

**17** Nucleic Acids and Molecular Biology  
Hans Joachim Gross (Ed.)

# Small RNAs

## Analysis and Regulatory Functions

Wolfgang Nellen  
Christian Hammann (Eds.)



 Springer

# Small Rnas Analysis And Regulatory Functions

**Yule Liu,Feng Li,Jian-Zhong Liu**



## **Small Rnas Analysis And Regulatory Functions:**

Small RNAs: Wolfgang Nellen,Christian Hammann,2007-11-10 In recent years the discovery of functional small RNAs has brought about an unprecedented revolution within the field of molecular biology This volume describes strategies for the discovery and validation of small RNAs It provides a snapshot of our current understanding of the different mechanisms triggered by small RNAs and the variations encountered in different organisms

**Roles of Regulatory RNAs in Bacterial Pathogens** Olga Soutourina,Florence Hommais,2022-07-07

The Chlamydomonas Sourcebook Ursula Goodenough,2023-02-15 The Chlamydomonas Sourcebook 3rd Edition Introduction to Chlamydomonas and Its Laboratory Use Volume 1 The gold standard reference covering the basic biology of the Chlamydomonas alga and techniques for its laboratory analysis Originally published as the standalone Chlamydomonas Sourcebook then expanded as the first volume in a three part comprehensive gold standard reference The Chlamydomonas Sourcebook Introduction to Chlamydomonas and Its Laboratory Use has been fully revised and updated to include a wealth of new resources for the Chlamydomonas community Early chapters cover current understandings of its taxonomy ultrastructure cell and life cycles and nuclear and organelle genomes followed by technique oriented chapters covering such topics as cell culture mutagenesis genetic analysis construction of mutant libraries and protein localization using immunofluorescence This volume presents the latest in research and best practices making it a must have resource for researchers and students working in plant science and photosynthesis fertility mammalian vision and biochemistry crop scientists plant physiologists and plant molecular and human disease biologists Remains the only complete reference to provide both the historical background and the most up to date information and applications on Chlamydomonas Includes best practices for applications in research including methods for culture genetic analysis genomic and transcriptomic analysis and mutant screening Helps researchers solve common laboratory problems provides details on the properties of particular strains and offers a comprehensive survey of molecular approaches Provides a broad perspective for studies in cell and molecular biology genetics plant physiology and related fields

**RNA Structure and Function** Jan Barciszewski,2023-11-03 This book focuses on the current status of our understanding of RNA a key biological molecule The various RNAs covered are messenger RNA ribosomal RNA transfer RNA noncoding RNAs modified nucleosides and RNA enzymes The different chapters detail methods to investigate RNA structure and function the chemistry of modified RNAs and the latest advances in our understanding of the vast array of biological processes in which RNA is involved RNA in one form or another touches almost everything in a cell RNA has both structural and catalytic properties RNA fulfills a broad range of functions These molecules are no longer seen as passive elements transferring the genetic information from DNA into proteins but regulate the activity of genes during development cellular differentiation and changing environments RNAs are involved in various aspects of cell physiology and disease development Discoveries of RNA with unexpected diverse functions in healthy and diseased cells such as the role of RNA as both the

source and countermeasure to cancer or severe viral infection stimulate new trends passion and solutions for molecular medicine In this book fundamental questions about the biochemical and genetic importance of RNA how mRNAs are generated and used to produce proteins how noncoding and catalytic RNAs mediate key cellular processes how to determine RNA structure and how to apply RNA in treatment of diseases This book is an essential resource for researches in academia and industry contributing to the development of new RNA therapeutics The book is geared toward scientists from the graduate level on up and particularly appeals to active investigators in RNA biology molecular biology and biochemistry

**MicroRNAs in Plant Development and Stress Responses** Ramanjulu Sunkar,2012-02-22 Precise regulation of gene expression in both time and space is vital to plant growth development and adaptation to biotic and abiotic stress conditions This is achieved by multiple mechanisms with perhaps the most important control being exerted at the level of transcription However with the recent discovery of microRNAs another ubiquitous mode of gene regulation that occurs at the post transcriptional level has been identified MicroRNAs can silence gene expression by targeting complementary or partially complementary mRNAs for degradation or translational inhibition Recent studies have revealed that microRNAs play fundamental roles in plant growth and development as well as in adaptation to biotic and abiotic stresses This book highlights the roles of individual miRNAs that control and regulate diverse aspects of plant processes Roles and regulatory mechanisms of microRNA in plant development, evolution, and adaptation Lei Li,Xiuren Zhang,Xiaozeng

