Medical Epigenetics

Epigenetics in Psychiatry

Regulation of Gene Expression in the Nervous System

Epigenetic Regulation of Oligodendrocyte Development and Regeneration in the Central Nervous System

Epigenetic mechanisms (DNA modifications, histone alterations and non-coding RNAs) are crucial for transcriptional regulation and alterations of the “physiological epigenome” are increasingly associated with human diseases. During the last decade the emerging field of neuroepigenomics have started to impact tremendously in areas such learning and memory, addiction or neurodegeneration. This expert volume covers the role of epigenetic molecular mechanism in regulation of central nervous system’s function, one of the most exciting areas of contemporary molecular neuroscience. The book describes the current knowledge on the epigenetic basis of human disease covering the complete lifespan: from neurodevelopment/childhood (Rett Syndrome, Rubinstein-Taybi, autism), adolescence (eating disorders, drug addiction, anxiety), adulthood (depression, schizophrenia, amyotrophic lateral sclerosis, Huntington’s disease) and elderly (Alzheimer’s disease, Parkinson’s disease). The book also covers the three major players on neuroepigenomic mechanisms: histones alterations, DNA modifications and non-coding RNAs, their roles at the molecular and cellular level and the impact of their alterations on neuronal function and behavior. Finally, a special chapter on state-of-the-art technologies helps the reader not only to understand epigenetic driven changes in human cognition and diseases but also the methodology that will help to generate paradigm shifts on our understanding of brain function and the role of the neuroepigenome in human diseases.

Epigenetic Regulation in the Nervous System Proper cellular development and function is a complex process established by elaborate gene expression networks. These networks are regulated by epigenetic processes, which alter chromatin states and coordinate the binding of transcription factors (TFs) to regulatory elements (RES), such as enhancers, across the genome to facilitate gene expression. It follows then that a major experimental effort is to profile and understand the binding patterns of TFs to RES in various cellular types and contexts. Critically however, current TF profiling techniques are limited in their abilities to profile TF occupancy in targeted cellular populations and temporal windows, hindering investigations into epigenetic control in complex, multicellular systems, such as the brain. This dissertation focuses on two related areas: firstly, the design of new tools for profiling TF genome occupancy in the mouse brain in specific cellular populations and time periods, and secondly, investigating TF-mediated mechanisms of disease pathogenesis in animal models. In Chapter 2, we describe the development of a novel, viral-mediated method, termed adeno-associated virus (AAV) calling cards, for profiling binding sites of TFs across the genome in the live mouse brain. The AAV calling cards approach allows unique access to TF occupancy information that is inaccessible with other existing techniques, including cell type specificity (through Cre-mediated conditional
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Bookmark File PDF Epigenetic Regulation In The Nervous System Basic Mechanisms And Clinical Impact

Autism Medical Epigenetics provides a comprehensive analysis of the importance of epigenetics to health management. The purpose of this book is to fill a current need for a comprehensive volume on the medical aspects of epigenetics with a focus on human systems, epigenetic diseases that affect these systems and modes of treating epigenetic-based disorders and diseases. The intent of this book is to provide a stand-alone comprehensive volume that will cover all human systems relevant to epigenetic maladies and all major aspects of medical epigenetics. The overall goal is to provide the leading book on medical epigenetics that will be useful not only to physicians, nurses, medical students and many others directly involved with health care, but also investigators in life sciences, biotech companies, graduate students and many others who are interested in more applied aspects of epigenetics. Research in the area of translational epigenetics is a cornerstone of this volume. Critical reviews dedicated to the burgeoning role of epigenetics in medical practice Coverage of emerging topics including twin epigenetics as well as epigenetics of gastrointestinal disease, muscle disorders, endocrine disorders, ocular medicine, pediatric diseases, sports medicine, noncoding RNA therapeutics, pain management and regenerative medicine Encompasses a disease-oriented perspective of medical epigenetics as well as diagnostic and prognostic epigenetic approaches to applied medicine

