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ANGIOGENIC POTENTIAL OF ALIGNED PLGA FIBER AND HUMAN AMNIOTIC MEMBRANE COMPOSITE SCAFFOLD

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SUMMARY

Introduction: High alignment of electrospun fiber (EF) makes it an attractive biomaterial for the regeneration of highly ordered tissue, but EF functionality is often hampered by the lack of mechanical strength. We previously reinforced EF scaffold by spinning poly lactic-co-glycolic acid (PLGA) fibers on decellularized human amniotic membrane (HAM), thus producing a mechanically competent composite scaffold with cell guiding ability. At present, we aimed to study the effect of EF-HAM scaffolds on proliferative potential and population balance of skeletal muscle cells i.e. myoblast and fibroblast. We also evaluated the angiogenic properties of conditioned media (CM) collected from muscle cells-seeded EF-HAMs on endothelial cells. **Material and methods:** 20% PLGA 50:50 polymer was spun on HAMs for 3 mins, 5 mins or 7 mins to create fibers of varying thicknesses. Muscle cells isolated from consented patients were seeded on HAMs and EF-HAMs, and the number of proliferating cells and the proportion of myoblasts to fibroblasts were analyzed through immunofluorescence staining of Ki-67 and desmin markers, respectively. The concentration of angiogenic factors in CM were determined using multiplex assay. Subsequently, the effect of CM on endothelial tube formation was studied on Matrigel-based assay. **Results:** The highest proportion of myoblasts compared to fibroblasts were found on HAM scaffold. Meanwhile, no significant difference was observed for the number of proliferating cells among the cultured conditions. CM collected from muscle cells-seeded HAMs and EF-HAMs contained significantly elevated concentration of angiogenic factors including angiogenin, IL-8 and VEGF-A compared to control. Meanwhile, CM derived from EF-HAM 3 min scaffolds had the highest tube formation potential on Matrigel compared to other CM groups. **Conclusion:** Muscle cells-seeded EF-HAM scaffolds can promote tissue vascularization through paracrine secretion of potent angiogenic mediators and endothelial tube formation, although EF-HAM did not enhance myoblast growth. In summary, EF-HAM composite scaffold design holds promising applications in muscle tissue reconstruction.

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