

METHODS IN MOLECULAR BIOLOGY

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MicroRNA Detection and Target Identification

Methods and Protocols

Edited by

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Preface

This book is a follow-up of a previous book in this series; therefore, it is unnecessary to introduce microRNAs (miRNAs) to any reader who is reading this preface. The previous book (*MicroRNAs in development*; published in 2011) described protocols to detect, profile, and manipulate miRNAs in various organisms, as well as how to validate targets of miRNAs in plants and animals. However, a lot of new techniques have been developed in the last 5–6 years, which warranted a new book.

Some of the new protocols describe slight but important changes to well-established techniques that were described in the previous edition, such as Northern blot (Chapter 1) and preparation of cDNA libraries of small RNAs (Chapter 4). An alternative method to these two approaches to detect miRNAs is RT-qPCR, and there are two protocols for this in the book, one describing high-throughput RT-qPCR (Chapter 2) and the other describing the application of digital PCR for miRNA detection (Chapter 16). In addition, there is a review chapter on the comparison of next-generation sequencing and RT-qPCR platforms (Chapter 3).

MiRNAs have been increasingly used as biomarkers in cell-free body liquids such as serum or urine. The amount of miRNAs in these samples is much lower than in samples containing cells; therefore, there is a need for more sensitive methods. There are a number of protocols for miRNA detection in this book that are based on completely novel approaches. These exciting techniques utilize nanotechnology, microfluidics, or other engineering innovations to lower the detection limit (Chapters 5, 6, 8, 16, 17, 18, and 20).

A very important aspect of miRNA research is to identify and validate their target mRNAs. Identifying targets in plants is relatively straightforward due to the high complementarity between miRNAs and their targets. This near perfect match results in a cleavage at a specific position on the mRNA, and these cleavage fragments can be sequenced and therefore identified. Since that protocol was published in the previous edition, there is no chapter on plant miRNA target identification in this book. However, there are two new experimental approaches for miRNA target identification in animals included in this edition (Chapters 7 and 9).

In addition to wet laboratory protocols, miRNA research hugely relies on bioinformatics approaches, probably more so than most other field of biology. This aspect was completely missing from the previous edition and we now make up for it. There are seven chapters describing either specific programs or entire tool kits or reviewing certain aspects of miRNA bioinformatics. These are chapters 10–15 and 19.

Norwich, UK

Tamas Dalmay

Contents

<i>Preface</i>	V
<i>Contributors</i>	IX
1 Improved Denaturation of Small RNA Duplexes and Its Application for Northern Blotting <i>C. Jake Harris, David C. Baulcombe, and Attila Molnar</i>	1
2 High-Throughput RT-qPCR for the Analysis of Circulating MicroRNAs. <i>Geok Wee Tan and Lu Ping Tan</i>	7
3 Genome-Wide Comparison of Next-Generation Sequencing and qPCR Platforms for microRNA Profiling in Serum <i>Thorarinn Blondal, Maurizia Rossana Brunetto, Daniela Cavallone, Martin Mikkelsen, Michael Thorsen, Yuan Mang, Hazel Pinheiro, Ferruccio Bonino, and Peter Mouritzen</i>	21
4 Small RNA Profiling by Next-Generation Sequencing Using High-Definition Adapters <i>Martina Billmeier and Ping Xu</i>	45
5 Surface Acoustic Wave Lysis and Ion-Exchange Membrane Quantification of Exosomal MicroRNA <i>Katherine E. Richards, David B. Go, and Reginald Hill</i>	59
6 Droplet Microfluidic Device Fabrication and Use for Isothermal Amplification and Detection of MicroRNA <i>Maria Chiara Giuffrida, Roberta D'Agata, and Giuseppe Spoto</i>	71
7 Interrogation of Functional miRNA–Target Interactions by CRISPR/Cas9 Genome Engineering <i>Yale S. Michaels, Qianxin Wu, and Tudor A. Fulga</i>	79
8 Cell-Free Urinary MicroRNAs Expression in Small-Scale Experiments. <i>Ludek Zavesky, Eva Jandakova, Radovan Turyna, Daniela Duskova, Lucie Langmeierova, Vit Weinberger, Lubos Minar, Ales Horinek, and Milada Kohoutova</i>	99
9 Peptide-Based Isolation of Argonaute Protein Complexes Using Ago-APP <i>Judith Hauptmann and Gunter Meister</i>	107
10 Predicting Functional MicroRNA-mRNA Interactions <i>Zixing Wang and Yin Liu</i>	117
11 Computational and Experimental Identification of Tissue-Specific MicroRNA Targets <i>Rabeleh Amirkhah, Hojjat Naderi Meshkin, Ali Farazmand, John E.J. Rasko, and Ulf Schmitz</i>	127

12	sRNAtoolboxVM: Small RNA Analysis in a Virtual Machine	149
	<i>Cristina Gómez-Martín, Ricardo Lebrón, Antonio Rueda, José L. Oliver, and Michael Hackenberg</i>	
13	An Assessment of the Next Generation of Animal miRNA Target Prediction Algorithms	175
	<i>Thomas Bradley and Simon Moxon</i>	
14	The UEA Small RNA Workbench: A Suite of Computational Tools for Small RNA Analysis	193
	<i>Irina Mohorianu, Matthew Benedict Stocks, Christopher Steven Applegate, Leighton Folkes, and Vincent Moulton</i>	
15	Prediction of miRNA–mRNA Interactions Using miRGate	225
	<i>Eduardo Andrés-León, Gonzalo Gómez-López, and David G. Pisano</i>	
16	Detection of microRNAs Using Chip-Based QuantStudio 3D Digital PCR . . .	239
	<i>Cristina Borzi, Linda Calzolari, Davide Conte, Gabriella Sozzi, and Orazio Fortunato</i>	
17	MiRNA Quantitation with Microelectrode Sensors Enabled by Enzymeless Electrochemical Signal Amplification	249
	<i>Tanyu Wang, Gangli Wang, Didier Merlin, and Emilie Viennois</i>	
18	A Robust Protocol to Quantify Circulating Cancer Biomarker MicroRNAs	265
	<i>Emma Bell, Hannah L. Watson, Shivani Bailey, Matthew J. Murray, and Nicholas Coleman</i>	
19	MicroRNAs, Regulatory Networks, and Comorbidities: Decoding Complex Systems	281
	<i>Francesco Russo, Kirstine Belling, Anders Boeck Jensen, Flavia Scoyni, Søren Brunak, and Marco Pellegrini</i>	
20	Label-Free Direct Detection of MiRNAs with Poly-Silicon Nanowire Biosensors	297
	<i>Jing He, Jianjun Zhu, Bin Jiang, and Yulan Zhao</i>	
	Erratum to:	E1
	<i>Index</i>	303

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