THE FIBROBLAST-POPULATED COLLAGEN MATRIX MODELS THE RESPONSE OF GRANULATION TISSUE TO DISRUPTION OF WOUND ANCHORAGE

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Introduction. Models of wound healing are important for dissecting complex healing mechanisms. There is some controversy over whether the fibroblast-populated collagen matrix (FPCM) is an appropriate model of dermal healing. Anchorage of the wound matrix is important for granulation tissue survival. We hypothesized that the gross morphology, cytoskeletal morphology, and apoptotic rates of the FPCM *vs.* excisional wound granulation tissue (GT) would react similarly to disruption of extracellular matrix (ECM) anchorage.
Methods. The FPCM (2×10^5 neonatal foreskin fibroblasts in 0.2 ml bovine collagen, 3 mg/ml) was compared to GT from a wound created 6 days earlier (2x2 cm full-thickness dermal excision from the rat dorsum) using H&E histology, phalloidin-FITC staining, and TUNEL. ECM anchorage was disrupted by lifting the matrix off the culture well (FPCM) or circumferentially incising the wound edge (GT). Measurements of distance, area, cell population density, phalloidin staining intensity, and TUNEL-positive rate were determined from analysis of digital images using NIH Image (public domain software, http://rsb.info.nih.gov/nih-image/).
Results. In the anchored state, the FPCM and GT both have discoid cross-sectional morphology; this rapidly changes (within minutes) to ovoid after disruption of ECM anchorage. H&E cellular morphology in both the anchored and disrupted condition was subjectively similar in the FPCM *vs.* GT. After 24 hr of ECM anchorage disruption, the cross-sectional area and cell population density of both the FPCM and GT decreased compared to anchored controls ($*p < 0.05$, unpaired t-test). In addition, the actin cytoskeletal morphology was similar in the FPCM *vs.* GT in both the anchored condition (prominent stress fibers) and 24 hr after disruption (wavy, attenuated fibers); the intensity of phalloidin-FITC staining decreased in both the FPCM and GT 24 hr after ECM anchorage disruption ($*p < 0.05$ compared to anchored controls). The rate of TUNEL-positive nuclei increased from <1% (anchored matrix) to 5 and 3% in the FPCM and GT, respectively ($*p < 0.05$ compared to anchored controls).
Conclusions. The FPCM and GT demonstrate a similar response to ECM anchorage and anchorage disruption in terms of gross ECM shape, microscopic cellular shape, cytoskeletal morphology, and cell death rate. The FPCM is able to model the behavior of GT with respect to ECM anchorage.

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Abstract Title: A Zinc/Iron Solution Stimulates Epithelization of Acute Partial Thickness Wounds

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Abstract Body: Zinc has been shown to be beneficial in the wound healing process, however, the combined role of zinc and iron has not been studied. The purpose of this study was to evaluate a new zinc/iron solution (ZIS) on the healing of partial thickness wounds. Ten pigs received multiple partial thickness wounds and received one of the following treatments: 1) 0.003% ZIS, 2) vehicle, 3) untreated air exposed. Wounds were treated by sterile 4-ply gauze saturated with each agent and then covered with a polyurethane dressing. Wounds were treated daily. Five wounds were excised on days 3-8 and evaluated for complete epithelization using a well-described salt-split technique. A total of five hundred and forty wounds were evaluated. All wounds that received any treatment epithelized sooner than untreated air exposed. The 0.003% ZIS enhanced complete epithelization as compared to wounds treated with vehicle alone. This data demonstrates that a new zinc/iron agent is effective at stimulating healing which may have important clinical implications.

Expression Characteristics of PDGF and Its Receptors in Fetal and Postnatal Skins and Their Effects on Scarless Healing

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Objective: To investigate the protein changes of PDGF-A, PDGF-B and their receptors (PDGFR- α and PDGFR- β) in fetal and postnatal skins in order to reveal their possible roles on fetal scarless healing.
Methods: The expression intensity and distribution of PDGF-A, PDGF-B, PDGFR- α and PDGFR- β were detected with immunohistochemistry method in 8 cases of adult skin and 8 cases of fetal skin with different gestational ages.
Results: In both fetal and adult skin, PDGF was mainly located in the cytoplasm of epidermal basal cells and vascular endothelial cells, while PDGFR- a was mostly distributed in the membrane of epidermal cells and endothelial cells. PDGFR- β was found in the cellular membrane of epidermal keratinocytes. With the increase in gestational *ages,* the protein contents of both PDGF subunits and their receptors were increased gradually in fetal skin. Compared with the early stage of fetal development, the number of PDGF-A, PDGF-B, PDGFR- a and PDGFR- β positive cells was significantly elevated in skins of 3 l-month gestational fetus(13.8 ±3.1%, 15.3±5.9%, 20.8±5.1% and 6.6±3.6% respectively). In adult skin, the positive ratio of PDGF-A, PDGF-B, PDGFR-a and PDGFR-β were 15.2±5.6%, 22.4±7.4%, 36.7± 4.3% and 15.3 ± 4.8% respectively.
Conclusions: In fetal skin, the relative lackage in both PDGF and their receptors might be one reason why the fetal wounds were healed by regenerating rather than scarring. The increment of PDGF and PDGFR contents in elder fetal and adult skins versus younger fetal skin might be associated with the mechanisms of scar healing.

Effects of Basic Fibroblast Growth Factor on Reversibility of Myotibroblasts in Burn Wound Healing

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Objective To observe the effect of basic fibroblast growth factor (bFGF) on the reversibility of myofibroblasts in burn wound healing and to explore the possible mechanisms of bFGF accelerating wound healing.
Methods 78 Wistar *rats* were subjected to a 30% of total body surface area full-thickness scald injury and randomly divided into three groups as follows: normal control (n=6), thermal injury (n=36), and bFGF treated groups (n=36). Immunohistochemistry and in situ hybridization staining techniques were employed to detect the expression of alpha-smooth muscle actin (ASMA), TGF- β 1 and apoptosis development on different time points post-bum.
Results There was no evident difference in ASMA expression in dermal tissues at the beginning of wound healing. A significant increase of ASMA expression in tissues was observed at 7 day after thermal injury ($p<0.01$), and then decreased gradually. Treatment with bFGF could decrease the ASMA positive expression from 3 hour to 3 day, and then increased the level of ASMA expression from 7 day to 14 day after scald injury. Treatment with bFGF might also increase the number of TGF- β 1 immunoreactive positive cells.
Conclusions Myofibroblasts play critical role in wound closure and healing. The wounds treated with bFGF could induce some characteristic changes of myofibroblasts by altering the expression of TGF- β 1, and bFGF might have a potential synergistic effect with other growth factors on the stimulation of apoptosis in myofibroblasts during wound healing.