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Sweta Rani *Editor*

# MicroRNA Profiling

Methods and Protocols

*Second Edition*

 Humana Press

# Microrna Protocols Methods In Molecular Biology

**Alessandro Laganà**



## **Microrna Protocols Methods In Molecular Biology:**

**MicroRNA Profiling** Sweta Rani, 2022-11-28 This second edition provides updated and comprehensive methods on miRNA biogenesis and their role in the development and progression of various human diseases Chapters detail miRNA biogenesis isolating RNA extracellular vesicles EVs circulating miRNAs analyzing miRNA and miRDeep P2 protocols for total RNA isolation from cells cell derived products isolation and characterization of exosomes serum plasma specimens and software tools Written in the successful Methods in Molecular Biology series format chapters include introductions to their respective topics lists of the necessary materials and reagents step by step readily reproducible protocols and notes on troubleshooting and avoiding known pitfalls Authoritative and cutting edge MicroRNA Profiling Methods and Protocols Second Edition aims to provide comprehensive and accessible methods to undergraduate graduate and established scientist

*MicroRNA Protocols* Shao-Yao Ying, 2008-02-04 MicroRNA Protocols provides diverse novel and useful descriptions of miRNAs in several species including plants worms flies fish chicks mice and humans These include some useful adaptations and applications that could be relevant to the wider research community who are already familiar with the identification of miRNAs This volume will stimulate the reader to explore diverse ways to understanding the mechanism in which miRNAs facilitate the molecular aspects of the biomedical research

*MicroRNA Detection and Target Identification* Tamas Dalmay, 2023-01-23 This updated volume reflects new and evolved techniques to study detection profiling and manipulation of microRNAs miRNAs in plants and animals After overviews of how best to detect identify and validate microRNAs the book continues by exploring state of the art protocols for microRNA detection approaches to profile the expression level of microRNAs spatial expression analysis describe in silico analysis of microRNAs and their targets as well as protocols for functional analysis of microRNAs and their targets by CRISPR Cas Written for the highly successful Methods in Molecular Biology series chapters include introductions to their respective topics lists of the necessary materials and reagents step by step and readily reproducible laboratory protocols and tips on troubleshooting and avoiding known pitfalls Authoritative and up to date MicroRNA Detection and Target Identification Methods and Protocols Second Edition aims to ensure successful results in the further study of this vital field

MicroRNA Expression Detection Methods Zhiguo Wang, Baofeng Yang, 2009-12-23 MicroRNAs miRNAs endogenous noncoding regulatory mRNAs of nucleotides have rapidly emerged as the central players in gene expression regulation Owing to their ever increasing implications in the control of various biological and pathological processes miRNAs have now been considered novel biomarkers of various human diseases including cancer viral disease cardiovascular disorders metabolic disturbances etc Particular expression profiles have been associated with particular pathological states Expression profiling of miRNAs have therefore become extremely important not only for fundamentalists but also for clinicians However the methodologies used for detecting protein coding mRNAs cannot be directly applied to miRNAs because of their small size Over the past years researchers have made great efforts to developing

techniques suitable for miRNA detection and quantification a wide spectrum of creative and innovative techniques more than 30 different methods have been invented and validated It has come to the time now to summarize these methods and present them in an orderly manner for better understanding and utilization of these methods to miRNA research and applications In particular the development of methods for quantifying circulating miRNAs opens up a fascinating opportunity for realizing miRNA as diagnostic and prognostic biomarkers of human disease A book on this subject may help boosting up the passion of researchers to further improve the existing techniques and develop more new methods to meet new application needs These considerations prompted us and urged us to undertake the work writing a book focusing on miRNA expression detection methods

