

Preface

Neurological diseases are disorders in the central nervous system or the peripheral nervous system that is caused by structural, biochemical, and electrophysiological dysfunctions or abnormal functions of neurons or glial cells. There are some groups of neurological diseases including neurodegenerative diseases such as Parkinson's disease, Huntington's disease, and amyotrophic lateral sclerosis, and others related to dysfunctional blood circulation such as ischemic and hemorrhagic strokes or cancer such as glioma.

Although there are different symptoms, all neurological diseases are results from the significant loss of neurons or glial cells. The regeneration of these cells is considered as the promising strategy to treat diseases. Stem cell therapy draws attention as a promising regenerative option for the treatment of various neurologic diseases.

In recent years, stem cell therapies are moved to the clinic with exciting results. There are at least three ways that stem cells can correct injured neurological tissues including cell replacement, paracrine factors, and immunomodulation. Indeed, some kinds of stem cells, such as embryonic stem cells, induced pluripotent stem cells, neural stem cells, or mesenchymal stem cells, are easily differentiated or trans-differentiated into neural cells. Transplantation of these stem cells or differentiated cells from these stem cells can supply new neural cells to regenerate injured or degenerative tissues. In addition to direct cell replacement, stem cells can secrete various cytokines and growth factors that elicit a variety of beneficial effects such as neural cell protection and induction of the endogenic recovery system. Recently, mesenchymal stem cells are proved as effective immunomodulatory factors. By direct communication or via cytokines, mesenchymal stem cells can suppress the inflammatory process, inhibit the autoimmune reactions, etc.

This volume of *Stem Cells in Clinical Applications* book series entitled *Neurological Regeneration* aims to provide updated invaluable resource for advanced undergraduate students, graduate students, researchers, and clinicians in stem cell applications for neurological regeneration.

This book with 13 chapters covers almost the present applications of stem cells in the central and peripheral nervous system regeneration. Chapter 1 introduces and

updates recent applications of stem cells in neurological regeneration. Chapters 2, 3, 4, 5, 6, 7, 8, and 9 introduce some recent approaches of stem cells in brain regeneration, and spinal injury healing, respectively. And Chaps. 10, 11, 12, and 13 focus on peripheral nervous system regeneration including tympanic membrane, retina, and cornea.

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