3D Printed Biodegradable Skin Scaffolds Using Cross-Linked Polymers to Predict Cell Regeneration

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Deeper superficial abrasions or wounds that extend into the dermis often require intensive treatment to prevent complications such as infection, pain, and delayed healing. In these cases, skin grafting is implemented as a common intervention for severe skin damage; however it carries significant risks including graft failure, infection, pain at the donor site, excessive scarring, and poor integration with native tissue. Skin scaffolds have emerged as a relatively new solution to counter the risks of skin grafting. 7 skin scaffold samples were manufactured, using a kobra anycubic 3D printer, with varying pore shapes to assess their ability to support uniform hydrogel seeding and swelling as a proxy for cell regeneration. Over 5 batches of trials, scaffolds were seeded with the cell-like substance (hydrogels) and introduced to water induced swelling to compare their capacity for uniform hydrogel uptake and swelling behavior. Using the ImageJ platform to assess the uniformity of the scaffolds in each stage, results suggest that scaffolds with high symmetrical pore shapes, such as hexagonal and cubic pores, exhibit the most uniform hydrogel distribution and controlled swelling intake. A scale was then used to measure water intake throughout the initial stage, initial seeding, and water induced swelling stage within the experiment to track probable nutrient diffusion. These findings suggest great potential for biodegradable skin scaffolds in live tissue regeneration, especially for human skin cells, addressing medical challenges in wound care and skin grafts. They provide a time effective, adaptable, and personalized alternative that would predictably support tissue regeneration.

Awards Won:

Fourth Award of $600