TS017
Novel bilayered Gellan gum/Gellan gum-hydroxyapatite scaffolds for osteochondral tissue engineering applications

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Osteoarthritis is a major cause of disability during aging. By the age of 60, close to 100% of the population will have histologic changes of degeneration in their knee cartilage (Loeser, 2000). Because of its avascular nature, cartilage has little capacity to self-regenerate. Despite the progress already achieved in osteochondral regeneration, some limitations have to be overcome. The formation of fibrocartilage has to be avoided and the innervation has to be improved. Further, one main feature to be promoted is the induction of vascularization in the bony part but not in the cartilage part and to avoid de-differentiation processes. A promising strategy could pass through the development and optimization of novel culture systems. The ideal approach could integrate scaffolds presenting regions with different physical characteristics, combined with different growth factors to support different stem cells fates, regarding the complex tissue physiology to be regenerate. This work aims to develop novel bilayered gellan gum (GG)/gellan gum-hydroxyapatite (HAp) hydrogels based structures for osteochondral tissue engineering applications. Bilayered GG/GG-HAp hydrogels were produced by joining both solutions of GG 2% (w/v) with and without HAp (20% wt.) for bony and cartilage parts, respectively. The solutions were introduced into a silicone mould with 20:10 mm (height and diameter, respectively). Gelation of GG was promoted by immersion in PBS solution for 24 h. The architecture of the bilayered scaffolds was investigated by micro-computed tomography. Results have shown that the freeze-dried bilayered scaffolds composed by low acyl GG(2%(w/v)/low acyl GG(2%(w/v)-HAp20%(w/w) possess a porosity of 83.4 ± 0.8%, pore size of 279.3 ± 38.6 μm and interconnectivity of 62.2 ± 5.4%. Degradability assays are being performed with the intent to use this system to culture human adipose derived stem cells inducing cell co-differentiation into chondrocytes and osteoblasts. Ultimately, the developed bilayered scaffolds will provide new therapeutic possibilities for the regeneration of osteochondral defects.

J Tissue Eng Regen Med 2012; **6 (Suppl. 2):** 8–39.
DOI: 10.1002/term.1608