Human Embryonic Stem Cells An Introduction To The Science And Theutic Potential

Stem cells are capable of generating various tissue cells which can be used for therapeutic approaches to debilitating and incurable disease. Even though many applications of stem cells are under investigation, such research has raised high hopes and promises along with warnings and ethical and religious questions in different societies. Generally, there is little concern about using non-human or adult stem cells. However, embryonic stem cell research been confronted with questions from medical professionals, the public, religious groups, and national and international organizations. The debate is partly related to "personhood" and the notion of human dignity. Sources of stem cells, the moral status of human embryo, the slippery slope toward commercialisation of human life, concerns about safety, germ line intervention and the challenge of proportionality are some ethical issues. Stem cell research is a promising but controversial issue on which many religions have taken strong positions. The point at which human life begins is a pivotal

challenge. Conception, primitive streak development, implantation, ensoulment and birth are specific stages in which different groups claim dignity begins in the course of human development. In this chapter, we will review the history and scientific facts of stem cells in brief; then, ethical considerations will be discussed. Our other aim is to clarify the religious debate on the issue, particularly monotheistic perspectives. Some related international and national guidelines will be reviewed in brief.

Pluripotency is a prerequisite for the subsequent coordinated differentiation of embryonic stem cells into all tissues of the body. This book describes recent advances in our understanding of pluripotency and the hormonal regulation of embryonic stem cell differentiation into tissue types derived from the ectoderm, mesoderm and endoderm.

Since the first successful isolation and cultivation of human embryonic stem cells at the University of Wisconsin, Madison in 1998, there has been high levels of both interest and controversy in this area of research. This book provides a concise overview of an exciting field, covering the

characteristics of both human embryonic stem cells and pluripotent stem cells from other human cell lineages. The following chapters describe state-of-the-art differentiation and characterization of specific ectoderm, mesoderm and endoderm-derived lineages from human embryonic stem cells, emphasizing how these can be used to study human developmental mechanisms. A further chapter discusses genetic manipulation of human ES cells. The concluding section covers therapeutic applications of human ES cells, as well as addressing the ethical and legal issues that this research have raised.

The Hormonal Regulation of Pluripotency and Embryogenesis

Science, Ethics, and Public Policy

Stem Cells

Stem Cells, Human Embryos and Ethics

2008 Amendments to the National Academies' Guidelines for Human Embryonic Stem Cell Research

Human pluripotent stem cells (hPSCs), which cover both human embryonic stem cells (hESCs) and induced pluripotent stem cells (iPSCs), show promise for drug discovery and regenerative medicine applications. These stem cells cannot be cultured on conventional tissue culture dishes but on biomaterials that have specific interactions with the hPSCs. Differentiation is regulated by

the biological and physical cues conferred by the biomaterial. This book provides a systematic treatment of these topics bridging the gap between fundamental biomaterials research of stem cells and their use in clinical trials. The author looks at hPSC culture on a range of biomaterial substrates. Differentiation and control of hESCs and iPSCs into cardiomyocytes, osteoblasts, neural lineages and hepatocytes are covered. The author then considers their translation into stem cell therapies and looks at clinical trials across spinal cord injury, macular degeneration, bone disease and myocardial infarction. Finally, a chapter on future directions closes the book. By using this book, the reader will gain a robust overview of current research and a clearer understanding of the status of clinical trials for stem cell therapies.

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

Drawing on a wide range of interviews and primary and secondary sources, this book investigates the dynamic interactions between national regulatory formation and the global biopolitics of regenerative medicine and human embryonic stem cell science.