Yang,Turgay Unver,2022-09-23 Regulatory RNAs Bibekanand Mallick,Zhumur Ghosh,2012-02-02 Recent progress in high throughput technologies and genome wide transcriptome studies have lead to a significant scientific milestone of discovering non coding RNAs ncRNAs which spans through a major portion of the genome These RNAs most often act as riboregulators and actively participate in the regulation of important cellular functions at the transcriptional and or post transcriptional levels rather than simply being an intermediated messenger between DNA and proteins As the appreciation for the importance of ncRNAs continues to emerge it is also increasingly clear that these play critical roles in gene regulatory processes during development and differentiation Further regulatory RNAs are useful biomarkers for diagnosis of diseases Hence these RNA regulators are essential to the development of therapeutics This book on Regulatory RNAs offers a comprehensive view on our current understanding of these regulatory RNAs viz siRNA miRNA piRNA snoRNA long non coding RNA small RNA etc It addresses both the biogenesis and mechanism of action of regulatory RNAs with a primary focus on their annotation experimental methodologies microarray next gen sequencing etc for their discovery computational tools for their prediction and above all applications of these revolutionary regulatory molecules in understanding biological systems and diseases including therapeutics This comprehensive volume is intended for readers with research or teaching interests in ncRNA biology and will provide a major information resource on current research in the fast moving fields of RNA and gene expression regulation Cutting edge and concise Regulatory RNAs Basics Methods and Applications promises

to support vital research in the field of regulatory RNAs ever continuing to grow rapidly and gain increasing importance in basic and translational biology Mycobacteria and the Macrophage Suzie Hingley-Wilson, Samantha Leigh Sampson, Sangeeta Tiwari, 2023-12-28 The macrophage or big eater is often considered the first cell type to encounter the causative agent of Tuberculosis TB Mycobacterium tuberculosis upon entry to the lung Once inside the macrophage the tubercle bacillus can survive and even replicate where many other invading pathogens perish Recent research suggests the bacilli adapts within this hostile environment treating the macrophage like a Trojan horse Indeed cutting edge techniques have revealed that the degree of bacterial heterogeneity and resistance to antibiotics changes within the macrophage M tuberculosis spends most of its life cycle within the macrophage and has adopted specific mechanisms to survive egress and to recruit more of this niche cell eg the Type VII secretion system ESX 1 Understanding the host pathogen interaction in tuberculous infection is key to understanding TB which remains the number one cause of death from a bacterial infection In this research topic we aim to cover advances in understanding how the tubercle bacillus adapts and survives within the host cell Determining the responsible mechanisms may reveal novel ways to target this deadly pathogen and halt its adaptation and transformation within these potentially destructive or permissive cells **Computational Non-coding RNA Biology**

Yun Zheng, 2018-09-14 Computational Non coding RNA Biology is a resource for the computation of non coding RNAs The book covers computational methods for the identification and quantification of non coding RNAs including miRNAs tasiRNAs phasiRNAs lariat originated circRNAs and back spliced circRNAs the identification of miRNA siRNA targets and the identification of mutations and editing sites in miRNAs The book introduces basic ideas of computational methods along with their detailed computational steps a critical component in the development of high throughput sequencing technologies for identifying different classes of non coding RNAs and predicting the possible functions of these molecules Finding quantifying and visualizing non coding RNAs from high throughput sequencing datasets at high volume is complex Therefore it is usually possible for biologists to complete all of the necessary steps for analysis Presents a comprehensive resource of computational methods for the identification and quantification of non coding RNAs Introduces 23 practical computational pipelines for various topics of non coding RNAs Provides a guide to assist biologists and other researchers dealing with complex datasets Introduces basic computational methods and provides guidelines for their replication by researchers Offers a solution to researchers approaching large and complex sequencing datasets Stress and Environmental Regulation of Gene

