Investigation of endothelial cell viability and growth on 3D printed GelMa vascular networks

Chrisoula Chappell, F Zheng , C Deans, O Tsigkou and B Derby

The University of Manchester, UK

INTRODUCTION: A limitation for the development of 3D engineered tissues is the absence of viable and perfusable vasculature [1-3]. As a precursor to vascularized adipose tissue, cylindrical channels were formed in a cast photocrosslinked gelatin methacrylate (GelMA) construct by printing sacrificial networks of Pluronic F127. Human umbilical vein endothelial cells (HUVECs) were seeded and cultured within the 3D printed channels, while Adipose derived stem cells (ADSCs) were cultured in the GelMA prior to casting the 3D printed channels.

METHODS: GelMA was synthesized using the one pot synthesis method [2]. The hydrogel was characterized by NMR, surface tension, contact angle, DMA and rheology. Pluronic filaments were printed onto glass slides using a robotic printer I&J 7300-LF (Fishnar, UK). HUVECs (PromoCell, UK) were cultured on GelMa substrate, whilst ADSCs (ThermoFisher) were embedded within the GelMa. Live/Dead and Alamar Blue assays were used to assess the cells' viability and proliferation respectively. Phalloidin staining was used to assess actin cytoskeleton organization. Further experimentation included the differentiation of the ADSCs into adipocytes onto GelMa.

RESULTS: Once methacrylation has occurred, NMR peaks are seen at 6ppm and 2ppm corresponding to lysine and methacrylated grafts of hydroxyl groups. Viability assays confirmed that HUVECs and ADSCs were viable after 7 days. Phalloidin staining demonstrated good organization of the actin cytoskeleton of HUVECs on GelMa. Data on HUVECs injected within the printed 2D networks and 3D culture of ADSCs within the GelMa matrix will also be presented.

DISCUSSION &CONCLUSIONS: Collectively, our data illustrate that HUVECs grow and fully line the printed networks, thus confirming the formation of a vascularized model..

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