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11TH WORLD DRUG DELIVERY SUMMIT

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Nanomaterials in regenerative medicine and cancer therapy

Nanomedicine is poised to shape the sustainability of industries and wealth of nations, and transform economies and societies on a global scale. The global market for nanomedicine was $250 billion in 2014 and it is expected to reach $550 billion by 2020. Nanotechnology is the solution to detection, diagnosis, and treatment of many diseases as biological processes and cellular mechanisms work at the nanoscale. Translation of nanoscale discoveries from the laboratory to the market promises new diagnostic tools, drug targeting systems, gene therapy platforms, biomaterials, regenerative tissue constructs, and personalized medicine. A major application of nanotechnology in medicine is in cancer therapy. A major contributing factor to mortality in cancer patients is relapse after therapy and developing resistance. Cancer recurrence and resistance is related to the existence of a very small population of initiating stem cells in the tumor tissue. The author will present strategies based on nanomaterials to selectively target chemotherapeutic agents to the stem cell sub-population of cells in the tumor tissue. Another important application of nanomedicine is in regeneration of skeletal tissues. In the process of bone formation, osteogenesis and vascularization are coupled by spatiotemporal regulation of paracrine signaling in which the invading vascular endothelial cells secrete osteogenic morphogens to stimulate cell differentiation and bone formation. The stratified structure of articular cartilage is rooted in the spatiotemporal gradients of morphogens that direct the formation of morphologically distinct cartilage zones. The author will present nanoparticle-based strategies for spatiotemporal release of morphogens for coupling osteogenesis and vascularization and to stimulate the formation of zonal architecture of articular cartilage.

Biography

Esmaiel Jabbari is Tenured Full Professor of Chemical and Biomedical Engineering at the University of South Carolina. He directs the biomaterials, tissue engineering, and drug delivery laboratory which specialize on the design of 3D multi-cellular co-culture systems to study the effect of nanoscale spatiotemporal delivery of morphogens and physico-mechanical factors on the fate of stem cells. He has received numerous awards for his research program including the Berton Rahn Award in 2012 from the AO Foundation, the Stephen Milam Award in 2008 from the Oral and Maxillofacial Surgery Foundation, and elected for the College of Fellows of the American Institute for Medical and Biological Engineering (AIMBE) in 2013. He is the author of more than 250 books, book chapters, refereed journal articles and conference proceedings and he has mentored more than 130 scholars. He has served as the Academic Editor for *PLOS ONE*.

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