Expression and Adaptation in Bacteria Frans J. de Bruijn, 2016-07-01 Bacteria in various habitats are subject to continuously changing environmental conditions such as nutrient deprivation heat and cold stress UV radiation oxidative stress dessication acid stress nitrosative stress cell envelope stress heavy metal exposure osmotic stress and others In order to survive they have to respond to these conditions by adapting their physiology through sometimes drastic changes in gene expression In addition they may adapt by changing their morphology forming biofilms fruiting bodies or spores filaments

Viable But Not Culturable VBNC cells or moving away from stress compounds via chemotaxis Changes in gene expression constitute the main component of the bacterial response to stress and environmental changes and involve a myriad of different mechanisms including alternative sigma factors bi or tri component regulatory systems small non coding RNA s chaperones CHRIS Cas systems DNA repair toxin antitoxin systems the stringent response efflux pumps alarmones and modulation of the cell envelope or membranes to name a few Many regulatory elements are conserved in different bacteria however there are endless variations on the theme and novel elements of gene regulation in bacteria inhabiting particular environments are constantly being discovered Especially in pathogenic bacteria colonizing the human body a plethora of bacterial responses to innate stresses such as pH reactive nitrogen and oxygen species and antibiotic stress are being described An attempt is made to not only cover model systems but give a broad overview of the stress responsive regulatory systems in a variety of bacteria including medically important bacteria where elucidation of certain aspects of these systems could lead to treatment strategies of the pathogens Many of the regulatory systems being uncovered are specific but there is also considerable cross talk between different circuits Stress and Environmental Regulation of Gene Expression and Adaptation in Bacteria is a comprehensive two volume work bringing together both review and original research articles on key topics in stress and environmental control of gene expression in bacteria Volume One contains key overview chapters as well as content on one two three component regulatory systems and stress responses sigma factors and stress responses small non coding RNAs and stress responses toxin antitoxin systems and stress responses stringent response to stress responses to UV irradiation SOS and double stranded systems repair systems and stress adaptation to both oxidative and osmotic stress and desiccation tolerance and drought stress Volume Two covers heat shock responses chaperonins and stress cold shock responses adaptation to acid stress nitrosative stress and envelope stress as well as iron homeostasis metal resistance quorum sensing chemotaxis and biofilm formation and viable but not culturable VBNC cells Covering the full breadth of current stress and environmental control of gene expression studies and expanding it towards future advances in the field these two volumes are a one stop reference for non medical molecular geneticists interested in gene regulation under stress

**Regulatory RNAs in the Nervous System, 2nd Edition** Tommaso Pizzorusso, Alessandro Cellerino, Laure Bally-Cuif, 2018-11-13 Until about a decade ago the non coding part of the genome was considered without function RNA sequencing studies have shown however that a considerable part of the non coding genome is transcribed and that these non coding RNAs nc RNAs can regulate gene expression Almost on weekly basis new findings reveal the regulatory role of nc RNAs exert in many biological processes Overall these studies are making increasingly clear that both in model organisms and in humans complexity is not a function of the number of protein coding genes but results from the possibility of using combinations of genetic programs and controlling their spatial and temporal regulation during development senescence and in disease by regulatory RNAs This has generated a novel picture of gene regulatory networks where regulatory nc RNAs

represent novel layers of regulation. Particularly well characterized is the role of microRNAs (miRNAs), small non-coding RNAs that bind to mRNAs and regulate gene expression after transcription. This message is particularly clear in the nervous system where miRNAs have been involved in regulating cellular pathways controlling fundamental functions during development, synaptic plasticity, and in neurodegenerative disease. It has also been shown that neuronal miRNAs are tightly regulated by electrical activity at the level of transcription, biogenesis, stability, and specifically targeted to dendrites and synapses. Deregulation of expression of miRNAs is proposed not only as a potential disease biomarker but it has been implicated directly in the pathogenesis of complex neurodegenerative disease. This so-called RNA revolution also led to the exploitation of RNA interference and the development of related tools as potential treatment of a vast array of CNS disease that could benefit from regulation of disease-associated genes. In spite of these advancements, the relatively young age of this field together with the inherent high molecular complexity of RNA regulation of biological processes have somewhat hindered its communication to the whole of the neuroscience community. This Research Topic aims at improving this aspect by putting around the same virtual table scientists covering aspects ranging from basic molecular mechanisms of regulatory RNAs in the nervous system to the analysis of the role of specific regulatory RNAs in neurobiological processes of development, plasticity, and aging. Furthermore, we included papers analyzing the role of regulatory RNAs in disease models from neuromuscular to higher cognitive functions and more technically oriented papers dealing with new methodologies to study regulatory RNA biology and its translational potential.