Epigenetic Regulation in the Nervous System Epigenetic Biomarkers and Diagnostics comprises 31 chapters contributed by leading active researchers in basic and clinical epigenetics. The book begins with the basis of epigenetic mechanisms and descriptions of epigenetic biomarkers that can be used in clinical diagnostics and prognostics. It goes on to discuss classical methods and next generation sequencing-based technologies to discover and analyze epigenetic biomarkers. The book concludes with an account of DNA methylation, post-translational modifications and noncoding RNAs as the most promising biomarkers for cancer (i.e. breast, lung, colon, etc.), metabolic disorders (i.e. diabetes and obesity), autoimmune diseases, infertility, allergy, infectious diseases, and neurological disorders. The book describes the challenging aspects of research in epigenetics, and current findings regarding new epigenetic elements and modifiers, providing guidance for researchers interested in the most advanced technologies and tested biomarkers to be used in the clinical diagnosis or prognosis of disease. Focuses on recent progress in several areas of epigenetics, general concepts regarding epigenetics, and the future prospects of this discipline in clinical diagnostics and prognostics Describes the importance of the quality of samples and clinical associated data, and also the ethical issues for epigenetic diagnostics Discusses the advances in epigenomics technologies, including next-generation sequencing based tools and applications Expounds on the utility of epigenetic biomarkers for diagnosis and prognosis of several diseases, highlighting the study of these biomarkers in cancer, cardiovascular and metabolic diseases, infertility, and infectious diseases Includes a special section that discusses the relevance of biobanks in the maintenance of high quality biosamples and clinical-associated data, and the relevance of the ethical aspects in epigenetic studies

Epigenetic Therapy of Cancer

Epigenetic Regulation in the Nervous System Epigenetic Mechanisms And Clinical Impact
analysis of epigenetic signatures that govern disease development, progression and metastasis. Epigenetic signatures dictating tumor etiologies present an opportunity for biomarker identification which has broad potential for improving diagnosis, prognosis, prediction, and risk assessment. This volume offers a unique evaluation of signature differences in childhood, sex-specific and race-specific cancers, and in doing so broadly illuminates the scope of epigenetic biomarkers in clinical environments. Chapters detail the major epigenetic process in humans consisting of DNA methylation, histone modifications and microRNAs (miRNAs) involved in the initiation, progression and metastasis of tumors. Also delineated are recent technologies such as next generation sequencing that are used to identify epigenetic profiles (primarily methylation analysis) in samples (normal, benign and cancerous) and which are highly important to the analysis of epigenetic outcomes. Offers broad coverage that is applicable to audiences in various area of cancer research - population studies, diagnostics, prognosis, prediction, therapy, risk, etc. Provides critical review analysis of the topics that will clarify and delineate the potential roles of epigenetic signatures in cancer management Provides comprehensive coverage of current epigenetic signatures involved in the etiology of various cancers and miRNAs

Brain Development Computational Epigenetics and Diseases, written by leading scientists in this evolving field, provides a comprehensive and cutting-edge knowledge of computational epigenetics in human diseases. In particular, the major computational tools, databases, and strategies for computational epigenetics analysis, for example, DNA methylation, histone modifications, microRNA, noncoding RNA, and ceRNA, are summarized, in the context of human diseases. This book discusses bioinformatics methods for epigenetic analysis specifically applied to human conditions such as aging, atherosclerosis, diabetes mellitus, schizophrenia, bipolar disorder, Alzheimer disease, Parkinson disease, liver and autoimmune disorders, and reproductive and respiratory diseases. Additionally, different organ cancers, such as breast, lung, and colon, are discussed. This book is a valuable source for graduate students and researchers in genetics and bioinformatics, and several biomedical field members interested in applying computational epigenetics in their research. Provides a comprehensive and cutting-edge knowledge of computational epigenetics in human diseases Summarizes the major computational tools, databases, and strategies for computational epigenetics analysis, such as DNA methylation, histone modifications, microRNA, noncoding RNA, and ceRNA Covers the major milestones and future directions of computational epigenetics in various kinds of human diseases such as aging, atherosclerosis, diabetes, heart disease, neurological disorders, cancers, blood disorders, liver diseases, reproductive diseases, respiratory diseases, autoimmune diseases, human imprinting disorders, and infectious diseases

