(OP 212) Novel Injectable Gel Encapsulating Human Articular Chondrocytes for Cartilage Tissue Repair and Regeneration

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Cartilage tissue loss, as a result of trauma, congenital disorders and diseases of joints, involving structural damage of articular cartilage surface, is a substantial clinical problem representing a major challenge for cartilage tissue engineering. The aim of our study was to evaluate the *in vitro* and *in vivo* behavior of human articular chondrocytes encapsulated within a novel carrageenan *in situ* injectable hydrogel for cartilage tissue engineering and regeneration. Human articular chondrocytes (Hac) were expanded using a well defined serum free medium able to support cell proliferation and differentiation with high cell chondrogenicity. Specifically, Hac were encapsulated within the hydrogels and cultured *in vitro* for 28 days. Results showed that there was a statistically significant increase of cellular viability, with deposition of extracellular matrix (ECM) and subsequent maintenance of chondrocyte differentiated phenotype, as revealed by expression of chondrogenic markers and reinforced by histological analysis. Optical sections acquired by APOTOME (Zeiss) of Hac hydrogel labelled with Hoechst (viable cell dye) allowed the construction of 3D models images demonstrating an homogenous viable cell dispersion as well as a increasing cell number over the time. Bovine full-thickness articular cartilage defects were injected with the biodegradable hydrogel loaded with Hac and implanted subcutaneously in nude mice. Histological results documented the formation of a new human origin cartilaginous repair tissue, clearly indicating the potential of this novel cell delivery system for cartilage tissue engineering.