stem cell biology in health and disease

#stem cells #stem cell biology #regenerative medicine #disease mechanisms #therapeutic applications

Stem cell biology explores the fundamental properties of stem cells and their profound implications for both maintaining health and combating various diseases. This crucial field illuminates developmental processes, tissue repair, and the development of innovative regenerative medicine strategies and cell therapies, offering immense potential to address conditions from neurodegenerative disorders to cardiovascular issues and usher in future medical advancements.

Each note is structured to summarize important concepts clearly and concisely.

Stem Cell Biology in Health and Disease

Stem Cell Biology in Health and Disease presents an up-to-date overview about the dual role of stem cells in health and disease. The Editors have drawn together an international team of experts providing chapters which, in this fully-illustrated volume, discuss: - the controversial debate on the great expectations concerning stem cell based regeneration therapies raised by the pluripotency of various stem cells. - the advantages and concerns about embryonic stem cells (ES cells), induced pluripotent stem cells (iPS cells) and adult stem cells, such as bone marrow-derived stem cells (BMDCs). - the type of stem cells, which has become of interest in the past decade, namely so-called cancer stem cells (CSCs). CSCs are now in the focus of cancer research since the eradication of tumour initiating cells would raise the changes of definitely cure cancer. Professor Dittmar and Professor Zänker have edited a must-read book for researchers and professionals working in the field of regenerative medicine and/or cancer.

Developmental and Stem Cell Biology in Health and Disease

Research into stem cells started in the 1960s with experiments on spleen cultures. Evans and Kaufman made a breakthrough in mouse embryo culturing and embryonic stem cell extraction in 1981, followed by the work of Thomson in 1998 on the technique for extracting human embryonic stem cells. Since then, stem cell research has rapidly expanded as a therapeutic avenue for different diseases in humans. This book explains the basic developmental biology of stem cells including the development of stem cells during the implantation stage in utero to the regulation of stem cell division. Medical applications of stem cells in the therapy of diseases such as cancer, neurodegenerative diseases, and bone diseases are also explained in subsequent chapters. The book also explains the effect of parasitic cells on stem cell growth. Concepts in the book are explained in a simple clear manner, making this book an informative reference for non-experts, students and professionals in the field of biology and medicine.

Stem Cells: Current Challenges and New Directions

This volume looks at the state-of-the-science in stem cells, discusses the current challenges, and examines the new directions the field is taking. Dr. Turksen, editor-in-chief of the journal "Stem Cell Reviews and Reports," has assembled a volume of internationally-known scientists who cover topics that are both clinically and research-oriented. The contents range from sources of stem cells through their physiological role in health and disease, therapeutic applications in regenerative medicine, and ethics and society. An initial overview and a final summary bookend the contents into a cohesive and invaluable volume.

Nuclear Reprogramming and Stem Cells

Research into the field of stem cell biology has developed exponentially over recent years, and is beginning to offer significant promise for unravelling the molecular basis of a multitude of disease states. Importantly, in addition to offering the opportunity to delve deeply into the mechanisms that drive disease aetiology the research is realistically opening the doors for development of targeted and personalized therapeutic applications that many considered, until recently, to be nothing more that a far fetched dream. This volume provides a timely glimpse into the methods that have been developed to instigate, and the mechanisms that have been identified to drive, the process of nuclear reprogramming, chronicling how the field has developed over the last 50-60 years. Since the early 1950s a small number of notable experiments have provided significant impetus to the field, primarily the demonstration of reprogramming ability, first by the complex cytoplasmic milieu that constitutes the amphibian egg, then that of the mammalian egg, and finally that of the mammalian embryonic stem cell. Most recently, the demonstration that a limited pool of defined molecules is capable of reprogramming a multitude of cell types has provided massive impetus and facilitated transition towards realistic therapeutic application. We have therefore reproduced some of the key articles that elegantly document these dramatic stages of development of the field in an inclusive appendix to the book, for the benefit of readers keen to investigate the history of how the field of stem cell biology has evolved. Owing to the ever broadening nature of this field, and the incredible rate at which it is evolving, the main content of this volume focuses on areas that have shown significant movement in recent years, are most likely to translate into personalized therapeutic application, and thus provide greatest potential for significant impact on human health in the not too distant future. We recognize that research into many other disease states and cell types are all equally worthy of discussion. We would therefore like to acknowledge those researchers involved whose work we have not been able to include in this volume. Nuclear Reprogramming and Stem Cells will serve as a valuable resource for all researchers in the field of stem cell biology, including those just setting out on their career path as well as those already established in the field.

Cell Biology and Translational Medicine, Volume 18

Much research has focused on the basic cellular and molecular biological aspects of stem cells. Much of this research has been fueled by their potential for use in regenerative medicine applications, which has in turn spurred growing numbers of translational and clinical studies. However, more work is needed if the potential is to be realized for improvement of the lives and well-being of patients with numerous diseases and conditions. This book series 'Cell Biology and Translational Medicine (CBTMED)' as part of Springer Nature's longstanding and very successful Advances in Experimental Medicine and Biology book series, has the goal to accelerate advances by timely information exchange. Emerging areas of regenerative medicine and translational aspects of stem cells are covered in each volume. Outstanding researchers are recruited to highlight developments and remaining challenges in both the basic research and clinical arenas. This current book is the 18th volume of a continuing series.