Epigenetic Gene Regulation in the Mammalian Central Nervous System and Its Implications in Rett Syndrome

Epigenetic Regulation in the Nervous System

Epigenetics and Regeneration

Epigenetic Regulation in the Nervous System Chromatin Regulation and Dynamics integrates knowledge on the dynamic regulation of primary chromatin fiber with the 3D nuclear architecture, then connects related processes to circadian regulation of cellular metabolic states, representing a paradigm of adaptation to environmental changes. The final chapters discuss the many ways chromatin dynamics can synergize to fundamentally contribute to the development of complex diseases. Chromatin dynamics, which is strategically positioned at the gene-environment interface, is at the core of disease development. As such, Chromatin Regulation and Dynamics, part of the Translational Epigenetics series, facilitates the flow of information between research areas such as chromatin regulation, developmental biology, and epidemiology by focusing on recent findings of the fast-moving field of chromatin regulation. Presents and discusses novel principles of chromatin regulation and dynamics with a cross-disciplinary perspective Promotes crosstalk between basic sciences and their applications in medicine Provides a framework for future studies on complex diseases by integrating various aspects of chromatin biology with cellular metabolic states, with an emphasis on the dynamic nature of chromatin and stochastic principles Integrates knowledge on the dynamic regulation of primary chromatin fiber with 3D nuclear architecture, then connects related processes to circadian regulation of cellular metabolic states, representing a paradigm of adaptation to environmental changes

Neuroepigenomics in Aging and Disease

Epigenetic Regulation in the Nervous System

Epigenetics of Chronic Pain

Neuroblastoma The mammalian nervous system is a highly intricate network consisting of over a hundred billion specialized cells called neurons. One unique characteristic of neurons is their highly polarized morphology; unlike other cells, neurons project long axonal extensions. These structures allow them to connect and communicate with not only other neurons, but also various cell types in the body and give rise
to all motor, sensory, and higher order function. Because axons can extend up to three feet, they are also vulnerable to injury from sources such as traumatic brain and spinal cord injuries, stroke, or neurodegenerative diseases. Indeed, patients who have experienced these injuries often suffer debilitating, irreversible loss of function. Interestingly, whereas neurons which reside in the central nervous system are incapable of regenerating after axon injury, neurons of the peripheral nervous system activate a robust pro-regenerative response capable of promoting long distance regeneration and functional recovery. The molecular mechanisms which underlie this pro-regenerative response may provide key insights into how a pro-regenerative response could be stimulated in injured central nervous system neurons. A comprehensive overview of the known molecular mechanisms involved in this response is reviewed in Chapter 1. As mammals age, the synaptic connections between neurons mature. Following axon injury in peripheral nervous system neurons, the genes involved in synaptic function are turned off and genes required for inducing axon growth are activated. These widespread epigenetic and transcriptional changes require a coordinated effort of epigenetic and transcriptional regulators including epigenetic modifiers, transcription factors, and microRNAs. In Chapter 2, we demonstrated that these changes are, in part, a result of the rapid downregulation of microRNA-9 which occurs following axon injury. At baseline in adult peripheral nervous system neurons, microRNA-9 is highly expressed and actively represses various genes including REST and UHRF1. When microRNA-9 expression decreases following injury, both REST and UHRF1 increase with UHRF1 also repressing REST and restricting REST expression to a tight temporal window. During this time, REST binds to and represses various genes involved in synaptic function such as ion channels; a process necessary for peripheral nervous system regeneration. This complete published work can be found in Chapter 2. In coordination with epigenetic modifiers such as UHRF1, various transcription factors are activated following axon injury and promote the expression of pro-growth genes. Various studies have worked to identify the transcription factors involved in this process as exogenous overexpression of transcription factors has been shown to confer specific phenotypes of interest, such as the conversion of one cell type to another, when the correct combination of transcription factors is manipulated. To further this work, in Chapter 3 I used bioinformatics analysis to identify 27 transcription factors putatively involved in the establishment of the pro-regenerative response. Using two complimentary in vitro screens, determined which transcription factors were both necessary for peripheral nervous system axon regeneration and sufficient to drive central nervous system axon regeneration. By pairing these results with network-based bioinformatics analysis, we identified Creb1 as a transcription factor which sits atop the pro-regenerative gene regulatory network. Follow-up studies in which we overexpressed Creb1 during optic nerve regeneration demonstrated Creb1 is sufficient to promote central nervous system axon regeneration in vivo. This work provides exciting new insight into the various transcription factors regulating this response as well as their putative genetic relationships.

