

Preface

It is my great honor to be invited by Professor Zhu Chen as the chief editor of the *Stem Cell Fascicle of Published Engineering*. Chinese scientists have been devoting to the basic research and clinical application in the field of stem cell biology and have obtained a series of original achievement in the flow of exploration of fundamental theory, key scientific problem research, clinical trials of products, and analysis of mechanism back in the lab laboratory in the past decade.

The essence of life lies in stem cells. Stem cell research currently is the hottest and leading part in the field of life science research. Stem cell research acts as a great role in the development of life science providing new medical method for human health service and leading the development of new drugs and technological industrialization. As it were, stem cell research occupies currently the most influential field of scientific research and economy, which advances with times, broad and profound, covers and contains everything. The interdisciplinary research of basis and clinic attracts many senior and junior scientists to participate in, which blooms the field of stem cell.

In China, under the long-term influence of traditional medicine, which is quite different from the western, we have got a unique understanding of life. Thus, stem cells have been given a special definition and called flesh and blood of human body and best product for nourishing and nurturing. Integrating innovative thinking and life science technology into traditional Chinese medicine has promoted stem cell research to achieve in basic scientific findings and clinical applications. The discovery of stem cell is hailed as the model of technological innovation of oriental medicine to which the government has attached high importance by sponsoring considerably through related departments chronically. In the field of life science, China predominates the IPR of core technology of stem cell and has built a leading industry of stem cells all over the world especially in the parts of new drugs and clinical transportation from the same starting line with other countries. It will promote considerably the development of stem cell industry, lead the technological innovation, and make our country one of the developed countries in regenerative medicine of stem cells.

The research of stem cell involves nearly every field of life science and biomedicine and the application of stem cell therapy covers almost all of the clinical major diseases in present. In recent years, stem cell research has repeatedly been named as annual important scientific achievement by the international scientific community for the reason that stem cell and its technology holds great promises for human to cure refractory diseases for a long and healthy life. Therefore, in near future, the storage of stem cell will contribute to cure several major diseases for human and it is sure that the research of stem cell will involve in more fields of health service. The differentiation of multiple system and refinement of division of work will be a trend in the field of stem cell research. Inducing the stem cell to differentiate in specific direction by reprogramming technology makes the treatment of stem cell more targeted. For instance, blood type incompatibility or blood supply insufficiency can be excluded by self-renewal of blood cells.

The field of stem cell research is vibrant and has a bright future; time waits for no one and we race against it. We should develop new technologies constantly, accelerate the research of innovative drugs and establish professional, systemic platform for resource sharing of stem cell and biological treatment research to evaluate immune function of stem cell. We should integrate and increase the utilization efficiency of clinical resource and mobilize fully the enthusiasm of stem cell research in various clinical departments to take advantage of interdisciplinary superiority of stem cell. We should implement the research of clinical transportation and integrate production, education and research to push forward effectively the advance of life science and transformation medicine, drive the development of technological industry of life, and promote national health industry one more step forward by doing what we can do.

Finally I want to express gratitude to the team of authors, which is the authority in the field.

Professor Yanan Du develops and integrates micro/nano scale technologies and biomaterials to advance the understanding and applications of cell/tissue engineering and therapy for drug testing, pathology investigation, and regenerative medicine.

Professor Xiaosong Gu does excellent work in based tissue engineering for the treatment of neurological injuries based on marrow mesenchymal stem cells.

Professor Ying Han explores the clinical applications and mechanisms of stem cell therapy in liver diseases.

Professor Zongjin Li has used state-of-the-art molecular biology technology and developed molecular imaging assays for the study of intact biological systems, especially stem cell therapy.

Professor Naihe Jing mainly focuses on BMP signaling pathway and epigenetic regulation of central neural system development and neural differentiation of pluripotent stem cell.

Professor Xuetao Pei's main research fields are stem cell biology, stem cell therapy and regenerative medicine.

Professor Ji Wu is a pioneer in the study of female germline stem cells in mammals.

Professor Kaichun Wu has been interested in the stem cell research and application for human intestinal diseases including inflammatory bowel disease.

Dr. Rongwen Xi uses *drosophila* as a genetic model organism for the understanding of microenvironmental and intrinsic mechanism regulating self-renewal and differentiation of stem cell tissues.

Professor Xinhua Xiao's main research interests include the role of genetics and epigenetics in the pathogenesis and progression of type 2 diabetes and monogenic disorders of glucose metabolism.

Professor Limei Yu focuses on the study of mesenchymal stem cells and epithelial cells derived from amnion membrane.

Professor Qi Zhou is a pioneer in the study of iPSCs.

Professor Jianhong Zhu is pioneer in the study of neural stem cells.

Professor Lee is a chaser of regenerative medicine through stem cell based gene therapy.

Professor Nedime Serakinci has internationally proven extensive expertise in Telomere/telomerase biology as well as in stem cell biology and pioneer in cellular immortalization of primary stem cells.

Dr. Mahmut Cerkez Ergoren specialized on the fundamental processes like mutation, recombination and polymorphism that generate DNA diversity and genome instability and thus contribute to disease and drive evolution.

Professor Philip Pastides is an orthopaedic surgeon based in London with an interest in trauma and biomechanics.

Dr. Wasim Khan is an orthopaedic surgeon based in London with an interest in stem cell biology and musculoskeletal tissue engineering.

Professor Seok-Goo Cho focuses on researching the underlying mechanisms of mesenchymal stem cell-based immune modulation for various applications and ultimately aims to enhance the therapeutic potential of mesenchymal stem cells through novel approaches including combinatory cell-based therapy, gene-modification and polarization in immune-mediated disorders.

Dr. Nayoun Kim pursues basic and translational research aimed at employing mesenchymal stem cell-based therapy to regulate the immune system in various pathological conditions.

Dr. Robert Henning is the Director of the Center for Cardiovascular Research at the James A. Haley Hospital/University of South Florida College of Medicine and has a special research interest in human umbilical cord stem cells in the repair of hearts damaged from myocardial infarction and myocardial ischemia and injury.

7 The Concept of Mesenchymal Stem Cell System and Its Role

Insights into Functional Research of MSCs
Shihua Wang and Wenjun Guo