Human Embryonic Stem Cells Handbook

The Ethics of Embryonic Stem Cell Research

Molecular Mechanisms Controlling Human Embryonic Stem Cell Self-renewal and Differentiation

A Connection Between Differentiation and Mechanics in Human Embryonic Stem Cells

Impact of Religion, Ethics, and Regulation on Human Embryonic Stem Cell Researc

Considerable advances have taken place since the initial isolation and characterization of human embryonic stem (HES) cells; however, significant challenges remain before their potential for restoration and regeneration processes in patients can be realized. Understanding the diversity amongst HES cell lines and realizing the ability to isolate

lines with robust differentiation potential remain difficult. In the Human Embryonic Stem Cells Handbook, experts in the field provide an assortment of protocols that have been used by various laboratories around the world so as to allow both novices and experienced investigators to compare and contrast different approaches to HES cell isolation and characterization with the hope that, from these protocols, researchers might standardize approaches for HES cell biology. Written in the Methods in Molecular BiologyTM series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips for troubleshooting and avoiding known pitfalls. Authoritative and accessible, Human Embryonic Stem Cells Handbook serves as a valuable reference for scientists pursuing this vital field and its enormous potential.

If you wish to grow or characterize embryonic stem cells or persuade them to differentiate into a particular cell type, then this book contains information that is vital to your success. The aim is to provide clear simple instructions and protocols for growing, maintaining and characterizing embryonic stem cells and details of the various methods used to make stem cells differentiate into specific cell types.

Human Embryonic Stem Cell Protocols contributes to progress in the field by investigating human embryonic stem cells (hES) and increasing our understanding of the regulation of their self-renewal capacity, commitment and differentiation along various lineages, and their potential utility in regenerative medicine applications. These hard-won protocols, all generously shared by experts in this field, support the

continued isolation of additional hES lines as well as the development of improved culture conditions, countering the view that hES cells are difficult to maintain and use.

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

Culture of Human Embryonic Stem Cells on Peptide Functionalized Polymer Networks

Guidelines for Using Cells from Established Human Embryonic Stem Cell Lines for Research

Scientific Facts and Fiction

Engineering Tissue from Human Embryonic Stem Cells: Differentiation of Embryonic Stem Cells to Clinically Relevant Populations: Lessons from Embryonic Development

Embryonic stem cell research holds great promise for biomedical research, but involves the destruction of human embryos. Katrien Devolder explores the tension between the view that embryos should never be deliberately harmed and the view that such research must go forward, and provides an in-depth analysis of major attempts to resolve the problem.

The emerging field of human embryonic stem cell biomedicine crosses many disciplinary boundaries-cell biology, reproductive biology, embryology, molecular biology, endocrinology, immunology, fetal med

Is it acceptable from an ethical point of view to use stem cells from human embryos for scientific research and clinical therapy? And what are the weaknesses and strengths of various opinions and

positions when they are critically evaluated? These are the main problems dealt with in this book. The various chapters as a whole give a comprehensive, many-sided and balanced discussion of the subject. The book contains contributions from biological, medical, social, political, philosophical and theological perspectives. The authors have been chosen because of their professional competence, many of them being respected scholars on a top international level. They give an updated contribution from their own discipline in order to enlighten the different aspects of the common theme. The authors cover various positions and evaluations with regard to the question of the use of embryonic stem cells for research and therapy. The book is written for several audiences: a) scholars and professionals working with stem cell research or with the ethical questions arising from this field (people from biology, medicine, law, philosophy, theology etc.), b) advanced and graduate students within the same professional disciplines and c) politicians and the general public interested in the burning ethical problems which are intensively debated in many countries.

Methods and Techniques

Neural Differentiation of Human Embryonic Stem Cells

Biomaterial Control of Therapeutic Stem Cells

The Human Embryonic Stem Cell Debate

The Global Politics of Human Embryonic Stem Cell Science

Recent scientific breakthroughs, celebrity patient advocates, and conflicting religious beliefs have come together to bring the state of stem cell research â € "specifically embryonic stem cell research â € "into the political crosshairs. President Bush â € ™s watershed policy statement allows federal funding for embryonic stem cell research but only on a limited number of stem cell lines. Millions of Americans could be affected by the continuing political debate among policymakers and the public. Stem Cells and the Future of

Regenerative Medicine provides a deeper exploration of the biological, ethical, and funding questions prompted by the therapeutic potential of undifferentiated human cells. In terms accessible to lay readers, the book summarizes what we know about adult and embryonic stem cells and discusses how to go about the transition from mouse studies to research that has therapeutic implications for people. Perhaps most important, Stem Cells and the Future of Regenerative Medicine also provides an overview of the moral and ethical problems that arise from the use of embryonic stem cells. This timely book compares the impact of public and private research funding and discusses approaches to appropriate research oversight. Based on the insights of leading scientists, ethicists, and other authorities, the book offers authoritative recommendations regarding the use of existing stem cell lines versus new lines in research, the important role of the federal government in this field of research, and other fundamental issues.

