Foreword

by
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Stem cell research has gained much prominence in recent years for its therapeutic potential in dealing with difficult diseases many of which are essentially incurable by normal therapies. These diseases are characterized by progressive cell loss and, in the nervous system, which has no regenerative potential, the degenerative process leads to Alzheimer and Parkinson diseases. These have become serious health problems as people in advanced societies now live longer. There is great variability in the occurrence and onset of these diseases and the underlying environmental and genetic factors are unknown. Cell loss can also be caused by autoimmune reactions which produce the destruction of the beta cells of pancreatic islets, the main cause of diabetes, another serious health problem.

In all of these cases, it is hoped that using stem cells with a potential to differentiate into the destroyed cells will allow a replacement of function and a cure or amelioration of the disease. A large part of stem cell research aims to identify and propagate the appropriate stem cells to recapitulate, so to speak, embryonic development for that particular cell lineage.

For therapeutic use we would want autologous cells or else we face the problem of transplantation barriers. There are organs which are capable of regeneration, such as the liver, as well several systems which are continually being renewed, such as the epithelial lining of the intestine, skin and, most prominently, the hemopoietic system. There is a large effort to identify and cultivate such stem cells and to see whether there are dormant stem cells and whether one stem cell could be converted into another.

Ideally, we would like methods to take a normal differentiated cell of an individual and drive it back in time to generate a stem cell with the appropriate differentiation potential. The only way of doing this today is to put the nucleus of a differentiated cell into a fertilized egg and allow it to develop a little further to isolate pluripotential stem cells bearing the same genetic properties of the donor. Since this is the first step in the cloning of organisms from somatic cells, this area has aroused much controversy. There are strong moves to ban human reproduction by cloning on socioethical grounds quite apart from the uncertainties of cloning that have been revealed by animal experiments. There are also moves to extend this prohibition to what is called therapeutic cloning, i.e. the use of cloning to generate stem cells. There is also the question of using human embryos to develop techniques of selecting and propagating human stem cells with specific differentiation potential.

The reader will find a complete and up-to-date coverage of this important field of stem cell research, ranging all the way from molecular biology to bioethics.

Foreword

by
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Stem cell research has great potential to transform modern clinical medicine, given the ability of stem cells to change themselves physiologically, morphing into distinct tissue types. These undifferentiated, self-renewing cells can provide doctors with the hope and means to tackle illnesses such as Parkinson and Alzheimer diseases, spinal cord injuries and insulin-dependent diabetes.

To take full advantage of their limitless potential requires highly-skilled, dedicated personnel and excellent facilities, all functioning under a forward-looking regulatory framework. Singapore possesses these key factors, as exemplified by our two universities, our hospitals, and our Biopolis, Singapore's unique biomedical sciences public and private research hub.

The success of the First International Stem Cell Conference 2003, co-hosted by our Biomedical Research Council of the Agency for Science, Technology and Research and the National University of Singapore, put the seal of approval on our island-state's reputation as a global player in this arena, something that it has been working towards since Prof. Ariff Bongso's discovery of human embryonic stem (ES) cells in 1994.

Prof. Bongso has since gone on to produce several ES cell lines and developed an animal-free system for growing them in culture, making him one of the world's acknowledged authorities on ES cells and an excellent choice for editor of this book.

Prof. Bongso's skills are complemented well by fellow editor Prof. Lee Eng Hin's expertise in adult stem cell-mediated physeal and articular cartilage repair. Prof. Lee and his team at the Faculty of Medicine, The National University of Singapore, were among the first in the world to bring this technology to clinical trials. They have since demonstrated that it can successfully restore damaged physeal and articular cartilage.

Together, the two co-editors bring a unique perspective to bear on Singapore's stem cell research scene; one that I hope the readers of this book will greatly enjoy.