



Mesenchymal Stem Cells in Human Health and Diseases. Ahmad H. K. El-Hashash (ed.) Academic Press, an imprint of Elsevier, 125 London Wall, London EC2Y5AS, United Kingdom. 2020. xxiv + 204 pages. Price: US\$ 200.00

It is indeed a pleasure going through the book entitled *Mesenchymal Stem Cells in Human Health and Diseases*. It is a wonderful collection of the current state of the Mesenchymal Stem Cells (MSCs) in health and diseases. It summarizes the therapeutic potential of MSCs in specific diseases and regenerative medicine.

The discovery of MSCs has transformed the cell-based therapies for various therapeutic purposes in recent decades. The author clearly mentioned that the translation of therapeutic outcomes in the *in-vitro* and *in-vivo* studies remains below satisfaction as large clinical trials are essential to prove the merit of MSCs. The author has amply described the growth of the clinical studies and subsequent numbers of cell-based research papers published with the help of statistical and financial data. This book basically describes the current scope of MSCs in the clinical disorders such as myocardial injury, osteoarthritis, pulmonary diseases, liver diseases, gastrointestinal diseases and a brief summary of the immune characteristics of the MSCs. The authors have rightly stated that the complexity of the MSCs function should be investigated with the extensive studies on single cell RNA sequencing, proteomics and genomics. The puzzle about the source of MSCs to be utilized for the particular disorders remains unresolved warranting source standardization.

Currently, immunoregulatory properties of MSCs are an attractive area of investigations, especially for the therapy of GVHD, diabetes, osteoarthritis, rheumatoid arthritis, etc. Authors have tried to incorporate most of the *in vivo* results obtained along with effector proteins and factors present in the secretome of the MSCs. Interaction of effector molecules of the MSCs with various cells involved in immune function such as dendritic cells, macrophages, natural killer cells, B cells and T cells is adequately described. I am of the opinion that authors could have included the immunosuppressive properties of MSCs during co-transplantation of beta cells. Also, the varying outcomes of MSCs mediated immune regulation during the autologous and allogeneic therapy could have been more elaborated with more citations. Furthermore, the chapter on MSCs, iPSCs and iMSCs originated differentiation of retinal cells is a treat to the readers as most of budding researchers are relatively unaware about the tremendous potential of MSCs in retinal disorders. The authors have adequately described the recent studies which have tested MSCs, iPSCs and iMSCs along with autografts and allografts. It is interesting to know that MSCs have tested for their differentiation into several tissue types which are integral part of cornea although with limited efficiency. The chapter 'Stem cell therapies in ocular repair, regeneration, and diseases' is an excellent contribution to this book and a feast for the readers especially ophthalmologists.

Secretome of the MSCs is one of the dynamic and fascinating secretory mixtures. The authors have described the autocrine and paracrine functions of secretome along with strategies to modulate the secretome by employing preconditioning, 3D culture and biomaterial approaches. They clearly state that MSCs live in relatively hypoxic conditions and therefore to increase its performance, hypoxic conditions while collecting secretome are best suited for therapeutic applications. Scaling up while maintaining the uniformity in the composition of secretome under GMP conditions is essential for constant therapeutic outcomes. They have summarized outcomes of secretome based *in-vitro* and *in-vivo* studies for therapeutic applications of stroke, traumatic brain injury, Parkinson disease and spinal cord injury. The secretome profile of MSCs along with growth

factors, cytokines and other bioactive components are not completely known, however the authors could have summarized known components of the secretome perhaps in the tabular form to give more clarity on the subject. It is apparent that the authors have kept the scope of therapeutic applications up to the brain disorders. I was surprised that systemic disorders such as type 2 diabetes which are strongly associated with inflammation are not included. Several studies have suggested secretome mediated reversal of insulin resistance which is an integral part of type 2 diabetes.

Furthermore, I found inclusion of the chapter 'Innovation in induced Mesenchymal stem cell uses in therapy' worthy. iPSCs derived iMSCs can surpass the several limitations possessed by MSCs as rightly stated in this well-written chapter. However, authors could have stated more on the difference between iPSCs derived iMSCs and MSCs secretory profile, also on any distinctive molecular mechanism of action.

Authors describe the *in-vivo* studies suggesting the efficacy MSCs in bone repair along with sufficient inclusion of molecular pathways involved in homing and immunomodulation. A brief description on the necessity of the development of 3D biomaterials which could enhance the transplantation and therapeutic efficacy of MSCs is well appreciated. However, it is not clear what percentage of the therapeutic efficacy is attributed to the direct differentiation of MSCs into osteoblasts and what is the contribution of immunomodulation into the bone healing. In molecular mechanisms which are stated in chapter, RANK/L model which effectively balance the ratio of osteoblast/osteoclast during the bone healing is missing. The characteristic features of tendon MSCs are still evolving. I appreciate the editor for including this chapter in the book. The growth factor secretion profile of the tendon MSCs is unique which may suggest their distinct role in the tendon functions. Authors could have elaborated more on the enhancement of therapeutic efficiency on mechanical stimulation; for instance on the potential of mechanical stretching in influencing the secretome of the tendon MSCs.

The chapter, 'Mesenchymal stem cell roles in osteoarthritis (Joint) disease' elaborates on epidemiology, pathology and stem cells based treatment of OA.

BOOK REVIEW

Although it is well described in minute details, the bioactive components of MSCs implicated in the OA is not described sufficiently. Applications of MSCs in cancer therapy is a highly controversial topic that is being addressed in this book. I appreciate the way authors have drafted the limitations of MSCs mediated cancer therapy though it showed great hope initially. Also, in recent times the role of MSCs has been explored for the delivery of the anti-cancer agents. This chapter indeed adds to the scope of MSCs in treatment of solid tumours.

Author has summarized the perspective of all the chapters included in this book. The translational rate of the results of the MSCs based therapeutics from lab

to the clinic is the major challenge ahead. Few questions such as origin of the MSCs (mesoderm, endoderm, ectoderm?), the overall distribution of the cells in varieties of the tissue and their respective pros/cons, efficient and optimum generation of the secretome under GMP conditions are few major challenges ahead which have been aptly described and discussed.

This book is primarily focused on *in-vivo* results obtained in the varieties of clinical conditions with excellent narrative on its pros and cons. I was little surprised why none of the book mentioned the use of herbal medicines to enhance the therapeutic potency of MSCs where plenty of original research and review articles have suggested the potential of

phytochemicals to enhance the efficacy of the therapy. It would have been good addition in the respective chapters or as a separate chapter as well.

Overall, this book will serve the purpose of inspiring researchers, scientists and students in the field of stem cell biology and regenerative medicine to carry out future research in the focused manner. This book points out the limitations and the scope of MSCS for improving the quality of life.

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