochondrial mRNAs lack the Shine-Dalgarno sequence, which is employed in prokaryotes to assist position the start codon at the ribosome's P-site. In all but three mRNAs, post-transcriptional processing fully removes the 5′ leader, according to direct study of the 5′ ends of the eleven open reading frames situated at the 5′ ends of human mitochondrial mRNAs. In mammalian mitochondria, the start codon at the 5′ end can be either AUG or AUA, both of which encode methionine. During chain start, these codons drive the insertion of formyl methionine, and during chain elongation, they direct the insertion of methionine.

- Mammalian expression systems are commonly used for the following purposes.
- Cloned gene product verification.
- A study of how protein expression affects cell physiology.
- Gene isolation and synthesis from cDNA libraries.
- Generation of appropriately folded and glycosylated proteins for in vitro and in vivo testing of biological function.
- Synthesis of sufficient quantities of proteins and glycoproteins for structural analysis of protein and carbohydrate moieties.
- Production of clinically important viral surface antigens, such as prehepatitis B virus surface antigen (preS2 HBVsAg), as well as therapeutic proteins, such as interferon, tissue plasminogen activator (tPA), erythropoietin (EPO), and Factor VIII.

Mammalian cells can undergo posttranslational changes and release glycoproteins that are appropriately folded and include complex antennary oligosaccharides with terminal sialic acid, which are important characteristics. These covalent changes may affect the protein's therapeutic efficacy (e.g., circulatory half-life and bio specificity) or produce features useful for biochemical characterization (e.g., structural stability, functional groups, and biological role [1-5].

Conflict of Interest

None.

References

1. Morris, David R. "Growth control of translation in mammalian cells." Prog Nucleic Acid Res Mol Biol 51 (1995): 339-363.
2. Nott, Ajit, Hervé Le Hir, and Melissa J. Moore. "Splicing enhances translation in mammalian cells: An additional function of the exon junction complex." Genes Dev 18 (2004): 210-222.
3. Maquat, Lynne E. "Nonsense-mediated mRNA decay: splicing, translation and mRNP dynamics." Nat Rev Mol Cell Biol 5(2004): 89-99.
4. Faye, Mame Daro, Tyson E. Graber, and Martin Holcik. "Assessment of selective mRNA translation in mammalian cells by polysome profiling." JoVE 92 (2014): e52295.
5. Zucchelli, Silvia, Laura Patrucco and Francesca Persichetti. "Engineering translation in mammalian cell factories to increase protein yield: the unexpected use of long non-coding SINEUP RNAs." Comput Struct Biotechnol J 14 (2016): 404-410.

***Address for Correspondence:** Chris Ivana, Department of Internal Medicine, St. John's Research Institute, Spain; E-mail: IvanaC@im.edu*

Received: 05-March-2022, Manuscript No: jmgm-22-61728; **Editor assigned:** 07-March-2022, PreQC No. P-61728; **Reviewed:** 12-March-2022, QC No. Q-61728; **Revised:** 17-March-2022, Manuscript No. R-61728; **Published:** 22-March-2022, DOI: 10.37421/1747-0862.22.16.546

How to cite this article: Ivana, Chris. "Protein Translation in Mammalian Cells." *J Mol Genet Med* 16 (2022): 546.