
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.

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Methods and Protocols

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