

# Stem Cell Biology in Health and Disease

Thomas Dittmar · Kurt S. Zänker  
Editors

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 Springer

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# Preface

Within the last decade there has been a dramatic increase in the understanding and application of biological principles within stem cell therapies, which has made it necessary to produce a book which intends to summarize much of the body of knowledge concerning *Stem Cell Biology in Health and Disease*. Although some of the treatments have been suggested for many years, knowledge and technology have now progressed sufficiently to allow us to test many of the different concepts with human embryonic, induced pluripotent, organ-specific and resident, cancer and mesenchymal stem cells in animal models and clinical settings – alone or in combination with other therapies in cardiovascular and neurodegenerative diseases, in diabetes and against cancer.

Studies on stem cells have been hampered in the past by the ethical and biological difficulties in preparing sufficient cell numbers in a reasonable characterized and pure form. In stem cell research we are now on the threshold of a revolution; a revolution that will have major ramification for human medicine. Giant strides in our understanding of stem cell biology and the elements that control the biological behavior of the different traits of stem cells have made it possible to intervene directly with regenerative life processes and to open a novel chapter in the fight against cancer.

Chapter 1 shortly summarizes the historical hall marks of stem cell research in biology; Chapter 2 describes the hematopoietic stem and progenitor cells in clinical use; Chapter 3 describes the protocols to expand hematopoietic stem cells *ex vivo*; Chapter 4 highlights one important feature of hematopoietic stem/progenitor cells, namely cell migration; Chapter 5 opens the books on properties of mesenchymal stem cells for cancer cell therapy; Chapter 6 reviews intensively alternative embryonic stem cell sources to solve both ethical concerns and the allogeneic nature of human embryonic stem cells for therapeutic use; Chapters 7 and 8 describe the role of stem cell therapy in Multiple Sclerosis and Parkinson's Disease; Chapters 9, 10 and 11 introduce novel perspectives on cancer stem cells stimulating a provocative discussion of the complexity of cancer origin, and their niches of existence either in a tumor mass or in chronically inflamed microenvironment, e.g. inflamed periodontium (Chapter 12); Chapters 13 and 14 directly address hematopoietic and solid cancer stem cells and Chapter 15 embarks on a novel role of the diversity of cancer stem cells in tumor relapse and metastases formation. Chapter 16 describes

new therapeutic approaches to eliminate cancer stem cells and Chapter 17 puts the focus on a molecular target family in cancer stem/progenitor cells - the ATP-binding cassette membrane transporters - which are promising therapeutic entities. Multiple key references are provided by the authors at the end of each chapter, and the reader is encouraged to consult these sources as well, because due to the limited space of a monograph the technical details cannot be presented in a survey of this type.

Again, we would like to thank all distinguished authors for their valuable contributions to provide with this book a robust ground for the avalanche of discoveries that will deluge the field of stem cell research in the years to come.

Summer 2009

Witten, (Germany)  
Thomas Dittmar  
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