*MicroRNA Advances and Application in Plant Biology* Rahul Datta, Meenakshi Sharma, Sachidanand Singh, 2024-11-27 *MicroRNA Advances and Application in Plant Biology* presents a broad range of tools and techniques used for microRNA identification and utilization for diversity analysis in plants crop improvement and gene regulation With expert insights this book addresses those concepts through curated chapters that are well illustrated with informative data tables figures and photographs While biological microRNA database resources have been created for the better understanding of structural and functional properties of primary microRNAs pri-miRNAs to mature microRNAs there remains a need for foundation understanding of how microRNAs may play a very crucial role in a plant lifecycle as an regulatory and stress tolerance molecule There are still many unanswered questions about the structural and functional properties of the microRNAs like the role of microRNA in crop improvement gene regulation stress tolerance disease resistance plant-plant communication and environmental interaction Explains the role of microRNA in biotic and abiotic stress tolerance in horticultural crops Includes both foundational and more advanced information on MicroRNAs in plants Incorporates detailed information on specific microRNA or non-coding RNA gene networks in plant species

Circulating MicroRNAs Nobuyoshi Kosaka, 2016-08-23 microRNAs miRNAs are small non-coding RNAs that regulate various biological phenomena such as development and homeostasis The dysregulation of miRNA leads to disease progression particularly of cancer In *Circulating MicroRNAs Methods and Protocols* expert researchers in the field detail recent advances in the isolation purification and analysis of circulating miRNAs from a variety of sources for research The book is divided into three main topics The first section involves the study of secretory miRNAs in cell-cell communication and the second the study of circulating miRNAs in body fluids The last describes the novel techniques used to study circulating miRNAs Written in the highly successful *Methods in Molecular Biology*™ series format chapters include introductions to their respective topics lists of the necessary materials and reagents step-by-step readily reproducible laboratory protocols and key tips on troubleshooting and avoiding known pitfalls Authoritative and practical *Circulating MicroRNAs Methods and Protocols* seeks to aid scientists in dealing with the recent advances of RNAi technology from the bench to the bedside

*Plant MicroRNAs* Stefan de Folter, 2025-05-16 This second volume is a collection of new and updated protocols to study miRNA functions in plants

Chapters guide readers from the identification and detection of plant miRNAs bioinformatic analyses to strategies for functional analysis of miRNAs and their targets Furthermore it contains a few introductory chapters on plant miRNA functioning and on their conservation and evolution Written in the format of the highly successful Methods in Molecular Biology series each chapter includes an introduction to the topic lists necessary materials and reagents includes tips on troubleshooting and known pitfalls and step by step readily reproducible protocols Authoritative and cutting edge Plant MicroRNAs Methods and Protocols Second Edition aims to provide protocols to help new researchers while also supporting established researchers to broaden the scope of their investigations Issues in Life Sciences—Molecular Biology: 2012 Edition ,2013-01-10 Issues in Life Sciences Molecular Biology 2012 Edition is a ScholarlyEditions eBook that delivers timely authoritative and comprehensive information about Molecular Biology The editors have built Issues in Life Sciences Molecular Biology 2012 Edition on the vast information databases of ScholarlyNews You can expect the information about Molecular Biology in this eBook to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Life Sciences Molecular Biology 2012 Edition has been produced by the world s leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at <http://www.ScholarlyEditions.com> **mRNA Decay** Maxime Wery,2024-11-13 This detailed volume explores techniques for researching the diverse and specialized mechanisms for mRNA degradation both in the cytoplasm and the nucleus From classical methods for studying RNA degradation at the single RNA level to the latest transcriptome wide approaches involving long read sequencing and metabolic labeling this book focuses on methods for eukaryotic models such as procedures for studying deadenylation decapping and exoribonuclease activity assessing RNA decay rate characterizing RNA degradation intermediates RNA proteins interactions and more Written for the highly successful Methods in Molecular Biology series chapters include introductions to their respective topics lists of the necessary materials and reagents step by step and readily reproducible laboratory protocols and tips on troubleshooting and avoiding known pitfalls Authoritative and practical mRNA Decay Methods and Protocols provides both new and experienced RNA researchers with an inspiring collection of protocols to prompt further investigation of these vital degradation pathways *MicroRNA in Regenerative Medicine* Chandan K. Sen,2023-05-08 Regulating virtually all biological processes the genome s 2 654 newly discovered variants of mature microRNAs short ribonucleic acid molecules found in eukaryotic cells hold a key role in the body s toolkit of regenerative and reparative capacities Identifying how to activate and deliver these specialist molecules may aid in the repair and regeneration of major tissue and organ damage in future therapies In MicroRNA and Regenerative Medicine Second Edition over 50 leading experts address foundational and emerging topics in the field Concisely summarizing and

