

Chapter 14

Regenerative Medicine: Healing and Repairing with Cells

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Saravanan P¹, Meenakshi Sharma²

Abstract

Regeneration is a complex process encompassing inflammation, proliferation, and tissue remodeling. Stem cells, which are fundamental cells with the potential to undergo differentiation, can regenerate through self-replication and immune-modulation. This research investigates the application of stem cells and exosomes in skin and bone healing, providing novel approaches to tissue repair and regeneration. This study investigates the potential application of stem cell-based treatments in regenerative medicine, particularly an emphasis on how they can be applied in understanding aging and degenerative diseases. Stem cells, which regenerate themselves, could produce a variety of cell morphologies, and their current research and application in regenerative medicine is highlighted. Human periapical cyst-mesenchymal stem cells (hPCy-MSCs) represent a prospective subset of MSCs that are extracted from periapical cysts without compromising healthy tissues. They exhibit a cell surface marker profile identical to other oral-derived MSCs, are extremely proliferative, and are capable of differentiation into a variety of cell types including osteoblasts, adipocytes, and neurons-like cells, making them captivating for regenerative medical applications. This study explores into the latest innovations in hPSC-derived cardiomyocytes (hPSC-CM) differentiation and transplantation procedures for tissue repair, demonstrating their involvement in the process, problems in successful transplantation, and possible remedies. It also discusses the therapeutic applications of hPSC-CMs, clinical translation barriers, present study results, and future possibilities.

Keywords: Regenerative Therapy, Self-Regeneration, Immunomodulatory, Mesenchymal Stem Cells (Mscs), Extracellular Vesicles (EV), Adipose-Derived Stem Cells (Adscs)

I. Introduction

¹USCS, Uttaranchal University, Dehradun, Uttarakhand, India, dr.p.saravanan007@gmail.com

²Uttaranchal Institute of Management, Uttaranchal University, Dehradun, Uttarakhand, India

Corresponding Author

Email: sharma.mnk12@gmail.com

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