

1

Introduction

Saura C. Sahu

Division of Toxicology, Center for Food Safety and Applied Nutrition, Food and Drug Administration, USA

Stem cells are the mothers of all cells in multicellular organisms. They have the potential to become any other type of cell in the body. They are undifferentiated cells of the same family capable of dividing throughout life, generating new highly differentiated cells of unlimited potency. Because of their unique regenerative abilities, they can serve as an internal repair system to replenish damaged or dead cells in many tissues. Therefore, they have attracted increasing amounts scientific attention for their potential use in biomedical applications.

The studies by McCulloch and Till published in 1963 (Becker et al., 1963; Siminovitch et al., 1963) gave birth to modern stem cell research. Over a period of approximately half a century, there was exponential growth in this developing new area of scientific research. Stem cells have the capacity to grow in culture continuously in an undifferentiated state renewing themselves to more specialized differentiated cells. Therefore, they have become a very important and useful *in vitro* research tool in toxicology and medicine. They can be used as excellent *in vitro* models for predictive toxicity screening of chemicals and new drugs. Thus, the study of stem cells is a new developing scientific discipline and their use in toxicology and medicine is unlimited.

It is becoming increasingly clear from the rate of publications that developments in the use of stem cells in toxicology and medicine are moving so rapidly that new means are needed to report the current status of this new active area of research. As the Editor of this monograph *Stem Cells in Toxicology and Medicine*, it gives me great pride and pleasure to introduce this unique book that encompasses many aspects of stem cell research never published together before. It is only recently that this exciting area of research has attracted the attention of toxicologists. This book deals with information on stem cells at a level designated to take the reader to the frontier of research in this specific new developing scientific discipline. It is expected that stem cell research, actively pursued throughout the world, will lead to major discoveries of fundamental importance and of great clinical significance. This monograph brings together the ideas and work of investigators of international reputation who have pioneered in this exciting area of research in toxicology and medicine.

The book provides up-to-date information as well as new challenges in this exciting area of research. This book reflects the remarkable developments in the stem cell technology in recent years. New ideas and new approaches are being brought to bear on explorations of the role played by these unique cells in toxicology and medicine. Therefore, exciting times lie ahead for the future of stem cell research. I sincerely hope that the book will provide authoritative information as well as new ideas and challenges in this area of research for stimulating the creativity of investigators actively engaged in this rapidly developing new scientific discipline.

References

- Becker AJ, McCulloch EA, Till JE (1963). Cytological demonstration of the clonal nature of spleen colonies derived from transplanted mouse marrow cells. *Nature* 197 (4866): 452–454. Bibcode: 1963Natur.197.452B. doi: 10.1038/197452a0. PMID 13970094.
- Siminovitch L, McCulloch EA, Till JE (1963). The distribution of colony-forming cells among spleen colonies. *Journal of Cellular and Comparative Physiology* 62 (3): 327–336. doi:10.1002/jcp.1030620313. PMID 14086156.