

Wound Healing Response of a Full Thickness In Vitro Human Skin Equivalent (EpiDerm-FT 200) After Solar UV-Irradiation. Hayden, Patrick J.; Burnham, Brenda; Kubilus, Joseph; Klausner, Mitchell, MatTek Corporation, Ashland, MA 01721

ABSTRACT:

Purpose: To develop an in vitro wound healing model using the human skin equivalent, EpiDerm-FT 200.

Methods: Normal human epidermal keratinocytes (KC) and dermal fibroblasts (FB) were cultured to produce full-thickness skin equivalents with FB-containing dermal and stratified epidermal components and fully developed basement membrane at the dermal/epidermal junction (EpiDerm-FT 200, EFT). The wound healing response of EFT after solar UV-irradiation was compared to excised human skin.

Results: Histological sections of EFT showed a dose-dependent increase in apoptotic sunburn cells at 24 h post-irradiation. After 48 h, high dose (61 J/cm², metal halide lamp) samples showed extensive epidermal damage and some dermal damage. At 72 h, sunburn cells still persisted in mid dose samples (40 J/cm²), which were thinner than controls (indicating decreased KC proliferation) but still without major epidermal damage. Epidermal destruction of high dose samples was nearly complete at 72 h with loss of dermal matrix also evident. However viable basal cells remained in some areas, with signs of proliferation and epidermal regeneration. Between days 5-7, substantial regeneration of the epidermis had occurred. Active MMP-1 protein in the culture media increased by 50% in irradiated samples at 24 h. By 48 h, mid dose samples showed a 2-fold increase in active MMP-1 protein, while high dose samples showed a 3-fold increase. At 72 h, mid dose sample MMP-1 protein was comparable to controls, while high dose sample activity remained elevated by 3-fold. Similar responses were observed with excised human skin.

Conclusions: The EFT human skin equivalent behaves similar to excised human skin in terms of solar UV induced damage and wound healing. The model will likely prove useful for additional applications in dermal/epidermal wound healing phenomena.

For presentation at the 2004 American Association for Pharmaceutical Scientists Meeting (AAPS), Baltimore, MD, November 2004.