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Stem cell therapy: Bone regeneration for critical size bone defects

Critical-sized bone defects (CSBDs) are wounds that cannot be spontaneously bridged and results in the formation of fibrous connective tissue rather than bone when left untreated. Clinical therapies of CSBDs represent a great challenge for orthopedic and craniomaxillofacial surgeons, because current treatments rely on grafting materials such as autografts, allografts, or xenografts. However, recent advancements in stem cell based bone repair and regeneration have shown great promise in animal models and clinical studies. In this talk, the speaker will report her lab findings including using new injectable and moldable nano calcium sulfate scaffolds (nCS), and growth factor conjugated controllably released fibrin gel system to deliver mesenchymal stem cells, endothelial progenitor cells, genes, growth factors and PRP (Platelet rich plasma) for promoting angiogenesis and bone regeneration in critical sized bone defect models.

Recent Publications

1. Liu Z et al. (2017) The combination of nano-calcium sulfate/platelet rich plasma gel scaffold with BMP2 gene- modified mesenchymal stem cells promotes bone regeneration in rat critical-sized calvarial defects. Stem Cell Res Ther. 8(1):122.
2. Fernandes G and Yang S (2016) Application of platelet-rich plasma with stem cells in bone and periodontal tissue engineering. Bone Res. 4:16036.
3. Yuan X et al. (2016) Hybrid biomaterial with conjugated growth factors and mesenchymal stem cells for ectopic bone formation. Tissue Eng Part A. (13-14):928-939.
4. Fernandes G, Wang C, Yuan X, Liu Z, Dziak R and Yang S (2016) Combination of controlled release platelet-rich plasma alginate beads and bone morphogenetic protein-2 genetically modified mesenchymal stem cells for bone regeneration. J Periodontol. 87(4):470-80.
5. He X et al. (2013) BMP2 genetically engineered MSCs and EPCs promote vascularized bone regeneration in rat critical-sized calvarial bone defects. PLoS One. 8(4):e60473.

Biography

Shuying Yang is an Associate Professor in the Department of Anatomy & Cell Biology, Penn Dental School - University of Pennsylvania, USA. She received her MD and PhD in China, and then completed Postdoctoral Fellowships in Bone Biology at the University of Michigan, USA and later The Forsyth Institute & Harvard School of Dental Medicine, USA. She joined the Department of Oral Biology in The State University of New York, Buffalo campus in 2008 as an Assistant Professor and then became a Tenured Associate Professor in 2014. She is an author of over 50 papers published in international journals including Nature Communication, Cell Death & Differentiation, JBMR, Human Molecular Genetics, a reviewer for numerous journals and NIH and other study sections and Editorial Board Member of several journals. She has pursued innovative research on the mechanisms of bone formation and resorption, including craniofacial and bone development, metabolism and mechanostransduction and stem cell-mediated bone regeneration.

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