



Healing of dermal wounds in the EpiDerm-FT™ *in vitro* human skin model

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Background: Dermal wound healing involves interactions between dermal fibroblasts and epidermal keratinocytes, as well as cell and extracellular matrix interactions. The current poster describes wound healing experiments conducted with a full-thickness *in vitro* human skin model (EpiDerm-FT™).

Material and Methods: Normal human epidermal keratinocytes (KC) and dermal fibroblasts (FB) were cultured to produce the highly differentiated full-thickness skin model. Small wounds of several mm in diameter were induced in the epithelial model by means of a battery operated cauterizer or a dermal biopsy punch. The wounded EpiDerm-FT™ cultures were fixed at various time points and H&E stained paraffin sections were prepared to evaluate the wound and the wound healing process.

Results: Immediately after burn wounding, necrotic epithelium and denatured collagen dermal matrix were evident. Within one day, the denatured collagen matrix began to degrade and epithelial KC were observed migrating inward from the wound edges. Over a time course of seven days, migrating KC repopulated the wounded area to form a fully covered epithelium. Dermal fibroblasts were also observed to be proliferating within the wound area and generating new dermal matrix material. Biopsy punches were used to produce wounds that removed only the epidermis. These wounds also healed within a timeframe of 3-7 days. Increased FB proliferation in dermal areas directly adjacent to migrating KC was observed.

Discussion: These results demonstrate that EpiDerm-FT™ is a useful model for applications designed to elucidate dermal-epidermal interactions during wound healing and to evaluate the role of specific growth factors or new therapeutics in the dermal wound healing process.

References

- Clark, R. A. (2003). Epithelial-mesenchymal networks in wounds: a hierarchical view. *J. Invest. Dermatol.* 120(6), ix-xi.
- Pierce, G. F., Tarpley, J. E., Allman, R. M. et al. (1994). Tissue repair processes in healing chronic pressure ulcers treated with recombinant platelet-derived growth factor BB. *Am. J. Pathol.* 145(6), 1399-1410.
- Pierce, G. F., Vande Berg, J., Rudolph, R. et al. (1991). Platelet-derived growth factor-BB and transforming growth factor beta 1 selectively modulate glycosaminoglycans, collagen, and myofibroblasts in excisional wounds. *Am. J. Pathol.* 138(3), 629-646.
- Puolakkainen, P. A., Reed, M. J., Gombotz, W. R. (1995). Acceleration of wound healing in aged rats by topical application of transforming growth factor-beta(1). *Wound Repair Regen.* 3(3), 330-339.

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