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PO-010 - (23794) - ADVANCEMENT OF VASCULAR DISEASE MODELING WITH IPSC-DERIVED VSMC PHENOTYPIC SWITCHING IN A 3D CULTURE SYSTEM

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Cardiovascular disease (CVD) is a leading cause of death globally, with vascular disease being a key contributor. Vascular smooth muscle cells (VSMCs) play a critical role in both normal vascular function and disease progression. Their phenotypic switching is central to vascular disease pathology, where inhibiting the transition from a contractile to a synthetic
phenotype may mitigate disease severity. This study aims to establish a VSMC phenotypic switching model using induced pluripotent stem cells (iPSCs) and develop a three-dimensional (3D) culture method to more accurately simulate vascular disease processes.
iPSCs were differentiated into VSMCs, confirmed by detecting specific markers. To model disease, VSMCs were treated with platelet-derived growth factor (PDGF) to induce a dedifferentiated phenotype. The traditional two-dimensional (2D) Pre-Coating culture method was improved by adopting a 3D Pre-Mixing culture approach, wherein gelatin was combined with cells to simulate the in vivo extracellular matrix (ECM) environment.
The 3D culture more effectively promoted VSMC growth and significantly influenced phenotypic switching. Contractile VSMCs showed higher gene and protein expression levels in 3D culture than in 2D, while synthetic VSMCs exhibited greater proliferation and migration capabilities, indicating that the 3D approach better mimics physiological conditions.
The 3D Pre-Mixing culture method provides a more accurate model of VSMC phenotypic switching, highlighting the potential of iPSC-derived VSMCs in studying vascular disease. Future research will explore exosome metabolomics to identify key biomarkers involved in VSMC roles within vascular pathology.

Palavras-chave : induced pluripotent stem cells, vascular smooth muscle cells, phenotypic switching