DNA Modifications in the Brain

Enteric Glia Epigenetic Regulation in the Nervous System addresses current understanding of the roles of epigenetic processes at the molecular/cellular level, their impact on neural development and behavior, and the potential roles of these mechanisms in neurological and psychiatric disorders. This award-winning volume spans molecular epigenetics, development, cellular physiology and biochemistry, synaptic and neural plasticity, and behavioral models, and is unique in covering epigenetically based disorders of the central nervous system. Behavioral epigenetics is the study of how environmental factors alter behavior, addressing the fundamental mechanisms that shape development and individual vulnerability/resilience to adverse behavioral outcomes. By understanding the molecular mechanisms involved in epigenetic modulation, researchers may be able to develop targeted therapies for those individuals in whom it malfunctions. Edited by the most highly regarded leaders in the field, this book offers a comprehensive review of behavioral epigenetics and a balanced treatment of the strengths and weaknesses in experimentation in this area. Covering background material as well as topics of current interest, it serves both as a cutting-edge resource and a foundational reference. The book will benefit neuroscience researchers and graduate students with an interest in the links between gene regulation and behavior, as will clinicians dealing with disorders such as addiction, depression, and schizophrenia. BMA Medical Book Awards 2014 - Highly Commended, Neurology, British Medical Association BMA Medical Book Awards 2014 - First Prize, Neurology, British Medical Association 2013 PROSE Award winner for Best in Reference Works and Best Single Volume Reference in Science from the Association of American Publishers Presents a unified view of epigenetic mechanisms from behavior to genes and everything in between Discusses clinically relevant disorders in the context of epigenetics research, making the volume appealing to clinicians as well as basic scientists Provides numerous practical examples for the new investigator to facilitate implementation of research in neuroepigenetics

Computational Epigenetics and Diseases Recent years have seen spectacular advances in the field of epigenetics. These have attracted the interest of researchers in many fields and evidence connecting epigenetic regulation to brain functions has been accumulating. Neurons daily convert a variety of external stimuli into rapid or long-lasting changes in gene expression. A variety of studies have centered on the molecular mechanisms implicated in epigenetic control and how these may operate in concert. It will be critical to unravel how specificity is achieved. The focus of this volume is on critical epigenetic regulation and chromatin remodeling events that occur in the nervous system and on the presumed mechanisms that operate within neurons to translate them into long-lasting neuronal responses.
Epigenetic Regulation in the Nervous System

Chromatin Regulation and Dynamics Offers an up-to-date account of the latest research findings concerned with the regulatory mechanisms of gene expression in neuronal and glial cells under different conditions. The book explores the cellular and neurobiological aspects of important phenomena of the nervous system and its role in health, disease and injury. Contributions from prominent scientists in the field address a variety of specific topics concerned with gene expression in the nervous system--from growth, hormonal and trophic factors to neural tissue reactions in injury or aging.

