T1-010

Investigation of Biocompatible Chitosan-Based Hydrogel Scaffold as A Cell Carrier

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A major problem in cartilage tissue engineering is the application of an appropriate scaffold design. Firstly, to function as a carrier to promote cell activity and tissue consolidation, ultimately convert the implanted scaffold into native cartilage during cartilage repair. A porous biocompatible hydrogel scaffold based on poly(vinyl alcohol) (PVA) and N,O-carboxymethylate chitosan (NOCC) was synthesised for this purpose. The aim of this study was to characterise our novel synthesised PVA/NOCC hydrogel scaffold, to investigate its biocompatibility and thus suitability for cartilage tissue engineering. Scanning electron microscopy (SEM) was used to analyse hydrogel microstructure. Chondrocytes derived from articular cartilage of New Zealand White rabbits were seeded onto each pre-wetted scaffold (density of $5X10^6$ cells). The cell-scaffold constructs were then cultured for 35 days prior to SEM. SEM analysis revealed that PVA/NOCC hydrogel contained an interconnecting porous structure with adequate pore size. Penetration of chondrocytes and abundant extracellular matrix were observed in PVA/NOCC hydrogel constructs. Chondrocytes adhered to the scaffold covering large areas of the scaffold's surface, forming colonies while retaining their spherical morphology. Quantitative analysis of cell viability was also performed by MTT assay. In conclusion, our novel porous biocompatible PVA/NOCC hydrogel possesses the desired scaffold structure and promotes chondrogenesis of implanted cells. PVA/NOCC hydrogel scaffold demonstrates great potential as a cell carrier for cartilage tissue engineering.