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3D Printing of Biodegradable Scaffolds for Tissue Engineering Applications

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Research & Scholarship SYMPOSIUM

3D Printing of Biodegradable Scaffolds for Tissue Engineering Applications

With the recent improvements in three dimensional (3D) printing technologies, the potential for tissue engineering and regenerative medicine have significantly improved. One key idea in tissue engineering is to specifically design scaffolds to aid in the healing process by being incorporated into the body's own tissue. The overall goal of this project is to investigate 3D printable scaffold design to assess suitability for tissue replacement. This was accomplished by analyzing the effect of the material used to create the scaffolds, pore size, and pore shape on mechanical stiffness and cell culturability. Based on published literature, it was determined that, depending upon the desired tissue type, the best pore shapes are circles, squares, and hexagons. This study focused on designing numerous scaffolds by varying the parameters listed above, and then printing 3D biodegradable (PLA & TPU) scaffolds to be cultured, mechanically tested and evaluated. The scaffolds were cultured with endothelial cell lines to ensure cell survivability on the 3D printed material. After cell culturing protocol, cell attachment and viability were assessed and cell density recorded. The mechanical tests were performed using a standard tension test machine in order to gather stiffness and strength data. By analyzing our results, we will be able to make recommendations regarding which pore shape, size, and porosity will yield the most anatomically compliant results for the desired tissue.