Mesenchymal Stem Cells in Human Health and Diseases

Mesenchymal Stem Cells in Human Health and Diseases provides a contemporary overview of the fast-moving field of MSC biology, regenerative medicine and therapeutics. MSCs offer the potential to dramatically reduce human suffering from disease. Numerous MSC-based studies are ongoing each year, each offering hope for novel treatments in human disease. This book provides information on MSC application in well-studied human diseases and tissue repair/regeneration and recent advances in their research and treatment. These discoveries are placed within the structural context of tissue and developmental biology in sections dealing with recent advances in our understanding of MSC biology. Includes insights ranging from MSC biology and development through the derivation and identification and properties of MSCs Helps to identify potential innovative solutions for restoring normal

morphogenesis and/or regeneration of diseased organs Discusses the fact-based promise of MSC therapeutics and regenerative medicine in the real world

Autophagy in Health and Disease

This timely volume explores the impact of autophagy in various human diseases, emphasizing the cell biological aspects and focusing on therapeutic approaches to these diseases. The chapters cover autophagy and its potential applications on diseases ranging from obesity, osteoarthritis, pulmonary fibrosis, and inflammation, through ALS, Parkinson's, retinal degeneration, breast cancer, alcoholic liver disease and more. The final chapters round out the book with a discussion of autophagy in drug discovery and 'bench to bedside'. Chapters are contributed by leading authorities and describe the general concepts of autophagy in health and disease, marrying cell biology and pharmacology and covering: studies derived from preclinical experiments, manufacturing considerations,and regulatory requirements pertaining to drug discovery and manufacturing and production. This volume will be useful for basic scientists as well as already practicing clinicians and advanced graduate students.

The SAGE Encyclopedia of Stem Cell Research

The SAGE Encyclopedia of Stem Cell Research, Second Edition is filled with new procedures and exciting medical breakthroughs, including executive orders from the Obama administration reversing barriers to research imposed under the Bush administration, court rulings impacting NIH funding of research based on human embryonic stem cells, edicts by the Papacy and other religious leaders, and the first success in cloning human stem cells. Stem cell biology is clearly fueling excitement and potential in traditional areas of developmental biology and in the field of regenerative medicine, where they are believed to hold much promise in addressing any number of intractable medical conditions. This updated second edition encyclopedia will expand on information that was given in the first edition and present more than 270 new and updated articles that explore major topics in ways accessible to nonscientists, thus bringing readers up-to-date with where stem cell biology stands today, including new and evolving ethical, religious, legal, social, and political perspectives. This second edition reference work will serve as a universal resource for all public and academic libraries. It is an excellent foundation for anyone who is interested in the subject area of stem cell biology. Key Features: Reader’s Guide, Further Readings, Cross References, Chronology, Resource Guide, Index A Glossary will elucidate stem cell terminology for the nonscientist Statistics and selected reprints of major journal articles that pertain to milestones achieved in stem cell research Documents from Congressional Hearings on stem cells and cloning Reports to the President’s Council on Bioethics, and more

Biology in Stem Cell Niche

This comprehensive volume explores functions, pathologies, and applications of stem cells in relation to the niches in which they develop. Ten chapters cover the subject in depth, from a historical perspective through signaling, hormonal control, quiescence, biomimetics, epigenetics, engineering strategies for emulating, tumorigenesis and more. The chapter authors represent a broad range of international expertise and perspectives. This installment of the popular Stem Cell Biology and Regenerative Medicine series delivers authoritative, international perspectives on this rapidly growing field. Biology of Stem Cell Niche is an ideal complementary volume to Tissue-Specific Stem Cell Niche and Adult Stem Cells, Second Edition and will be invaluable to clinicians and researchers working with stem cells as well as to postgraduate trainees who are studying them.

Lung Stem Cells in Development, Health and Disease

Most organs in the adult human body are able to maintain themselves and undergo repair after injury; these processes are largely dependent on stem cells. In this Monograph, the Guest Editors bring together leading authors in the field to provide information about the different classes of stem cells present both in the developing and adult lung: where they are found, how they function in homeostasis and pathologic conditions, the mechanisms that regulate their behaviour, and how they may be harnessed for therapeutic purposes. The book focuses on stem cells in the mouse and human lung but also includes the ferret as an increasingly important new model organism. Chapters also discuss how lung tissue, including endogenous stem cells, can be generated in vitro from pluripotent stem cell lines. This state-of-the-art collection comprehensively covers one of the most exciting areas of respiratory science

The Y Chromosome and Male Germ Cell Biology in Health and Diseases

The roles of mouse Y chromosome genes in spermatogenesis -- Male meiotic sex chromosome inactivation and meiotic silencing -- Insights into SRY action from sex reversal mutations -- The TSPY gene family -- Structure and function of AZFa locus in human spermatogenesis -- RBMY and DAZ in spermatogenesis -- Neurotrophic factors in the development of the postnatal male germ line -- Dickkopf-like 1-a protein unique to mammals that is associated both with formation of trophoblast stem cells and with spermatogenesis -- Antisense transcription in developing male germ cells -- The spermatogonial stem cell model -- Transplantation of germ cells and testis tissue -- Orthodox and unorthodox ways to initiate fertilization and development in mammals -- Pathogenesis of testicular germ cell tumors -- Origin of testicular germ cell neoplasia: the role of sex chromosomes.