Mechanisms of Memory

Epigenetic Biomarkers and Diagnostics Epigenetics in Psychiatry covers all major areas of psychiatry in which extensive epigenetic research has been performed, fully encompassing a diverse and maturing field, including drug addiction, bipolar disorder, epidemiology, cognitive disorders, and the uses of putative epigenetic-based psychotropic drugs. Uniquely, each chapter correlates epigenetics with relevant advances across genomics, transcriptomics, and proteomics. The book acts as a catalyst for further research in this potentially very important and useful area of psychiatry. The elucidation of basic principles of epigenetic biology points to the creation of more optimal and effective therapies for major classes of psychiatric disease. In this regard, epigenetic therapy, the use of drugs to correct epigenetic defects, may help in the pharmacotherapy of patients with these disorders. With time, such advances may eventually point to replacements for psychotropic drugs presently of symptomatic value and low efficacy. Moreover, there is evidence to suggest that other forms of treatment commonly used in the management of psychiatric disorders, like psychotherapy and electroconvulsive therapy, may also act by epigenetic mechanisms. Chapters review fascinating new areas of research across neuronal stem cells, cognitive disorders, and transgenerational epigenetics through drug addiction. Epigenetics in Psychiatry relates broad advances in psychiatric epigenetics to a modern understanding of the genome, transcriptome, and protein catalyzes knowledge discovery in both basic epigenetic biology and clinical application as epigenetic targets for drug discovery.

Epigenetic Regulation in the Nervous System Epigenetics and Regeneration compiles the first foundational reference on epigenetic mechanisms governing tissue development, repair, homeostasis, and regeneration, as well as pathways to employ these mechanisms in clinical practice and translational science. In this book, life science researchers, clinicians, and students will discover an interdisciplinary resource bringing together common themes in the field, background overviews, research methods, recent advances, and opportunities for drug discovery. Throughout this volume, special attention is paid to preclinical and first clinical studies aimed at increasing the regenerative potential of damaged tissues by epigenetic drugs, as well as innovative, discipline spanning strategies to enhance cell reprogramming. As an all-inclusive, evidence-based volume, Epigenetics and Regeneration will stimulate discussion and boost new research in this fascinating and impactful area of translational epigenetics. Provides a foundational overview of epigenetics in regenerative medicine Examines epigenetic components of tissue regeneration for a variety of organ systems and tissue types, as well as current attempts to employ these mechanisms in clinical practice Discusses clinically relevant memory disorders in the context of modern molecular research and includes numerous practical examples.

Epigenetic Regulation in the Nervous System

Stress: Genetics, Epigenetics and Genomics This fully revised second edition provides the only unified synthesis of available information concerning the mechanisms of higher-order memory formation. It spans the range from learning theory, to human and animal behavioral learning models, to cellular physiology and biochemistry. It is unique in its incorporation of chapters on memory disorders, tying in these clinically important syndromes with the basic science of synaptic plasticity and memory mechanisms. It also covers cutting-edge approaches such as the use of genetically engineered animals in studies of memory and memory diseases. Written in an engaging and easily readable style and extensively illustrated with many new, full-color figures to help explain key concepts, this book demystifies the complexities of memory and deepens the reader's understanding. More than 25% new content, particularly expanding the scope to include new findings in translational research. Unique in its depth of coverage of molecular and cellular mechanisms Extensive cross-referencing to Comprehensive Learning and Memory Discusses clinically relevant memory disorders in the context of modern molecular research and includes numerous practical examples.

Epigenetic Regulation in the Nervous System

The enteric nervous system (ENS) is a complex neural network...
Neuroblastoma (NBL) is the most common extracranial solid tumor of childhood, with about 700 new cases of neuroblastoma seen each year in the United States. The 5-year survival rate for children with high-risk NBL is only 50-60%, and this survival rate has not improved over the last 10 years. High-risk patients receive multimodality treatment, including chemotherapy, surgery, radiation therapy, biologic therapy and immunotherapy, all of which are associated with significant morbidity. Recent years have seen many advances in treatment of neuroblastoma, including therapeutic MIBG, immunotherapy, and personalized targeted therapy based on the genetic alterations seen in the tumor. The primary objective of this book is to provide the readers with a comprehensive review of neuroblastoma, from clinical aspects and the currently available treatment to recent advancements and future directions in the field of NBL treatment. The topics and chapters have been compiled keeping in mind a diverse group of readers in different areas of specialty such as pediatric oncology, surgery, radiation oncology, and immunology, as well as physician scientists and therapists, occupational therapists, teachers, nurses and care workers.

