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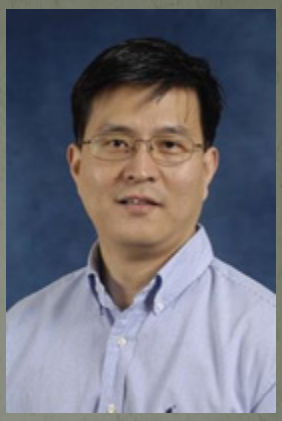

Materials/Organic Seminar Presentation

Thursday, Nov. 3, '11

12:15 p.m. Room 1315

"Tinkering with Nature's Tissue Scaffolds: Study and Application of Collagen and Collagen Mimetic Peptide Hybridization"

Due to the complex and dynamic nature of the extracellular matrix, engineering ideal tissue scaffolds is an exceptionally challenging task that will require not only in-depth understanding of cell-scaffold interactions but also technologies to encode cell-instructive cues onto biocompatible and biodegradable 2D and 3D scaffolds. Such encoding technology has mostly focused on synthetic materials although natural scaffolds are commonly used in regenerative medicine. Here we present the discovery of hybridization interaction between synthetic collagen mimetic peptide (CMP) and natural collagens, and its application as collagen-targeting methods for tissue imaging and scaffold engineering. The hybridization is specific to collagen and occurs when unfolded CMPs are allowed to fold into triple helix in the presence of collagen fibers. The length of the CMP that determines the associative strength of CMP triple helix influences both its level of adhesion to collagen fibers and release characteristics from CMP-loaded collagen films and gels. Understanding of this hybridization process led to the development of various CMP derivatives and CMP conjugate that can i) image collagens of human tissue, ii) enhance tubulogenesis of endothelial cells in collagen scaffolds, iii) photo-pattern collagen scaffolds, and vi) promote maintenance and directed differentiation of chondrocytes and stem cells, respectively. The precise mechanism of CMP-collagen hybridization remains elusive; however this unique collagen targeting methods could be used for imaging pathologic collagens and for spatial encoding of biological cues in collagen that may lead to new methods for complex tissue engineering.