*Molecular Function and Regulation of Non-coding RNAs in Multifactorial Diseases* Mohammadreza Hajjari, Seyed Javad Mowla, Mohammad Ali Faghihi, 2016-12-14. Our understanding of the mechanisms underlying the development of multifactorial diseases such as diabetes, autism, Alzheimer's disease, and cancer has been greatly advanced. Non-coding RNAs (ncRNAs), generally including microRNAs and long non-coding RNAs, have recently been found to have potential roles in these diseases and provide new opportunities for developing both specific biomarkers and therapeutic targets. However, the molecular function and regulation of these RNAs still remains challenging. Numerous studies are focusing on this field in order to fully appreciate the role and regulation of these molecules in human medicine and biology. This e-book aims to bring together new findings on non-coding RNAs in different complex diseases. It will highlight the characterization, roles, mechanism, and mode of action of these RNAs in complex disorders. We believe that the publications on this topic would be exponentially extended in the future. The improved approaches at multiple levels may pave the way for designing and applying new biomarkers and therapeutic targets for specific diseases based on these attractive molecules.

**Plant Immunity against Viruses** Yule Liu, Feng Li, Jian-Zhong Liu, 2017-09-28. Plant viruses impose a serious threat on agriculture which motivates extensive breeding efforts for viral-resistant crops and inspires lasting interests on basic research to understand the mechanisms underlying plant immunity against viruses. Viruses are obligate intracellular parasites. Their genomes are usually small and only encode a few products that are essential to hijack host

machinery for their nucleotide and protein biosynthesis and that are necessary to suppress host immunity. Plants evolved multilayers of defense mechanisms to defeat viral infection. In this research topic we gathered 13 papers covering recent advances in different aspects of plant immunity against viruses including reviews on RNA silencing and R gene based immunity and their application. Translational initiation factor mediated recessive resistance, genome editing based viral immunity, role of chloroplast in plant virus interaction and research articles providing new mechanistic insights on plant virus interactions. We hope that this Research Topic helps readers to have a better understanding of the progresses that have been made recently in plant immunity against viruses. A deeper understanding of plant antiviral immunity will facilitate the development of innovative approaches for crop protections and improvements.

**Non-coding RNAs and Cancer** Muller Fabbri, 2013-10-28 The discovery of microRNAs and its role as gene expression regulators in human carcinogenesis represents one of the most important scientific achievements of the last decade. More recently other non coding RNAs have been discovered and its implications in cancer are emerging as well suggesting a broader than anticipated involvement of the non coding genome in cancer. Moreover completely new and unexpected functions for microRNAs are being revealed leading to the identification of new anticancer molecular targets. This book represents a comprehensive guide on non coding RNAs and cancer spanning from its role as cancer biomarkers to providing the most useful bioinformatic tools to presenting some of the most relevant discoveries which indicates how these fascinating molecules act as fine orchestrators of cancer biology.

**Regulatory RNAs** Bruce Stillman, David Johnston Stewart, 2006 Explores how the application of RNA technologies combined with a growing understanding of the molecular basis of many RNA processes is yielding new insights into the treatment of many human diseases.

**Encyclopedia of Microbiology** Thomas M. Schmidt, 2019-09-11 Encyclopedia of Microbiology Fourth Edition Five Volume Set gathers both basic and applied dimensions in this dynamic field that includes virtually all environments on Earth. This range attracts a growing number of cross disciplinary studies which the encyclopedia makes available to readers from diverse educational backgrounds. The new edition builds on the solid foundation established in earlier versions adding new material that reflects recent advances in the field. New focus areas include Animal and Plant Microbiomes and Global Impact of Microbes. The thematic organization of the work allows users to focus on specific areas e.g. for didactical purposes while also browsing for topics in different areas. Offers an up to date and authoritative resource that covers the entire field of microbiology from basic principles to applied technologies. Provides an organic overview that is useful to academic teachers and scientists from different backgrounds. Includes chapters that are enriched with figures and graphs and that can be easily consulted in isolation to find fundamental definitions and concepts.