Epigenetics, Brain and Behavior DNA Modifications in the Brain: Neuroepigenetic Regulation of Gene Expression begins with an historical overview of the early discoveries surrounding DNA methylation in the mammalian brain and then explores the evidence supporting a role for this epigenetic mechanism in controlling gene expression programs across the lifespan in both normal and diseased states. Chapters describe new directions and technological advances, and provide an overview of what the future holds for this exciting new field. This book is ideal for medical, graduate and advanced undergraduate students, but is also a great resource for researchers who need a broad introduction to the dynamic nature of DNA that sheds light on evolving concepts of gene-environment interaction and their effects on adaptation and neuropsychiatric disease. Provides a comprehensive overview of the many facets of DNA modifications Discusses the impact of this dynamic epigenetic mechanism across brain development and lifespan at behavioral, cognitive, molecular and genetic levels Contains contributions by influential leaders in the field Edited by a Neuroscientist to further promote synthesis between epigenetics, neuroscience, and clinical relevance

Transcriptional and Epigenetic Regulation of Axon Regeneration Epigenetic Gene Expression and Regulation reviews current knowledge on the heritable molecular mechanisms that regulate gene expression, contribute to disease susceptibility, and point to potential treatment in future therapies. The book shows how these heritable mechanisms allow individual cells to establish stable and unique patterns of gene expression that can be passed through cell divisions without DNA mutations, thereby establishing how different heritable patterns of gene regulation control cell differentiation and organogenesis, resulting in a distinct human organism with a variety of differing cellular functions and tissues. The work begins with basic biology, encompasses methods, cellular and tissue organization, topical issues in epigenetic evolution and environmental epigenesis, and lastly clinical disease discovery and treatment. Each highly illustrated chapter is organized to briefly summarize current research, provide appropriate pedagogical guidance, pertinent methods, relevant model organisms, and clinical examples. Reviews current knowledge on the heritable molecular mechanisms that regulate gene expression, contribute to disease susceptibility, and point to potential treatment in future therapies Helps readers understand how epigenetic marks are targeted, and to what extent transgenerational epigenetic changes are instilled and possibly passed onto offspring Chapters are replete with clinical examples to empower the basic biology with translational significance Offers more than 100 illustrations to distill key concepts and decipher complex science

Epigenetic Regulation in the Nervous System This book opens with a discussion of neurodiversity and an elaboration of the diagnosis of autism. It then examines factors correlating with autism, including sex bias, month of birth, migration and impact of infant feeding. The next section is on the impact of autism. The neurobiology and genetic section deals with epigenetics and intracellular pathways associated with etiology. The development and behaviour section deals with proprioceptive profiles and joint attention in autism. The final section focuses on interventions including mindfulness, animal assisted activity, social/cultural perspective on autism intervention and physical activity. The book is relevant to all professionals and researchers working with persons with autism, including psychiatrists/psychologists, speech and language therapists, occupational therapists, teachers, nurses and care workers.

Epigenetic Gene Regulation in Mouse Embryonic Stem Cells and the Developing Central Nervous System Neuroblastoma (NBL) is the most common extracranial solid tumor of childhood, with about 700 new cases of neuroblastoma seen each year in the United States. The 5-year survival rate for children with high-risk NBL is only 50-60%, and this survival rate has not improved over the last 10 years. High-risk patients receive multimodality treatment, including chemotherapy, surgery, radiation therapy, biologic therapy and immunotherapy, all of which are associated with significant morbidity. Recent years have seen many advances in treatment of neuroblastoma, including therapeutic MIBG, immunotherapy, and personalized targeted therapy based on the genetic alterations seen in the tumor. The primary objective of this book is to provide the readers with a comprehensive review of neuroblastoma, from clinical aspects and the currently available treatment to recent advancements and future directions in the field of NBL treatment. The topics and chapters have been compiled keeping in mind a diverse group of readers in different areas of specialty such as pediatric oncology, surgery, radiation oncology, and immunology, as well as physician scientists and
Epigenetic Regulation in the Nervous System