Discusses the ethical issues involved in the use of human embryonic stem cells in regenerative medicine.

This dissertation, "Expression and Functions of FOXM1 in Human Embryonic Stem Cells" by Chun-ting, Davis, Kwok, 郭俊廷, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. Abstract: Human embryonic stem cells (hESCs) are characterized by unlimited proliferation (self-renewal), capability to differentiate into derivatives of all three germ layers (pluripotency), and abbreviated cell cycle structure. Despite tremendous efforts in identification of important regulators, the complicated molecular mechanisms and essential effectors underlying the distinctive features of hESCs have not yet been fully elucidated. Forkhead box transcription factor M1 (FOXM1) has been demonstrated to be critical for the maintenance of pluripotency in mouse embryonic stem cells (mESCs) and mouse embryonal carcinoma

cells (mECCs). The present study hypothesized that FOXM1 is important to the self-renewing capacity and pluripotency of hESCs. The objectives of this study were to characterize FOXM1 expression in undifferentiated and differentiating hESCs, and to study the effect of perturbing FOXM1 expression on pluripotency and proliferation. Undifferentiated VAL3 analyzed by bivariate flow cytometric analysis revealed that FOXM1 expression was regulated in a cell cycle phase-dependent manner, with expression level increased from G1 through S phase, and eventually reached peak levels in G2/M phase. To study the subcellular localization of FOXM1 with respect to cell cycle progression, VAL3 cells were synchronized by nocodazole-mediated cell cycle block, followed by immunocytochemical analysis. The result indicated that FOXM1 underwent nuclear translocation at late-S and early-G2 phase of the cell cycle. When VAL3 spontaneously differentiated as embryoid bodies (EBs), the mRNA expression of FOXM1 displayed profound fluctuation over the differentiation process. Retinoic acid (RA) treatment induced rapid differentiation of VAL3, yet differential expression pattern of FOXM1 was observed for cells grown in different culture media. FOXM1 mRNA expression persisted in differentiating VAL3 cultured in mTeSR. By contrast, RA-driven differentiation of VAL3 cultured in conditioned medium was accompanied by transient depletion and resurgence of FOXM1 protein expression. Differentiation of VAL3 driven by Definitive Endoderm kit did not alter FOXM1 expression, whereas induced differentiation by Bone Morphogenic Protein 4 (BMP4) led to repression of FOXM1. The functional role of FOXM1 in hESCs was investigated with the use of siRNA. Transient knockdown of FOXM1in VAL3 did not induce substantial repression of pluripotent marker (OCT4, SOX2, NANOG) expression nor significant morphological change of colonies, despite upregulation of early differentiation marker SSEA-1. Intriguingly, FOXM1 depletion led to altered cell cycle progression and delay in G2 phase progression, possibly attributed to the downregulation of Cyclin B1 and Cdc25B. Also FOXM1 knockdown impaired VAL3 proliferation, yet no prominent defect in mitosis

was observed. In conclusion, the present study reported for the first time the expression and functions of FOXM1 in undifferentiated hESCs. Upon differentiation, FOXM1 expression varied in cells committing to different lineages. Depletion of FOXM1 did not interfere with hESCs pluripotency, but hindered cell cycle progression and cell proliferation, suggesting that FOXM1 is mainly involved in promoting rapid proliferation of hESCs. The functional role and regulatory mechanics of FOXM1 in hESCs cell cycle control and differentiation warrant further investigation. DOI: 10.53

