Patel et al. developed polymeric scaffolds that can provide both topographical and electrical stimuli on mouse neural stem cells (mNSCs) for potential use in nerve tissue engineering. In contrast to conventional patterning techniques such as imprinting, soft/photolithography, and three-dimensional printing, microgroove patterns were generated by using aligned electrospun fibers as templates, via a process denoted as electrospun fiber-template lithography (EFTL). The preparation of polyvinylpyrrolidone (PVP) fibers, followed by the deposition of poly(lactic-co-glycolic acid) (PLGA) and the removal of the fiber template, produced freestanding PLGA scaffolds with microgrooves having widths of 1.72 ± 0.24 µm. The subsequent deposition of polypyrrole (PPy) via chemical oxidative polymerization added conductivity to the microgrooved PLGA scaffolds. The resultant scaffolds were cytocompatible with mNSCs. The microgroove patterns enhanced the alignment and elongation of mNSCs, and the PPy layer promoted the interaction of cells with the surface by forming more and longer filopodia compared with the nonconductive surface. Finally, the neuron differentiation of mNSCs was evaluated by monitoring the Tuj-1 neuronal gene expression. The presence of both microgrooves and the conductive PPy layer enhanced the neuronal differentiation of mNSCs even without electrical stimulation, and the neuronal differentiation was further enhanced by stimulation with a sufficient electrical pulse (1.0 V) [1].

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