evaluating key findings from new research and their translational application contributors examine current and future significance of clinical research in the miRNA area Coverage encompasses all major aspects of fundamental stem cell and developmental biology including the uses of miRNA in cell and tissue plasticity developmental biology tissue repair and regeneration In particular contributors provide focused coverage of methodologies for regenerative intervention and tissue engineering Topics new to this edition include proteomic changes during tissue repair and regeneration horizontal transfer of miRNAs in tissue regeneration tissue stemness peripheral nerve regeneration miRNA as biomarkers microRNA in pregnancy and embryo development exogenous and diet derived microRNA in tissue development ocular microRNA mitochondrial microRNA sensory hair cell death and regeneration and microRNA in senescence Features chapter contributions from international leaders in the field covering the spectrum from bench to bedside Includes short applied chapters offering focused discussion and practical examples Incorporates multi color text layout with more than 150 color figures to illustrate important findings

**RNA-Based Technologies for Functional Genomics in Plants** Guiliang Tang, Sachin Teotia, Xiaoqing Tang, Deepali Singh, 2021-04-11 This book offers a unique and comprehensive overview of key RNA based technologies as well as their development and applications for the functional genomics of plant coding and non coding genes It focuses on the latest as well as classical RNA based techniques used for studies on small RNAs long non coding RNAs and protein coding genes These techniques chiefly focus on target mimics TMs and short tandem target mimics STTMs for small RNAs and artificial microRNAs amiRNAs RNA interference RNAi and CRISPR Cas for genes Furthermore the book discusses the latest trends in the field and various modifications of the above mentioned approaches and explores how these RNA based technologies have been developed applied and validated as essential technologies in plant functional genomics RNA based technologies their mechanisms of action their advantages and disadvantages and insights into the further development and applications of these technologies in plants are discussed These techniques will enable the users to functionally characterize genes and small RNAs through silencing overexpression and editing Gathering contributions by globally respected experts the book will appeal to students teachers and scientists in academia and industry who are interested in horticulture genetics pathology entomology physiology molecular genetics and breeding in vitro culture genetic engineering and functional genomics

**miRNAomics and Stress Management in Plants** Peerzada Yasir Yousuf, Peerzada Arshid Shabir, Khalid Rehman Hakeem, 2024-10-02 Plants being sessile are negatively affected by the biotic and abiotic environmental stresses reducing plant growth productivity and quality to a larger extent Plants have evolved different physiological biochemical and molecular mechanisms to combat these stress conditions to maintain their growth development and productivity Understanding the mechanisms involved in the plant response to stress conditions is the foremost step in the development of stress tolerant plants One of the important adaptations to stress conditions is the precise and fine regulation of gene expression in both time and space Although gene regulation occurs at different levels through

