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MicroRNA Profiling as a Diagnostic Tool in Inflammatory Diseases.

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Introduction

MicroRNAs (miRNAs) are small, non-coding RNA molecules, approximately 18–25 nucleotides in length, that play critical roles in regulating gene expression at the post-transcriptional level. Over the past decade, research has revealed their involvement in a variety of biological processes, including cell differentiation, proliferation, and apoptosis. Their dysregulation has been closely associated with the pathogenesis of numerous inflammatory diseases, including rheumatoid arthritis, inflammatory bowel disease, psoriasis, and systemic lupus erythematosus.

Traditional diagnostic approaches for inflammatory disorders often rely on clinical evaluation, imaging, and protein biomarkers. However, these methods may lack the specificity or sensitivity required for early detection or monitoring disease progression [1, 2, 3, 4, 5]. miRNA profiling offers a promising alternative due to its high specificity, stability in body fluids, and potential for reflecting underlying molecular mechanisms.

Advancements in next-generation sequencing and quantitative PCR have made it feasible to detect disease-specific miRNA signatures from peripheral blood, synovial fluid, and even saliva. For example, certain miRNAs such as miR-146a, miR-155, and miR-21 have been repeatedly identified as regulators of key inflammatory pathways, making them potential biomarkers for disease diagnosis, prognosis, and therapeutic response monitoring. Additionally, miRNA panels could be integrated into personalized medicine approaches, enabling more targeted and effective treatment strategies [1, 2, 3, 4, 5].

Conclusion

The emerging role of miRNA profiling as a diagnostic tool represents a significant leap in the field of inflammatory disease research. Its high sensitivity, minimal invasiveness, and potential to detect subclinical disease activity make it a powerful complement to existing diagnostic modalities. Although technical standardization and large-scale clinical validation remain challenges, the integration of miRNA diagnostics into routine clinical practice appears increasingly plausible. In the near future, miRNA-based assays may not only facilitate early detection but also guide tailored therapeutic interventions, ultimately improving patient outcomes in inflammatory diseases.

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