Lung Stem Cells in the Epithelium and Vasculature

This book covers the identification and role of endogenous lung stem cells in health and disease, particularly the most recent advances. In addition, it discusses the rapidly growing field of stem cells and cell therapy as it relates to lung biology and disease as well as ex vivo lung bioengineering. Such approaches may provide novel therapeutic approaches for lung diseases. Human pluripotent stem cell differentiation to model the pulmonary epithelium and vasculature is also discussed. World-recognized scientists who specialize in studying both the lung epithelium and pulmonary vasculature contribute the chapters. Topics covered include: stem cell niches in the lung, the role of progenitor cells in fibrosis and asthma, iPSC in modeling lung disease, vascular repair by endothelial progenitor cells and circulating fibrocytes in pulmonary vascular remodeling. This volume of the Stem Cell Biology and Regenerative Medicine series is essential reading for researchers and clinicians interested in stem cells, lung biology and regenerative medicine. It is also an invaluable resource for advanced students studying cell biology, regenerative medicine and lung physiology.

Stem Cells, Tissue Engineering and Regenerative Medicine

Stem cells, tissue engineering and regenerative medicine are fast moving fields with vastly transformative implications for the future of health care and capital markets. This book will show the state of the art in the translational fields of stem cell biology, tissue engineering and regenerative medicine. The state of developments in specific organ systems, where novel solutions to organ failure are badly needed such as the lungs, kidney and so forth, are discussed in various chapters. These present and future advances are placed in the context of the overall field, offering a comprehensive and quick up-to-date drink from the fountain of knowledge in this rapidly emerging field. This book provides an investigator-level overview of the current field accessible to the educated scientific generalist as well as a college educated readership, undergraduates and science writers, educators and professionals of all kinds. Contents:Developmental Biology, Regenerative Medicine and Stem Cells: The Hope Machine is Justified (David Warburton)Towards Broader Approaches to Stem Cell Signaling and Therapeutics (Edwin Jesudason)Pluripotent Stem Cells from the Early Embryo (Claire E Cuddy and Martin F Pera)The First Cell Fate Decision During Mammalian Development (Melanie D White and Nicolas Plachta)Asymmetric Cell Divisions of Stem/Progenitor Cells (Ahmed HK El-Hashash)Microenvironmental Modulation of Stem Cell Differentiation with Focus on the Lung (Shimon Lecht, Collin T Stabler, Seda Karamil, Athanasios Mantalaris, Ali Samadikuchaksaraei, Julia M Polak and Peter I Lelkes)Smart Matrices for Distal Lung Tissue Engineering (Mark J Mondrinos and Peter I Lelkes)Skin Stem Cells and Their Roles in Skin Regeneration and Disorders (Chao-Kai Hsu, Chao-Chun Yang and Shyh-Jou Shieh)Stem Cell Recruitment and Impact in Skin Repair and Regeneration (Tim Hsu, Tai-Lan Tuan and Yun-Shain Lee)Epigenetic and Environmental Regulation of Skin Appendage Regeneration (Ting-Xin Jiang, Chih-Chiang Chen, Michael W Hughes, Cheng-Ming Chuong and Randall Widelitz)Cranial Neural Crest: An Extraordinarily Migratory and Multipotent Embryonic Cell Population (Samuel G Cox and J Gage Crump)Modeling Neurodegenerative Diseases and Neurodevelopmental Disorders with Reprogrammed Cells (Kate E Galloway and Justin K Ichida)Cytokine Regulation of Intestinal Stem Cells (Philip E Dubé, Unice J K Soh and D Brent Polk)The Intestinal Stem Cell Niche and Its Regulation by ErbB Growth Factor Receptors (Dana Almohazey and Mark R Frey)Tissue Engineering: Intestine (Avafia Y Dossa, Kathy A Schall, Tracy C Grikscheit and Christopher P Gayer)Liver Stem and Progenitor Cells in Development, Disease and Regenerative Medicine (Nirmala Mavila and Kasper S Wang)Lung Mesenchymal Stem Cells (Wei Shi)FGF Signaling in Lung Stem and Progenitor Cells (Soula Danopoulos and Denise Al Alam)Bioengineering Distal Airways (Christine Finck and Todd Jensen)The Isolation and Molecular Characterization of Cancer Stem Cells (Aggressive Endophe-

notypes) in Individual Lung Cancers (Raj K Batra, Scott Oh and Saroj Basak)Mesenchymal Stromal Cell-Based Therapies for Lung Diseases and Critical Illnesses (Fernanda Cruz, Patricia RM Rocco and Daniel J Weiss)Heart Regeneration and Repair: What We Have Learned from Model Organisms (Laurent Gamba, Michael R Harrison and Ching-Ling Lien)Leveraging Structure-Based Rational Drug Design and Nanotechnology to Destroy Leukemic Stem Cells (Fatih M Uckun, Jianjun Cheng, Cheney Mao and Sanjive Qazi)Placenta-Derived Stem Cells: Development and Preclinical Applications for Regenerative Medicine (Jennifer Izumi Divine, Hee Kyung Jung and Toshio Miki)Stem Cells in the Real World: Environmental Impacts (Theresa M Bastain, Lu Gao and Frank D Gilliland)Establishing a Research Grade Human Pluripotent Stem Cell Laboratory (Laura-Marie Nucho and Victoria Fox) Readership: Stem cell and tissue engineering scientists, patient advocates, educated laypeople, high school science students, undergraduate students, graduate students, physicians and surgeons. Key Features:This book presents up-to-date latest breakthroughs and near future applicationsBench to bedsideThis book features potential curesKeywords:Stem Cells;Tissue Engineering;Regenerative Medicine