Volume I: Isolation and Characterization

Human Embryonic Stem Cell Research

Oligodendrocyte Fate Determination in Human Embryonic Stem Cells

Guidelines for Human Embryonic Stem Cell Research

The Import of Human Embryonic Stem Cells

Since 1998, the volume of research being conducted using human embryonic stem (hES) cells has expanded primarily using private funds because of restrictions on the use of federal funds for such research. Given limited federal involvement, privately funded hES cell research has thus far been carried out under a patchwork of existing regulations, many of which were not designed with this research specifically in mind. In addition, hES cell research touches on many ethical, legal, scientific, and policy issues that are of concern to the public. This report provides guidelines for the conduct of hES cell research to address both ethical and scientific concerns. The guidelines are intended to enhance the integrity of privately funded hES cell research by encouraging responsible practices in the conduct of that research.

The promise of human embryonic stem cell research: hearing before a subcommittee of the Committee on Appropriations, United States Senate, One Hundred Eleventh Congress, second session, special hearing, September 16, 2010, Washington, DC.

A handbook of the practical aspects of working with human embryonic stem cells from their derivation to the development of clinical applications. The chapters would start with a brief review and then give practical details for experimental analysis and research. It would also cover ethical issues and requirements for clinical developments.

Human Pluripotent Stem Cells

The Promise of Human Embryonic Stem Cell Research

Embryonic Stem Cell Protocols

Human Mesenchymal and Embryonic Stem Cells

Centennial, Saint Mary's Church, 1840-1940

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.

Recent advances in human embryonic stem cell (hESC) biology now offer an alternative cell source for tissue engineers, as these cells are capable of proliferating indefinitely and differentiating to many clinically relevant

cell types. Novel culture methods capable of exerting spatial and temporal control over the stem cell microenvironment allow for more efficient expansion of hESCs, and significant advances have been made toward improving our understanding of the biophysical and biochemical cues that direct stem cell fate choices. Effective production of lineage specific progenitors or terminally differentiated cells enables researchers to incorporate hESC derivatives into engineered tissue constructs. Here, we describe current efforts using hESCs as a cell source for tissue engineering applications, highlighting potential advantages of hESCs over current practices as well as challenges which must be overcome

A discussion of all the key issues in the use of human pluripotent stem cells for treating degenerative diseases or for replacing tissues lost from trauma. On the practical side, the topics range from the problems of deriving human embryonic stem cells and driving their differentiation along specific lineages, regulating their development into mature cells, and bringing stem cell therapy to clinical trials. Regulatory issues are addressed in discussions of the ethical debate surrounding the derivation of human embryonic stem cells and the current policies governing their use in the United States and abroad, including the rules and conditions regulating federal funding and questions of intellectual property.

An Introduction to the Science and Therapeutic Potential

Expression and Functions of Foxm1 in Human Embryonic Stem Cells

Embryonic Stem Cells

A Novel Model System for Early Human Development

Pine Creek, Glenshaw, Pennsylvania, Labor Day, September 2, 1940

A comprehensive collection of diverse techniques for the molecular and cellular manipulation of human embryonic stem (hES) cells. These readily reproducible methods have been optimized for the derivation, characterization, and differentiation of hES cells, with special attention given to regenerative medicine

applications. A companion CD provides color versions of all illustrations in the book. The protocols follow the successful Methods in Molecular Biologya series format, each offering step-by-step laboratory instructions, an introduction outlining the principles behind the technique, lists of the necessary equipment and reagents, and tips on troubleshooting and avoiding known pitfalls.

