Electrospun Magnetic Nanofibrous Membrane for Active Tissue Scaffolding

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Technology description

Nanofibrous Membrane Mechanically Activates In Vitro Cell Culture and Stem Cell Differentiation

This electrospun nanofibrous tissue scaffolding system with magnetic nanoparticles embedded in the nanofibers can be used to actively stimulate cell culture or cell differentiation in vitro. A major problem in human healthcare is tissue and organ failure and the unavailability of adequate tissue or organ replacements. In the United States, this organ shortage yearly has deprived thousands of patients of a better quality of life and has caused a substantial increase in the cost of alternative medical care. Tissue engineering is emerging as a solution as it enables the creation of necessary biomaterials to meet such a shortage. Researchers at the University of Florida have developed a mechano-active nanofibrous scaffold system for in vitro active cell culture using electrospun nanofibers, magnetic particles and an electromagnet. This wirelessly driven active cell culture system, remotely actuated, provides mechanical stress and strain on culturing cells in response to external alternating current magnetic fields.

Technology

The electrospinning of nanofibers can be used to generate a magnetic nanofibrous membrane containing polycaprolactone and iron oxide nanoparticles. By embedding the magnetic nanoparticles in the nanofibers of the membrane, researchers can mechanically actuate the nanofibrous scaffolding membrane, controlling the resonant frequency to either enhance or suppress cell culture or cell differentiation. This wirelessly driven active cell culture system can stimulate cells remotely.

Application area

A mechano-active nanofibrous scaffold system for in vitro cell culture and tissue differentiation

Advantages

Offers mechanical support plus mechano-active support, providing both scaffolding and stimulation for enhanced cell growth and cell differentiation

Can be designed to have a specific resonant frequency or range of frequencies, enhancing or suppressing cell culture and/or cell differentiation as needed

Institution

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