Essentials of Stem Cell Biology

First developed as an accessible abridgement of the successful Handbook of Stem Cells, Essentials of Stem Cell Biology serves the needs of the evolving population of scientists, researchers, practitioners, and students embracing the latest advances in stem cells. Representing the combined effort of 7 editors and more than 200 scholars and scientists whose pioneering work has defined our understanding of stem cells, this book combines the prerequisites for a general understanding of adult and embryonic stem cells with a presentation by the world's experts of the latest research information about specific organ systems. From basic biology/mechanisms, early development, ectoderm, mesoderm, endoderm, and methods to the application of stem cells to specific human diseases, regulation and ethics, and patient perspectives, no topic in the field of stem cells is left uncovered. Contributions by Nobel Laureates and leading international investigators Includes two entirely new chapters devoted exclusively to induced pluripotent stem (iPS) cells written by the scientists who made the breakthrough Edited by a world-renowned author and researcher to present a complete story of stem cells in research, in application, and as the subject of political debate Presented in full color with a glossary, highlighted terms, and bibliographic entries replacing references

Neural Stem Cells in Health and Disease

This book is a comprehensive guide on neural stem cell behavior in health and disease. The book confers the altered behavior of endogenous neural stem cells in neurodegenerative disease conditions and the prospects of neural stem cell therapy for alleviating brain dysfunction in a variety of neurodegenerative disorders. Neural stem cell activity and neurogenesis in the adult brain is now confirmed in virtually all mammalian species including humans. Hence, a series of chapters in the first half of the book discusses the current knowledge on mechanisms of neural stem cell activity, the extent and functional significance of neurogenesis in the adult brain under normal, aged and disease environments, the susceptibility of neural stem cells and the plasticity of neurogenesis to alcohol, drugs of abuse and anesthetic agents, and advanced techniques that trigger neurogenesis in non-neurogenic regions. A second series of chapters in this book are focused on discussing the promise and efficacy of grafting of neural stem cells and/or other stem cells for treating neurological disorders such as Parkinson's disease, stroke, temporal lobe epilepsy, Alzheimer's disease and spinal cord injury. The final chapter confers on advances that are made in manufacturing a variety of neural cell types from human pluripotent stem cells that can be used as donor cells for cell transplantation.

Tissue-Specific Stem Cell Niche

This timely volume explores tissue-derived stem cells, summarizing and evaluating the current body of knowledge. Sixteen chapters cover hematopoietic, osteoblast, skeletal, cardiac, pancreatic, epithelial, corneal, hepatic, renal, testicular, ovarian, fingernail, hair follicle and other stem cells- discussing their individual development, functions and pathologies, as well as the commonalities and interdependence between niches. This installment of the popular Stem Cell Biology and Regenerative Medicine series delivers authoritative, international perspectives on this rapidly growing field. Tissue-Specific Stem Cell Niche is an ideal complementary volume to Biology of Stem Cell Niche and Adult Stem Cells, Second Edition and will be invaluable to clinicians and researchers working with stem cells as well as to postgraduate trainees who are studying them.

Stem Cell Engineering

This book describes a global assessment of stem cell engineering research, achieved through site visits by a panel of experts to leading institutes, followed by dedicated workshops. The assessment made clear that engineers and the engineering approach with its quantitative, system-based thinking can contribute much to the progress of stem cell research and development. The increased need for complex computational models and new, innovative technologies, such as high-throughput screening techniques, organ-on-a-chip models and in vitro tumor models require an increasing involvement of engineers and physical scientists. Additionally, this book will show that although the US is still in a leadership position in stem cell engineering, Asian countries such as Japan, China and Korea, as well as European countries like the UK, Germany, Sweden and the Netherlands are rapidly expanding their investments in the field. Strategic partnerships between countries could lead to major advances of the field and scalable expansion and differentiation of stem cells. This study was funded by the National Science Foundation (NSF), the National Institutes of Health (NIH) and the National Institute of Standards and Technology (NIST).

Molecular and Cellular Biology of Platelet Formation

This book gives a comprehensive insight into platelet biogenesis, platelet signal transduction, involvement of platelets in disease, the use of diverse animal models for platelet research and future perspectives in regard to platelet production and gene therapy. Being written by international experts, the book is a concise state-of-the art work in the field of platelet biogenesis, biology and research. It represents an indispensable tool for research scientists in biomedicine, vascular biology, hematopoiesis and hemostasis and specifically for scientists in platelet research, as well as for clinicians in the field of hematology and transfusion medicine.

The Intestine

The intestine is among the leading organs, in which several cutting edge in vitro and in vivo research tools and approaches have recently been developed and used to investigate stem cell biology/function, and the potential applications of stem cells in the treatment of intestinal diseases. These cutting-edge research tools and approaches involve human and murine organoid cultures, genetic editing in vitro and in vivo, human induced pluripotent cell (iPS cell) models of disease, haploid cells for genetic as well as compound screening paradigms, genetically engineered mice, and stem cell transplantation to cure diseases. Stem Cell Innovation in Health and Disease: Volume 1: The Intestine contains two major sections describing cutting edge research for understanding stem cell functions in the intestine, and for developing methods to bring stem cells from bench to bedside; respectively. Each section includes insights ranging from using mouse and human organoid cultures, genetic editing in vitro and in vivo, and human induced pluripotent cells (iPSCs) to study stem cell functions and model intestinal diseases, through the cutting-edge research, including the potential application of iPSCs, ESCs and blood stem cells (stem cell transplants) in the treatment of intestinal diseases/disorders. This volume, therefore, discusses the fact-based promise of stem cells and regenerative medicine in the intestine in the real world. Provides intensive scientific background and most recent information on cutting edge research to understand intestinal stem cell functions and develop methods to bring stem cells from bench to bedside for different intestinal diseases Analyzes the current state, opportunities, and challenges of innovative technologies and stem cells from bench to bed, including organoids and the CRISPR gene editing system in the intestine Contains two major sections describing cutting-edge research for understanding stem cell functions and for developing methods specific to the intestine

