



Application of Epidermal Stem Cells in Wound Healing

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DESCRIPTION

The skin serves crucial barrier, sensory, and immunological functions, all of which contribute to the organism's health and integrity. Extensive skin injuries that pose a threat to the entire organism must be treated quickly and effectively. Although wound healing is a normal reaction, it is insufficient in severe situations such as burns and diabetes to accomplish successful treatment. EPSCs are multipotent cells dedicated to the development and differentiation of the functional epidermis. EPSCs' contributions to wound healing and tissue regeneration have attracted the attention of researchers, and a growing variety of EPSC-based therapeutics are now being developed. The properties of EPSCs and the mechanisms underlying their activities during wound healing are discussed in this work. EPSC applications are also discussed in order to establish the possibility and practicality of using EPSCs in wound healing therapeutically.

Role of EPSCs in cutaneous wound healing

To cure skin flaws and regain lost integrity, tensile strength, and barrier function, wound healing is critical. Wound healing is a complicated and highly controlled process that provides critical tasks to diverse cell types; it is generally categorized into four phases that overlap.

Hemostasis: When platelets come into contact with ECM proteins, they instantly coagulate and form a fibrin clot, which acts as a temporary wound matrix. Platelets also play a role in the subsequent inflammatory phase by secreting growth factors. Furthermore, proteins like thrombospondin, vitronectin, and fibronectin, which fill blood clots, aid in the migration of wound-healing cells like keratinocytes, blood cells, and endothelial cells.

Inflammation: The first cells to arrive at the wound site, neutrophils, clean debris and bacteria and produce cytokines

(e.g., Interleukin (IL)-1, IL-1, and Tumour Necrosis Factor (TNF-)) to attract and activate other cells, thereby accelerating the inflammatory cascade. By secreting cytokines and growth factors such Transforming Growth Factor (TGF-), TGF-, Fibroblast Growth Factors (FGFs), and Platelet Derived Growth Factor, macrophages travel to the wound, clean up infections, and drive keratinocyte migration and ECM formation (PDGF).

Proliferation: Granulation tissue development, which replaces the original coagulation and fibrin clot and provides a wound bed for re-epithelialization, characterizes the succeeding proliferative phase. Bidirectional connections between keratinocytes and fibroblasts are critical at this stage, and they form a paracrine signaling loop that increases keratinocyte proliferation and fibroblast secretion of cytokines and growth factors that aid wound healing.

Tissue remodeling: In the final stage of wound healing, TGF-1 and other growth factors drive fibroblasts to develop into myofibroblasts, which promote wound contraction and shrink the wound area. As the granulation tissue declines, the mature wound tissue becomes avascular and acellular, resulting in scar formation.

CONCLUSION

EPSCs show promise as an effective tissue healing technique because of their properties, such as vast numbers, accessibility, and multipotency in the creation and differentiation of the epidermis. Recent research has shown that autologous EPSC therapy can help with cutaneous healing and regeneration. Although there are many unanswered questions about the experimental and clinical application of EPSCs, such as complex techniques and high costs, it is likely that knowledge of EPSC biology and technique safety will improve in the future, allowing EPSCs to be used more widely in wound healing and tissue regeneration.

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Received: 29-Apr-2022, Manuscript No. JSCRT-22-16821; **Editor Assigned:** 03-May-2022, PreQC No. JSCRT-22-16821 (PQ); **Reviewed:** 17-May-2022, QC No. JSCRT-22-16821; **Revised:** 26-May-2022, Manuscript No. JSCRT-22-16821 (R); **Published:** 02-Jun-2022, DOI: 10.35248/2157-7633.22.12.532.

Citation: Manjir B (2022) Application of Epidermal Stem Cells in Wound Healing. J Stem Cell Res Ther. 12:532.

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