

# Preface

MicroRNAs (miRNAs) are a kind of short noncoding RNAs that regulate gene expression by translational repression or degradation of messenger RNA. They play important roles in many cellular processes, including development, proliferation, differentiation and apoptosis. Particularly, aberrant miRNAs expressions have been proposed to be related to various pathological processes such as cancer, diabetes, cardiovascular disease and other illnesses. Therefore, establishment of an accurate and reliable miRNA expression profile is significant for the investigation of biological processes in health and disease and for exploring their potential as novel diagnostic and prognostic biomarkers and drug targets.

In recent years, due to tremendous expansion of analytical techniques and capability, the scope of miRNA detection has also been widened. A detailed description of covering all detection strategies is beyond the scopes of this book. The book presented is an attempt to describe the significant and emerging research effort being done in the miRNA detection, focusing on the potential clinical application. The miRNA biogenesis, function, regulation and mechanism of action, as well as the challenges for miRNA detection, are briefly described first in Chap. 1. In Chap. 2, special attention is given to the miRNAs pathological function and potential clinic diagnostics indicating their advantages as well as their shortcomings. We then present an overview of various techniques and methods currently used to detect miRNAs. The conventional techniques used for miRNA detection, including standard PCR, Northern blotting and microarray, are critically addressed in Chap. 3.

Subsequently, the most innovative techniques in miRNA detection and quantification with superior flexibility and adaptability were presented in Chaps. 4–6 according to different detection techniques based on electrochemical, optical or other signal detection. These chapters are focusing on nanotechnology techniques, novel molecular biological techniques, enzyme-assisted approaches, capillary electrophoresis methods, etc.

The latest development of clinical-related miRNA detection methods in living cell, circulating blood and tissue including in situ hybridization (ISH) and molecular imaging techniques are reported in Chap. 7. The advantages and deficiency of

various detection techniques in this fast moving field along with the challenge and new directions are proposed in Chap. 8.

The book summarizes most of the significant miRNAs-related detection techniques in a single resource. It is our hope the book will be useful for readers to understand miRNA biogenesis, function and mechanism of action, assisting and enriching readers to understand the various types of miRNA detection available or under development, as well as their potential application in future clinical study. It should be of broad interest for academic and scientific communication worldwide.

We would like to express our sincere appreciation to all the authors who have taken part in this project and written wonderful chapters adding depth and value to the book, and express our sincere gratitude to our editor June Tang who helped us get through the project successfully. Special thanks to the support from National Natural Science Foundation of China, China Postdoctoral Special Foundation and Ph.D. Programs Foundation of Ministry of Education of China and the Fundamental Research Funds for the Central Universities.

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