This fourth volume in the Handbook of Stress series, Stress: Genetics, Epigenetics and Genomics, deals with the influence that genetics, epigenetics, and genomics have on the effects of and responses to stress. Chapters refer to epigenetic mechanisms that involve DNA methylation, histone modification, and/or noncoding RNA-associated gene activation or silencing. There is also coverage of epigenetic mechanisms in stress-related transgenerational transmission of characteristics, and how these may help explain heritability in some complex human diseases. The Handbook of Stress series, comprised of self-contained volumes that each focus on a specific stress area, covers the significant advances made since the publication of Elsevier’s Encyclopedia of Stress (2000 and 2007). Volume 4 is ideal for graduate students, post-doctoral fellows, faculty and clinicians interested in stress genetics, epigenetics and genomics involved in neuroendocrinology, neuroscience, biomedicine, endocrinology, psychology, psychiatry and the social sciences. Articles carefully selected by eminent stress researchers and prepared by contributors representing outstanding scholarship in the field, with each chapter fully vetted for reliable expert knowledge. Richly illustrated with explanatory figures and tables, each chapter includes a boxed “Key points call out section. Affordably priced, self-contained volume for readers specifically interested in stress genetics and epigenetics, removing the need to purchase the whole Handbook series.

Epigenetic Mechanisms in Cancer The growing knowledge about disturbances of epigenetic gene regulation in hematopoietic stem cell disorders is now being translated into treatment approaches that target the epigenetic defects pharmacologically. This book first presents the latest evidence regarding the epigenetic regulation of hematopoietic stem cell differentiation and hemoglobin production. The significance of DNA methylation abnormalities in hematopoietic disorders and of epigenetic disturbances in lung cancer and other solid tumors is then discussed. A major part of the book, however, relates specifically to the translation of basic research and drug development to clinical applications, and in this context both present and future clinical strategies are considered. Individual chapters are devoted to the use of DNA hypomethylating agents and chromatin-modifying agents, and the treatment of hematologic malignancies and solid tumors by means of epigenetic agents is discussed in detail.

Epigenetic Regulation in the Nervous System Epigenetics of Chronic Pain, Volume Nine, presents comprehensive information on the role of epigenetics in chronic pain sensitivity, providing a detailed, but accessible, view of the field from basic principles, to clinical application. Leading international researchers discuss essential mechanisms of chronic pain epigenetics, including the molecular processes of chromatin remodeling, histone modifications, and the microRNAs and noncoding RNAs involved in regulating genes tied to pain sensitivity. The influence of epigenetics in inflammatory, neuropathic, visceral and other pain models is examined, with data derived from epigenetic studies on peripheral and central mechanisms of pain sensitivity in animal models and clinical cases studies. The studies and case examples cited highlight therapeutic pathways of significance and next steps for researchers to develop epigenetic-based treatments for chronic pain. In recent years, epigenetic regulation of gene expression has been shown to play a central role in managing human pain sensitivity. Findings show that expression of many genes critical to increases or decreases in pain sensitivity are indeed regulated by DNA methylation and its enzymes, histone-involved chromatin remodeling, and noncoding RNAs, mainly microRNAs. Compiles all known information on epigenetic regulation of chronic pain in one volume Covers the basic functionality of epigenetic mechanisms involved in pain management, applications of recent research in understanding different types of chronic pain, and pathways for developing therapeutics. Leading international researchers from across academia, clinical settings, and the pharmaceutical industry discuss epigenetics in inflammatory, neuropathic, visceral, and other pain models in-depth. Enables clinicians, researchers, and pharmacologists to better understand and treat chronic pain.