**4y Functional Elastomeric Scaffold Development for Tissue Engineering**

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Scaffolds for engineering soft tissue would ideally be mechanically compliant and anisotropic while possessing inherent bioactivity and enzyme sensitivity similar to the native extracellular matrix. Biodegradable elastomers, such as the cytocompatible poly(ester urethane)ureas (PEUUs) developed in our laboratory, represent attractive alternatives to the more common stiff biodegradable polyesters utilized in soft tissue engineering. These materials can be processed into scaffolds suitable for in vivo placement or for support of cellular adhesion and growth by an electrospinning technique. This process, where an electric field overcomes surface tension to generate and draw nanoscale fibers, can create scaffolds with extracellular matrix-like morphologies that retain mechanical strength and flexibility while also permitting protein incorporation into spun fibers to impart bioactivity.

PEUU was processed with electrospinning to create scaffolds that incorporated collagen and that could exhibit anisotropic microstructures. The incorporation of collagen is useful as a means of increasing cell adhesion and degradation rates, with or without collagenase. At low concentrations of collagen the protein appears to lose its helical structure, although still imparting increased cell adhesion. Anisotropy is of interest in creating oriented cellular structures and to control stress translation during tissue mechanical conditioning. These scaffolds possess mechanical properties and exhibit stress-strain curves that mimic those of the native pulmonary valve.

These elastomeric matrices can provide mechanical support, but typically require long seeding and culture times to achieve high density cellular in-growth. Therefore, we have developed a micro-integrated method during which a mesh of submicron elastomeric fibers is built into the scaffold wall during the cellular placement process. Cells are electrosprayed during the electrospinning of a synthetic elastomer, which expedites the time required for scaffold construction and cell seeding. This tissue engineered construct, which is largely cellular and supported with an elastomeric fiber net, can be appropriate for soft tissue replacement including the engineering of conduit structures such as a tissue engineered blood vessel.