Perspective

iMedPub Journals
www.imedpub.com

Medical and Clinical Reviews
ISSN 2471-299X

2022
Vol.8 No.11:004

Underlying Biology of ASCs and their Proliferation and Differentiation Capacities

Shigeo Ishikawa*

Department of Plastic and Reconstructive Surgery, Kindai University Osaka, Japan

***Corresponding author:** Shigeo Ishikawa, Department of Plastic and Reconstructive Surgery, Kindai University Osaka, Japan Email: Ishikashigeo234@gmail.com

Received date: October 07, 2022, Manuscript No. IPMCR-22-15350; **Editor assigned date:** October 11, 2022, PreQC No. IPMCR-22-15350(PQ); **Reviewed date:** October 18, 2022, QC No IPMCR-22-15350; **Revised date:** October 27, 2022, Manuscript No. IPMCR-22-15350(R); **Published date:** November 07, 2022, DOI: 10.36648/2471-299X.8.11.4

Citation: Ishikawa S (2022) Underlying Biology of ASCs and their Proliferation and Differentiation Capacities. Med Clin Rev Vol. 8 Iss No.11:004.

Description

Stem cell-based therapies for the repair and regeneration of various tissues and organs offer a paradigm shift in that they may provide alternative therapeutic solutions for a number of diseases. The use of embryonic stem cells or induced pluripotent stem cells in clinical settings is still limited due to cell regulation, genetic manipulation, and ethical considerations, even though these cells are highly beneficial. Adipose-Derived Stem Cells (ASCs) appear to be an ideal population of stem cells for practical regenerative medicine because they are not subject to the same restrictions. In addition, because of their autologous tissue origin, they are non-immunogenic, and are plentiful and easy to obtain. Although ASCs originate from mesodermal lineages, several preclinical studies have shown that the use of ASCs in regenerative medicine is not limited to mesodermal tissue, but also extends to both exodermal and endodermal tissues and organs.

Underlying Biology of ASCs and their Proliferation and Differentiation Capacities

Based on this background knowledge, the purpose of this review is to summarize and describe the underlying biology of ASCs and their proliferation and differentiation capacities, together with current preclinical and clinical data, particularly in the field of plastic and reconstructive surgery, regarding the use of ASCs in regenerative medicine. A number of life-threatening diseases such as organ failure, tissue loss due to trauma, cancer abrasion, and congenital structural anomalies can mostly be treated by current clinical technologies, including organ transplantation, autologous tissue transfer, and the use of artificial materials, but have potential issues such as organ shortage, damage to healthy body parts during treatment, allergic reactions, and immune rejection. Recent developments in the emerging field of regenerative medicine may allow for the repair of tissue damage and the eventual replacement of organs. In general, the fields of regenerative medicine and tissue engineering require a reliable source of stem cells together with appropriate biomaterial scaffolds and cytokines. A stem cell is characterized by its ability to self-renew and to differentiate along multiple lineage pathways. A major advantage of the stem cell approach is the supply of an unlimited number of cells having the potential to become a functional organ. Stem cell candidates include Embryonic Stem Cells (ESCs), Induced Pluripotent Stem Cells (iPSCs), and postnatal adult stem cells. Although the therapeutic potential of ESCs and iPSCs is enormous due to their auto-reproducibility and pluripotentiality, there are still some limitations to their practical use, including cell regulation, genetic manipulation, and ethical considerations. In contrast, postnatal adult stem cells are naturally immune-compatible, and there are no ethical issues related to their use.

Sources for Future Cell-Based Therapies and Regenerative Medicine

Mesenchymal Stem Cells (MSCs), isolated from bone marrow stroma, are representative of adult stem cells, and possess the potential for in vitro differentiation. Recently, MSCs with similar characteristics to bone marrow-derived MSCs, have been isolated from different tissue sources, including trabecular bone, periosteum, synovial membrane, muscle, articular cartilage, skin, pericytes, deciduous teeth, periodontal ligament, peripheral blood, and umbilical cord. Although the stem cell populations derived from these sources are valuable, common problems include low numbers of harvested cells and limited amounts of harvested tissues. With such a limited supply of stem cells, ex vivo expansion would be required to obtain a sufficient quantity of cells for clinical applications. Adipose tissue is present in abundance in many stores throughout the body where it plays a major role in energy balance and displays strong endocrine functions. Since such adipose tissue is a source of stem cells, termed Adipose-Derived Stem Cells (ASCs), it is regarded as one of the most promising sources for future cell-based therapies and regenerative medicine. During the past decade, both preclinical studies and clinical trials using ASCs have been conducted in various medical fields, from cardiovascular research to applications for corneal diseases. ASCs are classified as adult multipotent stem cells and as such, their multipotency is limited compared with ESCs and iPSCs.