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| **Fabrication of Multi-layered Crosslinked Functional Electrospun Nanoscaffolds as Substrates for Cell Culture** |
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| **Background:** Electrospun nanofibres have been greatly utilised in tissue engineering as nanoscaffolds due to their potential to mimic the structural and functional role of the extracellular matrix (ECM) architecture. Electrospun nanofibres can be generated as single, bi- or multi- layered systems. Multi-layered electrospinning results in hierarchical structure that is closer to ECM by better mimicking its complex three-dimensional (3D) architecture. The aim of this work was to fabricate multi-layered crosslinked functional electrospun nanoscaffolds composed of polyvinyl alcohol (PVA), pectin, poloxamer (P407), and polycaprolactone (PCL) for use as substrates for cell culture. The main objective was to develop a biomimetic platform for tissue engineering applications that can provide a suitable microenvironment for cell growth, proliferation, and differentiation.  |
| **Methods:** In this study, multi-layered nanoscaffolds were developed using a combination of natural and synthetic polymers namely PVA, pectin, P407, and PCL using electrospinning. Pectin was crosslinked with calcium chloride to enhance its stability within the structure. The produced nanoscaffolds were evaluated based on moisture content, porosity, morphology, fibre diameter, and 2D cell viability. |
| **Results:** In this study, multi-layered nanoscaffolds demonstrated a higher moisture content and porosity compared to single layer and non-crosslinked nanoscaffolds. Scanning electron microscopy (SEM) was used for morphological characterisation and showed the fibre diameter was found to be in the range of ~205-611nm with a layer thickness of ~79-1242 µm. The Fourier-transform infrared (FTIR) spectra confirmed the interaction of principal peak from all components within the nanofibre, indicating successful blending of the polymers. The 2D cell viability studies showed improvement in cell proliferation in all nanoscaffold multilayer combinations with the multi-layered nanoscaffolds outperforming the single-layered nanoscaffolds. |
| **Conclusions:** In conclusion, the multi-layered and crosslinked electrospun nanoscaffold from PVA, pectin, P407, and PCL was effectively created with improved properties and suitability for the cells compared to the single-layered nanoscaffold. An implication of this research is the potential of developing the multi-layered design of nanoscaffolds that would offer superior biomimicry as synthetic ECM in the extensive field of tissue engineering. |