With this valuable practical guide, three members of the Harvard Stem Cell Institute have compiled and edited the definite handbook for the exciting new field of human embryonic stem cell research. The editors have gathered protocols from scientists with extensive reputation and expertise, describing and comparing currently used techniques for the culture of human stem cells and discussing the strengths and weaknesses of the different approaches. Human Embryonic Stem Cells: The Practical Handbook contains the first centralised collection of methods used in human embryonic stem cell biology. The book covers the derivation of human stem cell lines, the obtaining of cells from human stem cell banks, the culturing and characterisation of the cells, and the differentiation of the cells in vitro and in vivo. Lastly, almost all of these protocols can also be used for analyzing and manipulating induced pluripotency iPS stem cells. This allows an even greater number of opportunities for those interested in purusing work in pluripotent stem cells, disease modelling, and other aspects of basic regenerative medicine research. The novel and useful focus of this book sets it apart from other available books: Compares and evaluates the protocols used in leading laboratories working on human embryonic stem cells Centred solely on practical protocols for human (not mouse) embryonic stem cell research Includes extensive troubleshooting sections Addresses the different proclivities and behaviours of individual human embryonic cell lines Contains techniques currently known only to a small number of specialised laboratories worldwide This handbook represents an essential source of up-to-date practical information for all cell and developmental biologists working with human embryonic stem cells or wishing to enter the field. It is also essential reading for clinical researchers in areas such as

diabetes, cardiovascular disease, and neurological diseases. Praise from the reviews: "...a highly readable and useful book... A notable feature of the book is its air of openness and honesty... This book... will help many to navigate the uncharted waters of human embryonic stem cell biology." BRITISH SOCIETY FOR CELL BIOLOGY "... the imaginative solutions in this book can inspire us to get past our most frustrating limitations." CELL STEM CELL "... the richness in the details of each protocol presented will certainly encourage more scientists to begin studies of Human pluripotent stem cells..." REGENERATIVE MEDICINE "In this fast-moving field, this [handbook] will help drive advances of more and more researchers." DIFFERENTIATION "...a valuable resource for seasoned and novice researchers... an excellent addition to the reference collection of any medical library or research laboratory." THE AMERICAN MEDICAL ASSOCIATION

This new book presents and discusses current research in the field of stem cell research, with a particular focus on both human mesenchymal and embryonic stem cells. Topics discussed include the effect of the n-terminal peptide of link protein on human mesenchymal stem cells from osteoarthritis patients; bone marrow derived mesenchymal stem cells; derivation of human embryonic stem cell lines; neuronal differentiation of murine embryonic stem cells; acute effect of endothelins on intercellular communication of human embryonic stem cells and commercialization of human stem cells and stem cell-based products.

Stem Cells and the Future of Regenerative Medicine

Inhibition of Human Embryonic Stem Cell Differentiation by Mechanical Strain

Cultivation of Human Embryonic Stem Cell-derived Embryoid Bodies Under Defined Environmental Conditions for the Production of Hematopoietic Cells

Human Embryonic Stem Cells

Interdisciplinary Perspectives

Now in two volumes, this completely updated and expanded edition of Embryonic Stem Cells: Methods and Protocols provides a diverse collection of readily reproducible cellular and molecular protocols for the manipulation of nonhuman embryonic stem cells. Volume one, Embryonic Stem Cell Protocols: Isolation and Characterization, Second Edition, provides a diverse collection of readily reproducible cellular and molecular protocols for the isolation, maintenance, and characterization of embryonic stem cells. The second volume, Embryonic Stem Cell Protocols: Differentiation Models, Second Edition, covers state-of-the-art methods for deriving many types of differentiating cells from ES cells. Together, the two volumes illuminate for both novices and experts our current understanding of the biology of embryonic stem cells and their utility in normal tissue homeostasis and regenerative medicine applications.

Human Embryonic Stem Cells in Development, Volume 129, the latest release in the Current Topics in Developmental Biology series, highlights new advances in the field, with this new volume presenting interesting chapters on topics such as recapitulating pancreas development from human embryonic stem cells in a dish, modeling mammalian gastrulation with embryonic stem cells, and a section on what stem cells tell us about human germ cell biology. Each chapter is written by an international board of authors. Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in the Current Topics in Developmental Biology series

In 2005, the National Academies released the report 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 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, the Committee identified issues that warranted revision, and this book addresses those issues in a second set of amendments. Most importantly, this book addresses new scientific developments in reprogramming of somatic cells to pluripotency by adding a new section and revising other relevant sections of the Guidelines.

The Practical Handbook

A Model for Human Neural Development

Regenerative Medicine in Transition

Human Embryonic Stem Cells in Development

Human Embryonic Stem Cell Protocols