Preface

The discovery of microRNAs (miRNAs or miRs) heralded a new and an exciting era in biology and started a new chapter in human gene regulation. The miRNAs, a class of small endogenous noncoding RNAs (~22 nt), fine tune the gene expression at the posttranscriptional level through mainly binding 3′-UTR of mRNAs. They are involved in stem cell self-renewal, cellular development, differentiation, proliferation, and apoptosis.

Small miRNAs have big impacts in cancer development. Among the many miRNAs, a subset of miRNAs were identified as regulators of neoplastic transformation, tumor progression, invasion, and metastasis as well as tumor-initiating cells (cancer stem cells). The widespread deregulation of miRNomes in diverse cancers when compared to normal tissues have been unveiled. The oncomirs (oncogenic miRNAs), TSmiRs (tumor suppressive miRNAs), and MetastamiRs (miRNAs associated to cancer metastasis) comprise an important part of the cancer genome and confer pivotal diagnostic and prognostic significance. Moreover, cancer-associated miRNAs are proving worthwhile for developing effective cancer biomarkers for individualized medicine and potential therapeutic targets.

This book provides the latest and foremost miRNAs knowledge of cancer research applications from scientists all over the world. It is organized in two parts: the first part begins with a general introduction of miRNA biogenesis which is followed by chapters on the computational prediction of new microRNAs in cancer, the innovative technologies for modulating miRNAs of interests, and an overview of miRNA-based therapeutic approaches for cancer treatment. The second part of the book provides experimental and computational procedures in miRNA detection with diverse techniques, miRNA library construction, epigenetic regulation of miNRAs, microRNA::mRNA regulatory networks predicted with computational analysis in cancer cells or tissues, and the principle of designing the miRNA-mimics for miRNA activation. These chapters have been written for practical use in laboratories for graduate students, postdoctoral fellows, and scientists in cancer research. The contributors have shared their most valuable experiences in the translation of miRNA knowledge into cancer research.

MicroRNA is a fast growing field, and microRNA knowledge is a pivotal element of cancer biology. An individual miRNA interferes with a broad range of mRNAs; conversely, a single mRNA could be targeted by a variety of miRNAs. The complexity of miRNA::mRNA interaction is far-reaching and a bit beyond our understanding to date. This book is expected to provide the basic principles of experimental and computational methods for microRNA study in cancer research and provide a firm grounding for those who wish to develop further applications.

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Wei Wu

Calgary, AB, Canada
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