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Cell-fibril interaction in peptide based Hydrogels relative to hydrogel stiffness HASSNA RAMAY, JOEL SCHNEIDER, DARRIN POCHAN, University of Delaware — Peptide hydrogels are potentially ideal scaffolds for tissue repair and regeneration due to their ability to mimic natural extra cellular matrix. The 20 amino acid peptide MAX1 has been shown to fold and self-assemble into a rigid hydrogel based on environmental cues such as pH, salt, and temperature. The hydrogel is composed of network of short fibrils that are 3nm wide and up to several hundred nm long. In addition, slight design variations in the arms of the MAX1 sequence allow for tunability of the self-assembly/hydrogelation kinetics. In turn, by controlling hydrogel self-assembly kinetics, one dictates the ultimate stiffness of the resultant network. The cell-material interaction in normal and pathological conditions is investigated by 2D and 3D cell culture. As shown by optical and laser scanning confocal microscopy, cells are viable for 3 weeks and grow in clonogenic spheroids. Characterization of the proliferation, differentiation and constitutive expression of various osteoblastic markers is performed relative to hydrogel stiffness using spectrophotometeric methods. The well-defined, fibrillar nanostructure of the hydrogel directs the attachment and growth of osteoblast cells and dictates the mineralization of hydroxyapatite in a manner similar to bone. This study will enable control over the interaction of cellular systems with the peptide hydrogel for biomedical applications.

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