

Decellularized Basement Matrix Membranes and Their Ability to Support Engraftment and Proliferation of Human Dermal Fibroblasts

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Decellularized extracellular matrix components isolated from animal sources have shown much clinical promise in the treatment of several wound care indications including a variety of dermal ulcerations (diabetic, pressure, venous, e.g.), full-thickness trauma wounds affecting the skin and skeletal muscle, and post-operative surgical wounds. The purpose of this study was to evaluate the biocompatibility of three sources of decellularized matrix wound care products using a novel tissue engineered dermal cellular proliferation assay. Decellularized basement matrices derived from porcine small intestinal submucosa (pSIS), porcine peritoneal membrane (pPM), and ovine forestomach (oFS), respectively, were tested for their ability to support the engraftment and proliferation of human neonatal dermal fibroblasts. Cells were seeded onto each respective membrane using a custom, non-adherent, cell culture system and cultured for 2 weeks. At 3, 5, 7, and 14 days time points cultures were assayed for proliferation and matrix integration using the PrestoBlue cell viability assay and fluorescent confocal laser scanning microscopy, respectively. Human dermal fibroblast attachment to all three materials was relatively low compared to conventional two-dimensional culture systems. However, pSIS displayed a consistently, but not statistically significant, greater level of fluorescence intensity in the cell viability assay, and qualitatively displayed a superior ability to support engraftment of dermal fibroblasts in comparison to pPM and oFS matrices. These data indicate that pSIS supports the attachment and growth of dermal cells in vitro, which may underscore the success of this material in pre-clinical and clinical wound healing studies.