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Chitosan/collagen II/nanohydroxyapatite composite hydrogels for osteochondral interface tissue engineering

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Natural composite biomaterials of chitosan and collagen-type I most studied - have been extensively used in tissue engineering for their good structural properties. Collagen type II is one of the major components in calcified cartilage zone together with the proteoglycans. In this study, it was aimed to conduct a composite hydrogel structure for possible use in the regeneration of calcified cartilage. Composite hydrogels consisting of chitosan (Chi), collagen type II (Coll) and nanohydroxyapatite (nHA) were prepared with 0.5% nHA (w/w) and different variations of Chi/Coll composition by using thermal gelation. Beta-glycerol phosphate (beta-GP) was used to initiate gelation of Chi-Coll-nHA composite gel mixture at pH 7.4 and 37°C. Additionally, genipin was used as a chemical crosslinker. Increase in Coll ratio caused a decrease in compressive modulus of the hydrogels. Morphological structure analysis showed the gels exhibited porous structure suitable

for cell encapsulation and proliferation. ATDC5 chondrocytes encapsulated in hydrogels at Chi/Coll ratios of 100/0, 70/30, 50/50 and 30/70 wt% exhibited high viability while the highest viability was observed in Chi70/Coll30/nHA gels over 14 days. DNA content also showed the same increase pattern during the culture. Our findings showed Chi/Coll/nHA composites supported the formation of a calcified cartilage-like matrix and have great potential as gel forming materials for osteochondral interface repair.

Speaker Biography

Ayşe Karakeçili has completed her PhD from Department of Chemical Engineering in Hacettepe University. She is currently working as an associate professor in Department of Chemical Engineering in Ankara University. Her research includes design, synthesis and characterization of polymeric biomaterials and nanocomposites for tissue engineering applications.

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