

Preface

In recent years, microRNAs (miRNAs) have been emerged as important players in physiological as well as malignant processes. Early research in developmental timing in *Caenorhabditis elegans* (*C. elegans*) led to the discovery of *lin-4*, the first miRNA gene. Since then, studies have shown that miRNAs can participate in several developmental and disease processes, including embryogenesis, organ development, cellular proliferation, differentiation, developmental timing, cell cycle regulation, stem cell fate determination, aging, host–pathogen interactions, various human diseases, including heart diseases, muscular disorders and neurodegenerative diseases, diabetes, hypertension, renal dysfunction, chronic hepatitis, acquired immune deficiency syndrome (AIDS), autoimmune disorders, cancer, obesity, and apoptosis.

miRNAs are a class of endogenous, small, non-protein-coding RNA molecules (~22 nucleotides), which are novel posttranscriptional regulators of gene expression. Using molecular cloning and bioinformatics prediction strategies, hundreds of miRNAs have been identified in worms, flies, fish, frogs, mammals, and flowering plants. The human genome may encode over 1000 miRNAs, which may target about 60 % of mammalian genes and are abundant in many human cell types. Since we have hundreds of miRNAs, the major challenge is now to understand their specific biological function. In fact, the experimental evidence suggests that signaling pathways could be ideal candidates for miRNA-mediated regulation. It is interesting to note that several studies suggests that miRNAs affect the responsiveness of cells to signaling molecules such as WNT, Notch, TGF- β , and EGFR.

Altered expression of particular miRNAs has been implicated in the onset and development of cancer and could be used as potential biomarkers for disease diagnosis. Recently, many studies have found that miRNAs have crucial regulatory roles in cancer stem cells (CSCs), a kind of tumor initiating cells (TICs) and dormancy. Findings also suggest that DNA methylation may be important in regulating the expression of many miRNAs in several cancer-initiating cells. Several miRNAs are known to be either upregulated or downregulated in CSCs when compared to non-cancerous cells from the same tissues. CSCs are a small subpopulation of cells identified in a variety of tumors and involved in self-renewal, multilineage differentiation, chemoresistance, and tumorigenesis. Therefore, these fields have been highlighted as important advancements due to their potential to further elucidate diseases and therapeutic perspectives.

miRNAs have the capacity to function as oncogenes or tumor suppressors. In addition, due to their small size and molecular properties, we can manipulate them as targets and therapeutics in several diseases, including cancer treatment. *MicroRNA in Development and in the Progression of Cancer* is divided in three parts. It provides a more complete understanding of miRNA function, summarizes the recent progress, provides insights by which miRNAs regulate normal development and diseases (including cancers) and the fate of stem cells. It also presents the prospect of the great potential of miRNAs in CSCs and therapeutic advances for cancer treatment.

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Shree Ram Singh
Pranela Rameshwar

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Singh, S.R.; Rameshwar, P. (Eds.)

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