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Short Communication

Significance of MicroRNAs in Diagnosis and Treatment of Infectious Diseases

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DESCRIPTION

Recently, a class of noncoding RNAs called miRNAs has emerged as a key gene regulator in cell proliferation, disease and development. miRNAs are 18–24 nucleotides long noncoding RNA that regulates gene expression by pairing with the three Untranslated Regions (UTRs) of the target by inhibiting or inducing translation of mRNA and protein mRNA degradation [1]. MiRNAs regulate critical cellular processes which involves cell growth, development and differentiation.

miRNAs make up approximately 1%-3% of the genome and it is expected to regulate 30% of human genes. MicroRNAs (miRNAs) are short endogenously initiated, noncoding RNAs that bind to the mRNAs which are targeted, leading to degradation or translational repression of the corresponding mRNAs. They are key players in physiological processes such as differentiation, cell proliferation, development and apoptosis. They have gained importance and recognition as regulators of gene expression in the immune system. They regulate antibody production and release various inflammatory mediators [2]. Abnormal expression and function of miRNAs in the immune system are involved in various diseases such as inflammatory diseases, allergic diseases, and cancer. Compared to the average human genome, miRNAs target immune system genes in very different ways. miRNAs appeared to regulate responses related to adaptive and innate immunity in humans. Several miRNAs play important roles in regulating transcription and even dysregulation of inflammatory mediators. Many miRNAs are upregulated or downregulated in various inflammatory and infectious diseases. Therefore, altering or targeting miRNA expression may serve as a new strategy for diagnosis, prevention and treatment of various inflammatory and infectious diseases. Human bodies have a wide variety of plants and animals that help in digest, maintain pH, and develop human immune system. However, exogenous pathogenic microorganisms such as bacteria, viruses, fungi, and parasites can cause diseases called infections. These exogenous pathogens disrupt normal physiological processes or modulate immune system responses, causing high fever and inflammation. These pathogens enter the human body primarily through vectors or through contact with bodily fluids. Entry of a pathogen into the host body results in the pathogen's entry into the host's immune response after that it replicates and spreads into the host cells and tissues. Numerous bacterial, viral, and fungal species have been reported to be pathogenic, overcoming host immune defenses, invading tissues, and causing a variety of infections. Molecular signaling pathways have been discovered that regulate the magnitude of inflammatory and infectious responses [3]. miRNAs play critical roles in these signaling pathways. miRNAs are generally small (20–22 nt) non-coding portions of RNA that make up approximately 1%–2% of mammalian genes. They act by binding to target mRNAs that have been degraded or transnationally inhibited. Several miRNAs have been observed to exhibit highly specific expression patterns in organs associated with the immune system. Even the differentiation of hematopoietic progenitor cells into lymphoid or myeloid lineages is regulated by different miRNA expression profiles. This clearly demonstrates the important role of miRNAs in immune cell development and function. Both innate and adaptive immune responses are influenced by miRNAs and influence the outcome of various diseases. Therefore, there is a need to understand how miRNAs regulate various physiological processes of the immune system under normal and disease conditions. Adaptive immune responses are characterized primarily by T and B cell activation and clonal expansion. This type of activation and expansion results in cytotoxic effector responses and antibody production in response to infection. miRNAs are widely involved in the regulation of adaptive immunity by regulating T and B cell development, activation, survival and proliferation. Proteins involved in inflammatory processes are regulated by miRNAs at the transcriptional level. Other physiological responses, such as the initiation of inflammation and oxidative stress, adipogenesis, and macrophage activation, are also regulated by miRNAs [4]. Thus, deregulation of immune-related miRNAs can lead to chronic inflammation, a hallmark of persistent inflammatory diseases.

CONCLUSION

miRNAs act on signaling proteins or support the immune system's inflammatory or anti-inflammatory responses. Therefore, miRNAs can serve as biomarkers or targets for the treatment of various infectious diseases. miRNA therapeutics,

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tested in human clinical trials, making regulation of miRNA function which may soon be revealed as a novel therapeutic approach to treat autoinflammation and autoimmunity. Researchers have reported that the expression of multiple genes can be regulated by a single miRNA. These are important for the survival and function of various immune cell types and have been reported to play important roles in mediating responses to infection. Different properties of miRNAs make them strong candidates for managing immunity and fighting infectious diseases. Although miRNA-based therapies have limitations, further research is needed to expand the knowledge of immune miRs. This can be considered a futuristic approach to the diagnosis and treatment of immune-mediated diseases (acute and chronic inflammatory diseases) and infectious diseases.

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