different mechanisms the most crucial is at the level of transcription One of the important posttranscriptional gene regulatory mechanisms used by the plants to restore and maintain cellular homeostasis during the stress conditions are microRNAs MicroRNAs a group of approximately 22 nucleotide long non coding RNAs have recently been identified as a new class of regulators governing gene expression at the post transcriptional level MiRNAs can silence genes either by guiding the degradation of the target mRNAs or by repressing the mRNA translation Plant miRNAs have been demonstrated to regulate many genes involved in various developmental processes for example auxin signaling organ polarity radial patterning developmental transitions and secondary metabolism regulation Moreover increasing evidence indicates the role of plant miRNA guided gene regulation in response to biotic and abiotic stresses High throughput sequencing approaches have significantly elucidated the identification and functional characterization of numerous miRNAs in plants Understanding the role and mechanism of action of miRNAs during abiotic and biotic stresses can potentially offer new approaches to improve plant growth and productivity This unique book covers the different aspects of plant microRNAomics including the discovery biogenesis role in different stress conditions and applications of microRNAs in developing stress tolerant plants Chapters cover the updated knowledge in the field of plant microRNA research The book miRNAomics and Stress Management in Plants intends to demonstrate the breadth of research and the significant advances that have been made in understanding the role of miRNAs in the plant development and stress management This comprehensive volume will be of value to plant physiologists plant biochemists geneticists molecular biologists agronomists environmental researchers and graduate and undergraduate students of plant science

#### **Epigenetics and DNA Damage** Miriam Galvonas

Jasiulionis, 2022-08-14 Although scientists recognize the role of epigenetic mechanisms in DNA damage response the complex mechanistic interplay between chromatin regulation and DNA repair is still poorly understood Comprehending how these processes are connected in time and space and play out in developmental processes may reveal novel directions for new research and disease treatment Epigenetics and DNA Damage a new volume in the Translational Epigenetics series offers a thorough grounding in the relationship between DNA Damage epigenetic modifications and chromatin regulation Early chapters address the basic science of DNA damage and its association with various epigenetic mechanisms including DNA methylation post translational histone modifications histone variants chromatin remodeling miRNAs and lncRNAs This is followed by a close discussion of DNA damage and epigenetics in metabolism aging cellular differentiation immune function stem cell biology and cancer tying recent research to translational application in disease understanding Later chapters examine possible epigenetic therapies combining DNA damage induction and epigenetic alteration as well as instructive chapters on how to analyze DNA damage and epigenetic alterations in new research Offers a thorough foundation in epigenetics and DNA damage research as well as informed discussion of evolving research trends disease findings and early therapeutics Features chapter contributions from leading international contributors Empowers scientists to apply protocols

in DNA damage and epigenetic alteration analysis and experimentation in their own research Cancer Evolution: From Biological Insights to Therapeutic Opportunities Marco Mina, Lorenzo Gerratana, Andrew Davis, 2022-09-20 **MicroRNA and Cancer** Wei Wu, 2018 This volume details basic principles of experimental and computational methods for the study of microRNAs in cancer research and therefore provides a firm grounding for those who wish to develop further applications Written in the highly successful *Methods in Molecular Biology* series format chapters include introductions to their respective topics lists of the necessary materials and reagents step by step readily reproducible laboratory protocols and tips on troubleshooting and avoiding known pitfalls Authoritative and cutting edge *MicroRNA and Cancer Methods and Protocols* Second Edition aims to ensure successful results in the further study of this vital field *New and Emerging Proteomic Techniques* Dobrin Nedelkov, Randall W. Nelson, 2008-02-04 Leading researchers and innovators describe in step by step detail the latest techniques that promise to significantly impact the practice of proteomics as well as its success in developing novel clinical agents The methods span the entire spectrum of top down and bottom up approaches including microarrays gels chromatography and affinity separations and address every aspect of the human proteome both quantitatively and qualitatively The techniques of protein detection utilized are diverse and range from fluorescence and resonance light scattering to surface plasmon resonance and mass spectrometry The protocols follow the successful *Methods in Molecular Biology*™ series format each offering step by step laboratory instructions an introduction outlining the principles behind the technique lists of the necessary equipment and reagents and tips on troubleshooting and avoiding known pitfalls

