

METHODS IN MOLECULAR BIOLOGY

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MicroRNA Protocols

Third Edition

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Preface

Since the first small noncoding RNA was identified, our knowledge about microRNAs (miRNAs) has grown exponentially. MiRNAs (endogenous, evolutionarily conserved small noncoding RNAs) participate in numerous aspects of development, differentiation, and homeostasis, consequently playing important roles in the pathogenesis, including their roles in the pathogenesis of cancer, diabetes, obesity, genetic and metabolic diseases, aging, and regenerative medicine. Profound progress has been made and the studies of miRNAs have been evolved from the analysis of miRNA, targets and expression profiling, and gain-or-loss of function to circulatory regulation and the post-transcriptional regulation of miRNAs. In addition, miRNAs have been shown to be stable in the biological fluid, can be easily isolated and measured, and closely associated with various diseases. There is a great potential of using miRNAs as novel diagnostic and prognostic biomarkers with high specificity and sensitivity. Even though miRNAs are increasingly popular drug targets, the direct use of mature miRNAs or their precursors for drugs, due to their stability and new in vivo delivery methodologies, has been much less explored. In addition, embryonic stem cell (ESC)-specific miRNAs have been shown to reprogram induced pluripotent stem (iPS) cells, which can be perpetually generated and produced the very ESC-miRNAs, providing a biogenic resource for potential drug production.

This book focuses on the analysis of miRNA, targets and expression profiling, various methods to determine its regulation of gene expression, the preparation and isolation of miRNAs in specific tissues, its detection in the biofluids as biomarkers, and potential application in cancer, wound healing, and miRNA-induced iPSCs. The first several chapters deal with the biogenesis, isolation, profiling, and analysis of exosomal miRNAs. Many chapters provide target validation, expression profiling, and regulation of gene expression by miRNAs; the emphasis here is to provide various methods that are readily reproducible for the analysis of the functional significance of miRNAs. Additional chapters describe techniques for studying exosomal miRNAs from iPSC-derived cardiomyocyte proliferation and regeneration. Several chapters deal with screening miRNAs in various conditions and miR-302/367-induced iPSCs. Finally, a chapter on glycyglycerins, recently discovered sugar-like RNA, in miRNA-mediated iPSCs was presented. The potential use of glycyglycerins in various biological processes, including wound healing, cardiovascular diseases, and cancer, may have immense practical benefit in developing miRNA-associated molecules as drugs.

Los Angeles, CA, USA

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