ELECTROSPINNING® COMPANY

Electrospun Materials for Orthopaedic Applications

Electrospinning technology is widely embraced by the academic community as the go to technology to create scaffolds to facilitate soft tissue regeneration. Year after year, the number of publications describing the use of electrospun scaffolds for orthopaedic use is increasing[1]. Numerous studies show the use of electrospun materials for the repair of ligaments, tendons and the bone-tendon interface[2,3], aimed at substituting allo/xenografts. Next to soft tissue repair, in vivo studies show that the use of electrospun materials has potential to treat non-union fractures[4,5] as well as facilitate local antibiotic release[6]. Electrospun materials have also been tested to treat unmet needs such as spinal hernia repair[7] and meniscal tears[8] with promising results.

Electrospinning technology allows superior design features impossible using biological grafts. Control over fibre diameter tailors the degree of tissue ingrowth, architecture control such as aligned fibres allow cell wicking and specific mechanical properties. The wide variety of polymers that can be electrospun, both synthetic and biological, further widens the mechanical properties and degradation time. Another unique feature is the ability to incorporate active pharmaceutical ingredients such as BMP-2 onto the fibres, providing local drug delivery.

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The versatility of electrospinning as a technology platform allows the design of biomaterials with superior features compared to the biological graft materials they could replace. The fibre diameter can be tailored to the desired degree of cell and tissue ingrowth and fibre orientation designed to guide cell growth and wick cells to healing sites. Biomaterial mechanical properties and degradation times can be controlled by choice of polymer as well as architecture. In addition, molecules, peptides, or nanoparticles can be incorporated into fibres to functionalise them. For example, BMP-2 can be incorporated and released slowly at the site of interest. Thanks to advances in electrospinning equipment, electrospun materials can now be produced at a scale attractive to market.

Some of these innovations have been translated into regulator-approved products and are gaining clinical adoption. The Electrospinning Company is at the forefront of one of these products used in sports medicine.

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