*Evolutionary Genomics and Systems Biology* Gustavo Caetano-Anollés, 2011-09-26 A comprehensive authoritative look at an emergent area in post genomic science Evolutionary genomics is an up and coming complex field that attempts to explain the biocomplexity of the living world Evolutionary Genomics and Systems Biology is the first full length book to blend established and emerging concepts in bioinformatics evolution genomics and structural biology with the integrative views of network and systems biology Three key aspects of evolutionary genomics and systems biology are covered in clear detail the study of genomic history i e understanding organismal evolution at the genomic level the study of macromolecular complements which encompasses the evolution of the protein and RNA machinery that propels life and the evolutionary and dynamic study of wiring diagrams macromolecular components in interaction in the context of genomic complements The book also features A solid comprehensive treatment of phylogenomics the evolution of genomes and the evolution of biological networks within the framework of systems biology A special section on RNA biology translation evolution of structure and micro RNA and regulation of gene expression Chapters on the mapping of genotypes to phenotypes the role of information in biology protein architecture and biological function chromosomal rearrangements and biological networks and disease Contributions by leading authorities on each topic Evolutionary Genomics and Systems Biology is an ideal book for students and professionals in genomics bioinformatics evolution structural biology complexity origins of life systematic

biology and organismal diversity as well as those individuals interested in aspects of biological sciences as they interface with chemistry physics and computer science and engineering

**Liver Cancer - Multidisciplinary Approach** Georgios Tsoulfas,2024-09-11 Hepatocellular carcinoma HCC represents one of the most significant health issues globally given its high prevalence and challenging nature of liver physiology and hepatic surgery This means that the most appropriate management of HCC should include a multidisciplinary approach combining expertise from various specialties This book showcases the steps involved in the development diagnosis staging and management of HCC and provides us with the views and thoughts of true experts in the field As such it is a useful companion for any physician or surgeon whether training or practicing who is interested in caring for these patients

**Bioanalytics** Friedrich Lottspeich,Joachim W. Engels,2018-05-29 Analytical methods are the essential enabling tools of the modern biosciences This book presents a comprehensive introduction into these analytical methods including their physical and chemical backgrounds as well as a discussion of the strengths and weakness of each method It covers all major techniques for the determination and experimental analysis of biological macromolecules including proteins carbohydrates lipids and nucleic acids The presentation includes frequent cross references in order to highlight the many connections between different techniques The book provides a bird s eye view of the entire subject and enables the reader to select the most appropriate method for any given bioanalytical challenge This makes the book a handy resource for students and researchers in setting up and evaluating experimental research The depth of the analysis and the comprehensive nature of the coverage mean that there is also a great deal of new material even for experienced experimentalists The following techniques are covered in detail Purification and determination of proteins Measuring enzymatic activity Microcalorimetry Immunoassays affinity chromatography and other immunological methods Cross linking cleavage and chemical modification of proteins Light microscopy electron microscopy and atomic force microscopy Chromatographic and electrophoretic techniques Protein sequence and composition analysis Mass spectrometry methods Measuring protein protein interactions Biosensors NMR and EPR of biomolecules Electron microscopy and X ray structure analysis Carbohydrate and lipid analysis Analysis of posttranslational modifications Isolation and determination of nucleic acids DNA hybridization techniques Polymerase chain reaction techniques Protein sequence and composition analysis DNA sequence and epigenetic modification analysis Analysis of protein nucleic acid interactions Analysis of sequence data Proteomics metabolomics peptidomics and toponomics Chemical biology

**RNA Amplification and Analysis** Mekbib Astatke,2024-06-22 This volume provides methods to analyze RNA and gain insight to a number of critical cellular functions Chapters detail RNA isolation and enrichment RNA amplification and detection RNA sequencing analysis of RNA modification RNA delivery approaches and analysis of RNA binding and catalytic activity Written in the highly successful Methods in Molecular Biology series format chapters include introductions to their respective topics lists of the necessary materials and reagents step by step readily reproducible laboratory protocols and key tips on troubleshooting and avoiding known pitfalls

Authoritative and cutting edge RNA Amplifications and Analysis Methods and Protocols aims to present researchers with cutting edge technologies with detailed explanations of critical steps while providing a clear understanding of the overall protocol

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