
Preface

The power of stem cells for tissue development, regeneration, and renewal has been well known by embryologists and developmental biologists for many years. Those presently active in research in the stem cell field owe much to previous work by embryologists and cancer researchers for their insights into what stem cells can do. In the last 4–5 years, the rapid expansion of the concept of adult tissue stem cells as pluripotent progenitors for various tissues has led to an even greater appreciation of the power of stem cells. The demonstration that both embryonic and adult tissue stem cells have the ability to produce progenitor cells for tissue renewal has opened vast possibilities for treatment of congenital deficiency diseases as well as for regeneration of damaged tissues. Older concepts of determination leading to loss of potential during differentiation of adult tissues are being replaced by newer ideas that cells with multiple potential exist in different forms in various adult organs and that cells thought to be restricted to differentiation to one cell type may be able to “transdifferentiate” into other tissue cell types. Thus, the concept of “embryonic rests” in adult tissues, hypothesized to be the cellular origin of cancer by Durante and Conheim in the 1870s, now can be expanded to include survival of pluripotential embryonic-like stem cells in adult tissues.

The goal of *Stem Cells Handbook* is to present in one resource both the background and the current understanding of what stem cells are and what they can do. The authors of the various chapters were selected for their significant contributions to and expertise in various aspects of stem cell biology. First, the function of embryonic stem cells in early development and organogenesis, and germinal stem cells in reproduction are presented, followed by how embryonic stem cells may be cloned and how they are programmed. The role of stem cells in amphibian regeneration and mammalian wound healing shows the potential of these cells for tissue renewal. The participation of stem cells in normal tissue renewal of various organ systems, including blood, nervous tissue, retina, blood vessels, heart, kidney, skin, glandular organs, gastrointestinal tract, liver, pancreas, mammary gland, prostate, and lung are then specifically adumbrated, including not only the role of stem cells in tissue renewal and carcinogenesis, but also the isolation and characterization of various stem cell types, the potential for their manipulation, and the possibilities for future therapeutic uses in experimental models and in human diseases. The remarkable properties of hematopoietic stem cells and the clinical results achieved by transplantation of bone marrow stem cells are documented in several chapters. The potential future promise for clinical applications for regeneration of the cardiovascular and nervous system as described in preclinical models is also emphasized. Of particular interest to the editor is the potential for stem cell therapy for liver, not only because the liver has special problems and importance as the major metabolic organ of the body, but also because of its potential as an objective for transplantation and gene therapy.

Finally, a codicil for a book such as this that tries to cover an active field of research is that by the time it is published there will almost certainly be advances in understanding that have already made some of the material out of date. For example, in the last few months, there have been a number of additional papers on the plasticity of adult tissue stem cells as well as the observation that some effects believed to result from stem cell plasticity may be explained by cell fusion. Only ongoing studies will resolve these questions and provide the approaches required for potential breakthroughs in application to human diseases. In the meantime, we hope that the expert

chapters in *Stem Cells Handbook* will provide useful and authoritative information to aid those who seek the answers to the unanswered questions.

The editor is indebted to G. Barry Pierce for his encouragement and insights into teratocarcinoma as a stem cell tumor, to Gerri Abelev for discovering alphafetoprotein, to the late Hidematsu Hirai for his enthusiastic support of international research in oncodevelopmental biology, to Fred Becker and Emmanuel Farber for their models and concepts of chemical hepatocarcinogenesis, to Benito Lombardi and Hishasi Shinozuka for their early work on models of oval cell proliferation, to Hyam Leffert for his encyclopedic knowledge of liver cell culture, to the many postdoctoral fellows, graduate students, and technicians who did all of the real work in my laboratory, to Thomas Lanigan and Humana Press for their encouragement and patience, and especially to the distinguished authors who contributed chapters to *Stem Cells Handbook*.

Stewart Sell, MD

Stem Cells Handbook

Sell, S. (Ed.)

2004, XIII, 509 p. 251 illus., 22 illus. in color., Hardcover

ISBN: 978-1-58829-113-4

A product of Humana Press