

PREFACE

Currently, stem cells research is generating considerable excitement and debate, which is clearly reflected in the ever-increasing number of scientific publications in peer-reviewed journals and clinical trials using stem cells. There is a growing consensus amongst the policy analysts and scientists alike that India is likely to play a key role in the scientific, clinical and commercial development of stem cell research. Although at a nascent stage, stem cell research and therapies is a rapidly growing field in India and the market is estimated to be of around US \$ 600 million. The global market for stem cell therapy is expected to be worth around US \$ 20 billion by 2010.

Although significant progress has been made in understanding their mechanisms and unraveling their potential for therapeutic application, widespread use of stem cell-based therapies is still in a nascent stage but can one day benefit a vast number of patients. At present, stem cells from multiple sources have been identified and characterised and this list is increasing. Embryonic stem cells, stem cells from bone marrow, adipose tissues, umbilical cord, dental pulp and several other locations can offer a potential source of allograft or auto graft in future. Recent establishment of induced pluripotent stem cells may revolutionise drug screening and toxicity.

Translational research in the field of stem cells is advancing at a rapid pace, mostly in the area of adult stem cells. However, these successes to some extent are limited by the problems of reproducibility, poor therapeutic outcome and lack of understanding of the mechanisms needed for clinical advances. It is, therefore, pertinent to research into all possible sources of stem cells at this point—embryonic as well as adult—as it is not clear which approach would lead to successful therapies for different diseases.

While putting together this book, we were attentive to its role in education and clinical research around the world, including India. Our primary goal was to maintain the unique components that make this book a first line resource—comprehensive yet succinct and clearly written chapters addressing all major areas of stem cell biology and their potential application in therapies. Many renowned experts have contributed to this book and we are greatly indebted to our contributing authors for giving us their valuable time while preparing these chapters. As the authors have described some of their own findings, the book also serves as a first-hand reference for researchers. The book covers the entire cross-section of stem cell biology and will be valuable for researchers, students and beginners.

Each chapter covers the basic as well as advanced material on each topic. It is assumed that students or readers using this book would have previously acquired a basic biological vocabulary. The book has been divided in two parts. *Part One* covers embryonic stem cells, the most potent stem cells known so far. This section also contains a chapter on the emerging field of embryonic stem cell-based drug screening platforms. *Part Two* deals with the multipotent adult stem cells from different tissue types. This section also covers some unique concepts such as cancer stem cells and tissue engineering-based approaches for designing the right microenvironments for tissue regeneration. An attempt has also been made to present a very balanced outlook on the therapeutic and technological advances in each area. We have made all efforts to ensure that this book provides an up-to-date, accurate and a complete resource for the topics covered. Nonetheless, the field of stem cell is multifaceted and rapidly evolving, and there is a remarkable scope for improvement.

KAUSHIK D. DEB

SATISH M. TOTY