Fabrication and Characterization of Biomimetic Scaffold based on Modified PVA/PEDOT: PSS Nano-Fiber Materials for Tissue Regeneration

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Tissue engineering is an emerging interdisciplinary field that applies principles of biology and engineering to the development of viable substitutes that restore or improve the function of human tissues. Scaffolds play a crucial role in nerve tissue engineering due to their encouragement towards cells' proliferation, ability to allow nutrients to permeate and their resemblance with the Extra Cellular Matrix (ECM), thus forming a unique microenvironment for cells, allowing them to interact in vivo. To this end, via electrospinning, a versatile process, we fabricated conductive nanofiber-based scaffolds, consisted of the biodegradable polymer Polyvinyl alcohol (PVA) and conductive polymer Poly (3, 4-ethylenedioxythiophene) Polystyrene sulfonate (PEDOT:PSS), and proceed towards the evaluation of their surface properties, emphasizing on the way that manipulate cell growth and adhesion. A neural cell-line was deposited onto the fabricated scaffolds in order to evaluate their cytocompatibility behavior. MTT cytotoxicity assay was used for the examination of cells' proliferation and revealed excellent compatibility. In agreement with MTT findings, methylene blue staining and SEM imaging further reinforced scaffold's cytocompatibility. Degradation and Swelling studies were carried out in order to examine scaffold's physicochemical behavior. Results indicated that the conductive non-woven scaffolds are cytocompatible with promising cell proliferation properties, thus providing good potential for further utilization in nerve tissue engineering applications.