Cancer Stem Cells in Solid Tumors

The “cancer stem cell” hypothesis postulates that cancer arises from a subpopulation of tumor-initiating cells or cancer stem cells (CSCs). While the idea of cancer stem cells has been around for more than a hundred years, evidence from the fields of hematology and cancer biology has now demonstrated the critical role of stem cells in hematological malignancies and suggested that these same mechanisms are also central to the initiation, progression, and treatment of solid cancers. Clinical and experimental studies have shown that CSCs exhibit many classical properties of normal stem cells, including a high self-renewal capacity and the ability to generate heterogeneous lineages; the requirement for a specific “niche”/microenvironment to grow; and an increased capacity for self-protection against harsh environments, toxins, and drugs. Cancer Stem Cells in Solid Tumors represents a detailed overview of cancer stem cells and their role in solid cancers. Comprised of 24 chapters, this volume will provide readers with a comprehensive understanding of this important and evolving field. Topics

covered include: Introduction of the CSC hypothesis Historical perspectives and the contributing lessons from leukemia Current knowledge regarding the identification and role of CSCs in various forms of solid cancer including breast, brain, colorectal, pancreatic, prostate, melanoma, lung, ovarian, hepatocellular, and head and neck cancer Molecular pathways involved in driving CSC function, with a particular focus on the novel convergence of embryonic and tumorigenic signaling pathways In vitro and in vivo assays, model systems, and imaging modalities for studying CSCs The clinical importance of CSCs for cancer management and treatment, including important implications for prognosis, prediction, and treatment resistance Consideration of the controversy surrounding the CSC hypothesis and important unanswered questions in this field This collective work was written by a group of prominent international experts in cancer biology, oncology, and/or stem cell biology. It will serve as a valuable resource for established researchers, professors, health care professionals, and students in the medical and scientific community who are investigating stem cells and/or oncology.

Cell Biology and Translational Medicine, Volume 9

Much research has focused on the basic cellular and molecular biological aspects of stem cells. Much of this research has been fueled by their potential for use in regenerative medicine applications, which has in turn spurred growing numbers of translational and clinical studies. However, more work is needed if the potential is to be realized for improvement of the lives and well-being of patients with numerous diseases and conditions. This book series 'Cell Biology and Translational Medicine (CBTMED)' as part of SpringerNature’s longstanding and very successful Advances in Experimental Medicine and Biology book series, has the goal to accelerate advances by timely information exchange. Emerging areas of regenerative medicine and translational aspects of stem cells are covered in each volume. Outstanding researchers are recruited to highlight developments and remaining challenges in both the basic research and clinical arenas. This current book is the ninth volume of a continuing series.

Handbook of Stem Cells

New discoveries in the field of stem cells increasingly dominate the news and scientific literature revealing an avalanche of new knowledge and research tools that are producing therapies for cancer, heart disease, diabetes, and a wide variety of other diseases that afflict humanity. The Handbook of Stem Cells integrates this exciting area of life science, combining in two volumes the requisites for a general understanding of adult and embryonic stem cells. Organized in two volumes entitled Pluripotent Stem Cells and Cell Biology and Adult and Fetal Stem Cells, this work contains contributions from the world’s experts in stem cell research to provide a description of the tools, methods, and experimental protocols needed to study and characterize stem cells and progenitor populations as well as a the latest information of what is known about each specific organ system. Provides comprehensive coverage on this highly topical subject Contains contributions by the foremost authorities and premiere names in the field of stem cell research Companion website - http://booksite.elsevier.com/9780123859426/ - contains over 250 color figures in presentation format

The Real Life Story of Stem Cells

This book is an autobiographical narration of the research activities, with penchant and passion, by two leading clinicians who turned towards stem cell research in later years of their life. The book is about facts as they happened, it also includes fiction as it should be a part of any novel and there is fantasizing as well as what one would like to be in the future. Facts, fiction and fantasy are frequently flavoured with philosophy as well. The authors axiomatically classify themselves as philosophers. Advocating that philosophy is the mother of all disciplines, they narrate how they jumped into deep waters of expensive stem cell research. The book describes how did they blunder at times and also cites the appearance of guardian angels to salvage them. Floundering from cell biology to different kinds of stem cell applications, the book describes where they have now parked at a far horizon, on the edge of new discovery of a wonderful drug. They ignite a spark of caution with restrictive regulations. The book ends with reframing the poem by Rabindranath Tagore, ‘Into that heaven of regenerative medicine, my Father, let my country awake.’

Biology of Stem Cells and the Molecular Basis of the Stem State

Biology of Stem Cells and the Molecular Basis of the Stem State concentrates upon adult stem cells, particularly on mesenchymal cell populations, which is the author’s area of expertise. The text offers the reader a detailed description of the emergence of stem cell research and the dogmas that were

created during the first decades of analysis of stem cell properties, particularly those of hemopoietic stem cells. Biology of Stem Cells and the Molecular Basis of the Stem State also introduces the reader to the commonly accepted notions regarding stem cell biology, with an emphasis on an alternative view of stemness, i.e. the stem state. In keeping with the popularity of this topic, Biology of Stem Cells and the Molecular Basis of the Stem State addresses the major controversies and points of dispute, among researchers in the stem cell field. Overall, Biology of Stem Cells and the Molecular Basis of the Stem State presents a well-rounded dialogue about stem cells as it not only concentrates upon the biological elements of stem cell, but also addresses the controversy and hype currently enveloping this popular subject.

