

Tissue Engineering Skeletal Muscle On Elastic Fibers - A New Bioreactor System For Mechanical Stimulation

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Tissue engineering skeletal muscle has versatile potential applications but it is still challenging to produce large functional muscle tissues in vitro. Mechanical stimulation has been shown to positively influence this process. In the present study a bioreactor for mechanical stimulation was designed, built and evaluated. The system allows the utilization of a wide variety of scaffold materials and designs. Two potential fibrous scaffold materials were tested under static conditions.

C2C12 skeletal muscle progenitor cells were cultured on aligned elastic polyurethane micro diameter fiber arrays. Fibers were obtained from Hyosung (South Korea) and composition and shape were investigated using XPS, FT-IR ATR and SEM techniques. It was shown that C-100 fibers (50 μm in diameter) are a potential scaffold material for fundamental research on the effects of stimulation on skeletal muscle cells. Cells were grown and terminally differentiated into muscle fibers on C-100 fiber arrays. Myosin heavy chain and α -actinin were used as marker proteins to confirm terminal differentiation. The developed bioreactor system together with the scaffold material allow a wide variety of potential experimental setups and can be utilized to study muscle tissue formation in response to different stimulation patterns.