OFFICIAL ABSTRACT and CERTIFICATION

Evaluating the Viability of Bioprinting Skin Organotypic Through a Comparison of the Contraction of Collagen Hydrogels Prepared Using Extrusion-Based Printing and Traditional Skin Grafting Methods

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Bioprinting techniques currently have the ability to eliminate the need for donors and allow for faster integration with host tissue. However, the shear force applied during printing presents the potential to damage cells. During our experiment, we aimed to evaluate the cell survivability rates of fibroblasts. One of the most essential components of artificial skin constructs is the fibroblasts, which synthesize collagen and the extracellular matrix. In order to test the viability of this component once passed through the bioprinter nozzle, the collagen contraction was observed. The collagen gels were first prepared to have a concentration of 1.2 mg/mL and 7.5 x 104 cells/well for three poured and three printed samples. The associated volumes of materials including collagen and l.glutamine were combined along with cells to create a collagen gel solution. Three samples, each with a layer of collagen gel solution without cells and a separate layer with cells were printed at a pressure of 10 kPa. Three samples were also poured as a control to observe the effect of shear force on cell survivability. These gel inserts were then placed in the incubator at 37 °C to set. The contraction rate of the collagen gel was measured and compared over a period of 11 days using EVOS Imaging and Image J software. The results of the collagen contraction experiment showed that the contraction rates were very similar. Future research would include testing multiple trials and varying pressures to test the accuracy of these results.

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