Stem Cells & Regenerative Medicine

Defined as, “The science about the development of an embryo from the fertilization of the ovum to the fetus stage,” embryology has been a mainstay at universities throughout the world for many years. Throughout the last century, embryology became overshadowed by experimental-based genetics and cell biology, transforming the field into developmental biology, which replaced embryology in Biology departments in many universities. Major contributions in this young century in the fields of molecular biology, biochemistry and genomics were integrated with both embryology and developmental biology to provide an understanding of the molecular portrait of a “development cell.” That new integrated approach is known as stem-cell biology; it is an understanding of the embryology and development together at the molecular level using engineering, imaging and cell culture principles, and it is at the heart of this seminal book. Stem Cells and Regenerative Medicine: From Molecular Embryology to Tissue Engineering is completely devoted to the basic developmental, cellular and molecular biological aspects of stem cells as well as their clinical applications in tissue engineering and regenerative medicine. It focuses on the basic biology of embryonic and cancer cells plus their key involvement in self-renewal, muscle repair, epigenetic processes, and therapeutic applications. In addition, it covers other key relevant topics such as nuclear reprogramming induced pluripotency and stem cell culture techniques using novel biomaterials. A thorough introduction to stem-cell biology, this reference is aimed at graduate students, post-docs, and professors as well as executives and scientists in biotech and pharmaceutical companies.

Trends in Stem Cell Biology and Technology

Stem cells, characterized by the ability to both self-renew and to generate diff- entiated functional cell types, have been derived from the embryo and from va- ous sources of the postnatal animals and human. The recent advances in stem cell research have led to a better understanding of self-renewal, maintenance, and diff- entiation of both embryonic and somatic stem cells. This has significantly increased our knowledge of cellular and developmental biology in general and will certainly continue to do so for a long time to come. Moreover, given their role in maintaining and replenishing tissues, stem cells represent a potential means of restoring tissue function and thereby treating the root cause of degenerative disease. Therefore, in parallel, we need to improve our cognizance of the challenges involved in applying stem cells in clinical settings. The current chapters highlight both of these aspects: that of understanding the “actual” and that of developing the “possible. ” In recognition of the growing excitement and potential of stem cells as models for both the advancement of basic science and future clinical applications, I felt it timely to edit this book in which forefront investigators would provide new findings for the use of stem cells to study various lineages and tissue types and some app- cations.

Stem Cells

The second edition of Stem Cells: Scientific Facts and Fiction provides the non-stem cell expert with an understandable review of the history, current state of affairs, and facts and fiction of the promises of stem cells. Building on success of its award-winning preceding edition, the second edition features new chapters on embryonic and iPS cells and stem cells in veterinary science and medicine. It contains major revisions on cancer stem cells to include new culture models, additional interviews with leaders in progenitor cells, engineered eye tissue, and xeno organs from stem cells, as well as new information on "organs on chips" and adult progenitor cells. In the past decades our understanding of stem cell biology has increased tremendously. Many types of stem cells have been discovered in tissues that everyone presumed were unable to regenerate in adults, the heart and the brain in particular. There is vast interest in stem cells from biologists and clinicians who see the potential for regenerative medicine and future treatments for chronic diseases like Parkinson's, diabetes, and spinal cord lesions, based on the

use of stem cells; and from entrepreneurs in biotechnology who expect new commercial applications ranging from drug discovery to transplantation therapies. Explains in straightforward, non-specialist language the basic biology of stem cells and their applications in modern medicine and future therapy Includes extensive coverage of adult and embryonic stem cells both historically and in contemporary practice Richly illustrated to assist in understanding how research is done and the current hurdles to clinical practice

Cell Biology and Translational Medicine, Volume 6

Much research has focused on the basic cellular and molecular biological aspects of stem cells. Much of this research has been fueled by their potential for use in regenerative medicine applications, which has in turn spurred growing numbers of translational and clinical studies. However, more work is needed if the potential is to be realized for improvement of the lives and well-being of patients with numerous diseases and conditions. This book series 'Cell Biology and Translational Medicine (CBTMED)' as part of SpringerNature’s longstanding and very successful Advances in Experimental Medicine and Biology book series, has the goal to accelerate advances by timely information exchange. Emerging areas of regenerative medicine and translational aspects of stem cells are covered in each volume. Outstanding researchers are recruited to highlight developments and remaining challenges in both the basic research and clinical arenas. This current book is the sixth volume of a continuing series.

Cellular Endocrinology in Health and Disease

Cellular Endocrinology in Health and Disease, Second Edition, describes the underlying basis of endocrine function, providing an important tool to understand the fundamentals of endocrine diseases. Delivering a comprehensive review of the basic science of endocrinology, from cell biology to human disease, this work explores and dissects the function of a number of cellular systems. The new edition provides an understanding of how endocrine glands function by integrating information resulting in biological effects on both local and systemic levels, also providing new information on the molecular physiopathogenesis of endocrine neoplasic cells. The new edition expands the most used chapters from the first edition and proposes a series of substitutions and additions to the table of contents. New chapters cover signaling, brown adipose tissue, hypothalamic cell models, cellular basis of insulin resistance, genetics and epigenetics of neuroendocrine tumors, and a series of chapters on endocrine-related cancer. Providing content that crosses disciplines, Cellular Endocrinology in Health and Disease, Second Edition, details how cellular endocrine function contributes to system physiology and mediates endocrine disorders. A methods section proves novel and useful approaches across research focus that will be attractive to medical students, residents, and specialists in the field of endocrinology, as well as to those interested in cellular regulation. Editors Alfredo Ulloa-Aguirre and Ya-Xiong Tao, experts in molecular and cellular aspects of endocrinology, deliver contributions carefully selected for relevance, impact, and clarity of expression from leading field experts Explores endocrine cells biology in normal and pathologic conditions Covers new aspects of endocrine cell function in distinct tissues Provides a view into the biological effect in local and systemic levels 15 new chapters covering the recent developments in the field

