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Perspective

The Mechanisms of Non-coding MRNA in Genetic Expressions and Cellular Functions of Micro RNA

Selina James*

Department of Medicine, University of California, California, USA

DESCRIPTION

In the intricate movement of molecular biology, non-coding mRNA emerges as a key player, challenging the traditional view that mRNA solely serves as a messenger for protein synthesis. Non-coding mRNA, also known as Non Coding Ribo Nucleic Acid (ncRNA), has become a focal point in understanding the sophisticated regulatory mechanisms within our cells. This class of RNA, distinct from its protein-coding counterpart, is rewriting the narrative of genetic expression and regulation.

Defying the dogma

The central dogma of molecular biology, proposed by Francis Crick, outlines the unidirectional flow of genetic information: Deoxy Ribo Nucleic Acid (DNA) transcribes into RNA, which translates into proteins. However, the discovery of non-coding mRNA has expanded this simplistic view. While protein-coding mRNA directs the synthesis of proteins, non-coding mRNA participates in a myriad of cellular processes without encoding proteins.

Diverse roles of non-coding mRNA

Non-coding mRNA can be classified into various subtypes, each with unique functions. MicroRNAs (miRNAs) are small non-coding RNAs that regulate gene expression by binding to target mRNAs and inhibiting their translation or promoting their degradation. Long Non Coding RNAs (lncRNAs) are another class that influences gene expression through diverse mechanisms, such as chromatin remodeling and interaction with proteins.

Regulation of gene expression

One of the primary roles of non-coding mRNA is to regulate gene expression. MiRNAs, for instance, act as post-transcriptional regulators by binding to complementary sequences in the 3' Untranslated Region (UTR) of target mRNAs. This interaction prevents the translation of the mRNA into a functional protein, effectively controlling the abundance of specific proteins within the cell.

Beyond protein coding genes

Non-coding mRNA extends its influence beyond the field of protein-coding genes. It plays a crucial role in the regulation of other non-coding elements, including pseudogenes and transposable elements. This intricate web of interactions contributes to the maintenance of genomic stability and proper cellular function.

Implications in disease

The dysregulation of non-coding mRNA has been implicated in various diseases, including cancer, neurodegenerative disorders, and cardiovascular diseases. Aberrant expression of miRNAs, for instance, can lead to the uncontrolled proliferation of cells or the suppression of essential genes, contributing to the development of cancer.

Therapeutic potential

The discovery of non-coding mRNA has opened new avenues for therapeutic interventions. Researchers are exploring the potential of manipulating miRNA expression to treat diseases by restoring the balance of gene regulation. Antisense oligonucleotides, small molecules, and other innovative strategies are being developed to target non-coding RNA and modulate their activities.

Noncoding mRNA in vaccine development

One of the groundbreaking applications of non-coding mRNA is in the development of vaccines, as demonstrated by the success of mRNA vaccines against infectious diseases, such as COVID-19. In this context, the non-coding mRNA serves as a template for the production of viral antigens, eliciting an immune response without the need for live attenuated viruses.

CONCLUSION

Non-coding mRNA, once relegated to the sidelines, has emerged as a central player in the intricate symphony of genetic

Correspondence to: Selina James, Department of Medicine, University of California, California, USA, Email: selina_james@usedu.com

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regulation. Its diverse roles in controlling gene expression, maintaining genomic stability, and influencing cellular processes highlight the complexity of molecular biology beyond the traditional protein-centric perspective. As research in this field progresses, the therapeutic potential of non-coding mRNA holds promise for revolutionizing medicine and providing innovative solutions for a wide range of diseases. The era of non-coding mRNA research has truly in a novel origin of one's cellular level.