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Biomolecules Based Microarray for Screening Human Endothelial Cells Behavior

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Abstract : Endothelial Progenitor Cell (EPC) based therapies continue to be of interest to treat ischemic events based on their proven role to promote blood vessel formation and thus tissue re-vascularisation. Current strategies for the production of clinical-grade EPCs requires the in vitro isolation of EPCs from peripheral blood followed by cell expansion to provide sufficient quantities EPCs for cell therapy. This study aims to examine the use of different biomolecules to significantly improve the current strategy of EPC capture and expansion on collagen type I (Col I). In this study, four different biomolecules were immobilised on a surface and then investigated for their capacity to support EPC capture and proliferation. First, a cell microarray platform was fabricated by coating a glass surface with epoxy functional allyl glycidyl ether plasma polymer (AGEpp) to mediate biomolecule binding. The four candidate biomolecules tested were Col I, collagen type II (Col II), collagen type IV (Col IV) and vascular endothelial growth factor A (VEGF-A), which were arrayed on the epoxy-functionalised surface using a non-contact printer. The surrounding area between the printed biomolecules was passivated with polyethylene glycol-bisamine (A-PEG) to prevent non-specific cell attachment. EPCs were seeded onto the microarray platform and cell numbers quantified after 1 h (to determine capture) and 72 h (to determine proliferation). All of the extracellular matrix (ECM) biomolecules printed demonstrated an ability to capture EPCs within 1 h of cell seeding with Col II exhibiting the highest level of attachment when compared to the other biomolecules. Interestingly, Col IV exhibited the highest increase in EPC expansion after 72 h when compared to Col I, Col II and VEGF-A. These results provide information for significant improvement in the capture and expansion of human EPC for further application.

Keywords : biomolecules, cell microarray platform, cell therapy, endothelial progenitor cells, high throughput screening
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