Cell Biology and Translational Medicine, Volume 12

Much research has focused on the basic cellular and molecular biological aspects of stem cells. Much of this research has been fueled by their potential for use in regenerative medicine applications, which has in turn spurred growing numbers of translational and clinical studies. However, more work is needed if the potential is to be realized for improvement of the lives and well-being of patients with numerous diseases and conditions. This book series 'Cell Biology and Translational Medicine (CBTMED)' as part of Springer Nature’s long-standing and very successful Advances in Experimental Medicine and Biology book series, has the goal to accelerate advances by timely information exchange. Emerging areas of regenerative medicine and translational aspects of stem cells are covered in each volume. Outstanding researchers are recruited to highlight developments and remaining challenges in both the basic research and clinical arenas. This current book is the twelfth volume of a continuing series.

Principles of Regenerative Medicine

Virtually any disease that results from malfunctioning, damaged, or failing tissues may be potentially cured through regenerative medicine therapies, by either regenerating the damaged tissues in vivo, or by growing the tissues and organs in vitro and implanting them into the patient. Principles of

Regenerative Medicine discusses the latest advances in technology and medicine for replacing tissues and organs damaged by disease and of developing therapies for previously untreatable conditions, such as diabetes, heart disease, liver disease, and renal failure. * Key for all researchers and instituions in Stem Cell Biology, Bioengineering, and Developmental Biology * The first of its kind to offer an advanced understanding of the latest technologies in regenerative medicine * New discoveries from leading researchers on restoration of diseased tissues and organs

Stem Cells and Human Diseases

The main objective of this book is to provide a comprehensive review on stem cells and their role in tissue regeneration, homeostasis and therapy. In addition, the role of cancer stem cells in cancer initiation, progression and drug resistance are discussed. The cell signaling pathways and microRNA regulating stem cell self-renewal, tissue homeostasis and drug resistance are also mentioned. Overall, these reviews will provide a new understanding of the influence of stem cells in tissue regeneration, disease regulation, therapy and drug resistance in several human diseases.

Final Report of the National Academies' Human Embryonic Stem Cell Research Advisory Committee and 2010 Amendments to the National Academies' Guidelines for Human Embryonic Stem Cell Research

In 2005, the National Academies released the book, Guidelines for Human Embryonic Stem Cell Research, which offered a common set of ethical standards for a field that, due to the absence of comprehensive federal funding, was lacking national standards for research. In order to keep the Guidelines up to date, given the rapid pace of scientific and policy developments in the field of stem cell research, the Human Embryonic Stem Cell Research Advisory Committee was established in 2006 with support from The Ellison Medical Foundation, The Greenwall Foundation, and the Howard Hughes Medical Institute. As it did in 2007 and 2008, the Committee identified issues that warranted revision, and this book addresses those issues in a third and final set of amendments. Specifically, this book sets out an updated version of the National Academies' Guidelines, one that takes into account the new, expanded role of the NIH in overseeing hES cell research. It also identifies those avenues of continuing National Academies' involvement deemed most valuable by the research community and other significant stakeholders.

Cell Biology and Translational Medicine, Volume 13

Much research has focused on the basic cellular and molecular biological aspects of stem cells. Much of this research has been fueled by their potential for use in regenerative medicine applications, which has in turn spurred growing numbers of translational and clinical studies. However, more work is needed if the potential is to be realized for improvement of the lives and well-being of patients with numerous diseases and conditions. This book series 'Cell Biology and Translational Medicine (CBTMED)' as part of SpringerNature’s longstanding and very successful Advances in Experimental Medicine and Biology book series, has the goal to accelerate advances by timely information exchange. Emerging areas of regenerative medicine and translational aspects of stem cells are covered in each volume. Outstanding researchers are recruited to highlight developments and remaining challenges in both the basic research and clinical arenas. This current book is the thirteenth volume of a continuing series.

Regenerative Medicine and Stem Cell Biology

This textbook covers the basic aspects of stem cell research and applications in regenerative medicine. Each chapter includes a didactic component and a practical section. The book offers readers insights into: How to identify the basic concepts of stem cell biology and the molecular regulation of pluripotency and stem cell development. How to produce induced pluripotent stem cells (iPSCs) and the basics of transfection. The biology of adult stem cells, with particular emphasis on mesenchymal stromal cells and hematopoietic stem cells, and the basic mechanisms that regulate them. How cancer stem cells arise and metastasize, and their properties. How to develop the skills needed to isolate, differentiate and characterize adult stem The clinical significance of stem cell research and the potential problems that need to be overcome. Evaluating the use of stem cells for tissue engineering and therapies (the amniotic membrane) The applications of bio-nanotechnology in stem cell research. How epigenetic mechanisms, including various DNA modifications and histone dynamics, are involved in regulating the potentiality and differentiation of stem cells. The scientific methods, ethical considerations and implications of stem cell research.

