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Nanostructured composites for controlled drug delivery and stem cell functions

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Abstract

This presentation will highlight recent advances in nanostructured ceramic/polymer composites for controlled drug delivery and enhanced human mesenchymal stem cell (hMSC) functions for regenerative medicine applications. Specifically, we designed and fabricated nanophase ceramic/polymer composites into 2D and 3D structures at the nano- and micro-scale to mimic properties of natural bone closely. Results showed that osteoblast (bone-forming cell) functions increased the most by the nanocomposites with the closest nano-surface characteristics to bone. We further investigated the loading of a bone morphogenetic protein (BMP-7)-derived short peptide (DIF-7c) into the nanocomposites and studied the prolonged release of the peptide and their potential for osteogenic differentiation of hMSCs. Results showed that the nanocomposites promoted hMSC adhesion than the polymer controls and enhanced osteogenic differentiation (i.e. calcium deposition and alkaline phosphatase activity) of hMSCs *in vitro*. In summary, the nanocomposites are promising for more effective bone tissue regeneration and should be further studied for clinical translation.

Biography

Huinan Liu received her Ph.D. in Biomedical Engineering from Brown University in 2008 and her M.S. and B.S. in Materials Science and Engineering from Purdue University and the University of Science and Technology in Beijing. She has published 32 articles in peer-reviewed journals, 21 conference proceeding papers, 2 books, and 8 invited book chapters. She served as a symposium organizer for Materials Research Society (MRS) annual Meeting and World Biomaterials Congress (WBC), and session chair for American Institute of Chemical Engineers (AIChE) annual meeting, American Society of Mechanical Engineers (ASME) annual meeting, Society for Biomaterials (SFB) annual meeting, etc.