Novel Three-Dimensional Scaffold for Skeletal Muscle Tissue | Biological Engineering

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Full Abstract

Three-dimensional cell culture models are of particular interest when attempting to accurately model in vivo tissues in a lab environment. The development of these models can provide a platform that is more accessible than animal models but still provides meaningful insight into tissues. These models can also be used for testing cellular response to disease treatment or for personalized medicine and implantation of tissues. Skeletal muscle atrophies very quickly during periods of immobilization or irregular muscle loading due to injury or disease. Developing an improved model of skeletal muscle is valuable to understand the changes that from damage or disease.

In this work, C2C12 myoblasts are seeded onto a novel device of acrylic and silk substrates for the differentiation of myoblasts into full-length myofibers that morphologically and genetically resemble native tissue. The success of this device is measured by genetic analysis and protein production, both of which are well understood in monitoring appropriate cell growth and differentiation. Silk substrate mechanical properties and protein secondary structure content are characterized to inform changes in myofilament gene expression. The results of this research indicate that this novel three-dimensional device is superior to current two-dimensional cell platforms. The success of this device also further improves the available three-dimensional models for studying possible treatments for those suffering from debilitating skeletal muscle diseases.