Regulatory Networks in Stem Cells

Stem cells appear to be fundamental cellular units associated with the origin of multicellular organisms and have evolved to function in safeguarding the cellular homeostasis in organ t- sues. The characteristics of stem cells that distinguish them from other cells have been the fascinating subjects of stem cell research. The important properties of stem cells, such as ma- tenance of quiescence, self-renewal capacity, and differentiation potential, have propelled this exciting ?eld and presently form a common theme of research in developmental biology and medicine. The derivation of pluripotent embryonic stem cells, the prospective identi?cation of multipotent adult stem cells, and, more recently, the induced pluripotent stem cells (popularly called iPS) are important milestones in the arena of stem cell biology. Complex networks of transcription factors, different signaling molecules, and the interaction of genetic and epi- netic events constantly modulate stem cell behavior to evoke programming and reprogramming processes in normal tissue homeostasis during development. In any given cellular scenario, the regulatory networks can pose considerable complexity and yet exert an orderly control of stem cell differentiation during normal development. An aberration in these ?nely tuned processes during development usually results in a spectrum of diseases such as cancers and neurological disorders. Thisunderscorestheimminentneedforamorecompleteunderstandingofmolecular mechanisms underlying the regulatory circuitries required for stem cell maintenance. Overthepast3–5years,adiversegroupofbenchandphysicianscientistshaveprospectively enhanced our knowledge of stem cell biology. These studies are unveiling many unrecognized or previously unknown fundamentals of developmental biology.

Cell Press Reviews: Stem Cells to Model and Treat Disease

Cell Press Reviews: Stem Cells to Model and Treat Disease informs, inspires, and connects stem cell researchers and clinicians at all stages in their careers with timely, comprehensive reviews written by leaders in the field and curated by Cell Press editors. The publication offers a broad view of some of the most compelling topics in stem cell research including: Safety and efficacy of stem cell treatments Stem-cell-based organ regeneration Integrating stem cells into personalized drug discovery Using pluripotent stem cells for treating neurological disease Engineering hematopoietic stem cells for innovative therapies Contributions come from leading voices in the field, including: - Shinya Yamanaka, Recipient of the 2012 Nobel Prize for Physiology or Medicine, Recipient of the 2012 Millennium Technology Prize, Professor and Director of the Center for iPS Cell Research and Application at Kyoto University, Senior Investigator at the Gladstone Institute of Cardiovascular Disease, L.K. Whittier Foundation Investigator in Stem Cell Biology and Professor at the University of California, San Francisco - George Q. Daley, Samuel E. Lux IV Professor of Hematology/Oncology at Harvard Medical School and Director for the Stem Cell Transplantation Program at Boston Children's Hospital - Irving Weissman, Member of National Academy of Sciences, Virgina & D.K Ludwig Professor for Clinical Investigation in Cancer Research, and Director for Institute of Stem Cell Biology and Regenerative Medicine at Stanford University of Medicine Cell Press Reviews: Stem Cells to Model and Treat Disease is part of the Cell Press Reviews series, which features reviews published in Cell Press primary research and Trends reviews journals.

Stem Cells

Stem cell science, encompassing basic biology to practical application, is both vast and diverse. A full appreciation of it requires an understanding of cell and molecular biology, tissue structure and physiology, the practicalities of tissue engineering and bioprocessing, and the pathways to clinical implementation—including the ethical and regulatory imperatives that our society requires us to address. Expectation and debate have been driven by the allure of regenerative medicine using stem cells as a source of replacements for damaged or aged tissues. The potential of stem cell application goes far beyond this. Highly innovative uses of stem cells are emerging as possible therapies for cancers, treating acute damage in conditions such as stroke and myocardial infarction, and resolving a whole range of diseases. Stem Cells: Biology and Application presents the basic concepts underlying the fast-moving science of stem cell biology. This textbook is written for an advanced stem cell biology course. The target audience includes senior undergraduates, first year graduate students, and practitioners in molecular biology, biology, and biomedical engineering. Stem Cells provides a comprehensive understanding of these unique cells, highlighting key areas of research, associated controversies, case studies, technologies, and pioneers in the field.

Hematopoietic Stem Cell Biology

In the summer of 1988, my developmental biology professor announced to the class that hematopoietic stem cells (HSCs) had finally been purified. Somehow, I never forgot the professor's words. When I started working in Dr. Irv Weissman's labo- tory at Stanford as a postdoctoral fellow, I realized that the findings mentioned by the professor were from Weissman's laboratory and had been published in a 1988 edition of the journal Science. It has been over 20 years since the publication of that seminal paper, and since then tremendous advances in understanding the biology and maturation of HSCs, namely the process of hematopoiesis, which includes lymphocyte development, have been made. These discoveries were made possible in part by advancements in technology. For example, recent availability of user friendly fluorescence activated cell sorting (FACS) machines and monoclonal an- bodies with a variety of fluorescent labels has allowed more scientists to sort and analyze rare populations in the bone marrow, such as HSCs. All classes of hematopoietic cells are derived from HSCs. Stem cell biology draws enormous attention not only from scientists, but also from ordinary people because of the tremendous potential for development of new therapeutic application to diseases that currently lack any type of effective therapy. Thus, this type of "regenerative medicine" is a relatively new and attractive field in both basic science and clinical medicine.

Stem Cells for Cancer and Genetic Disease Treatment

This invaluable resource discusses insights ranging from basic biological mechanisms of various types of stem cells through the potential applications in the treatment of human diseases, including cancer and genetic disorders. These discoveries are placed within the structural context of tissue and developmental biology in sections dealing with recent advances in understanding different types of stem cell biology and their potential applications in tissue repair and regeneration and in the treatment different types of human cancer and genetic diseases or disorders. Stem Cells for Cancer and Genetic Disease Treatment and the other books in the Stem Cells in Clinical Applicationsseries will be invaluable to scientists, researchers, advanced students and clinicians working in stem cells, regenerative medicine or tissue engineering as well as cancer or genetics research.