**Regulating with RNA in Bacteria and Archaea** Gisela Storz, Kai Papenfort, 2020-07-10 Revealing the many roles of RNA in regulating gene expression. For decades after the discoveries of messenger RNA, transfer RNA and ribosomal RNA it was largely assumed that the role of RNA in the cell was limited to shuttling the genomic message, chaperoning amino acids and toiling in the



ribosomes Eventually hints that RNA molecules might have regulatory roles began to appear With the advent of genomics and bioinformatics it became evident that numerous other RNA forms exist and have specific functions including small RNAs sRNA RNA thermometers and riboswitches to regulate core metabolic pathways bacterial pathogenesis iron homeostasis quorum sensing and biofilm formation All of these functions and more are presented in *Regulating with RNA in Bacteria and Archaea* written by RNA biologists from around the globe Divided into eight sections RNases and Helicases Cis Acting RNAs Cis Encoded Base Pairing RNAs Trans Encoded Base Pairing RNAs Protein Titration and Scaffolding General Considerations Emerging Topics and Resources this book serves as an excellent resource for established RNA biologists and for the many scientists who are studying regulated cellular systems It is no longer a fair assumption that gene expression regulation is the provenance of proteins only or that control is exerted primarily at the level of transcription This book makes clear that regulatory RNAs are key partners along with proteins in controlling the complex interactions and pathways found within prokaryotes [Biomedical Index to PHS-supported Research](#) ,1988

**Abiotic Stress Adaptation and Tolerance Mechanisms in Crop Plants** Jiban Shrestha, Ji-Hong Liu, Bhaskar Gupta, Mirza Hasanuzzaman, 2024-06-27 Agricultural communities are being affected by climate change Droughts heat waves cold snaps and flooding are all regarded as severe threats to crop production as they hinder plant growth and development resulting in yield losses Plants respond to stress through a complex process that includes changes in physiological and biochemical processes gene expression and alterations in the amounts of metabolites and proteins at different developmental stages This special issue will focus on recent advances in the use of various traditional and modern biotechnological strategies to understand stress adaptation and tolerance mechanisms including but not limited to genomics transcriptomics metabolomics proteomics miRNA genome editing transgenic plants exogenous application of plant growth regulators and so on Abiotic stress is a key constraint to agricultural production around the world Water deficit excess precipitation high and low temperature and salinity are the most prevalent abiotic stresses Compaction mineral availability and pH related stressors are among the others This Research Topic aims to highlight the most recent breakthroughs in plant responses to abiotic stresses and adaptation tolerance strategies This special issue provides the advanced toolkit and technologies that are used to investigate and understand plant responses to abiotic stress The purpose of this special issue is to give a platform for scientists and academics from across the world to promote share and discuss new concerns and advancements in the field of abiotic stress in plants Current updates and recent developments in the physiological molecular and genetic perspectives on combined and sequential stress responses and tolerance in field crops are expected in articles Original research and review articles dealing with abiotic stress are welcomed In this special issue potential topics include but are not limited to Physiological biochemical and molecular responses of plants under abiotic stress Systems biology approaches to study abiotic stress in crop plants Phenotyping for abiotic stress tolerance in crops Physiological and molecular characterization of crop tolerance to abiotic stresses Molecular

breeding for developing and improving abiotic stress resilience in crops Microbial mitigation of abiotic stress responses in crops Omics technologies for abiotic stress tolerance in plants Performance of novel GMO crops under abiotic stress conditions CRISPR Cas Genome editing tools for the Improvement of abiotic stress tolerance in plants Crop production in abiotic stress conditions

**Plant Viruses, Volume II: Molecular Plant Virus Epidemiology and its Management**

Rajarshi kumar Gaur,Akhtar Ali,Xiaofei Cheng,Kristiina Mäkinen,Bright Agindotan,Xifeng Wang,2021-12-30

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