

Nanomedicine & Healthcare

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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. I 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. I 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.

Speaker Biography

Dr. Jabbari is a Tenured Full Professor of Chemical and Biomedical Engineering and the Director of Biomaterials, Tissue Engineering and Drug Delivery at the University of South Carolina. He earned his Ph.D. from Purdue University in Chemical Engineering. He began his independent career as an Assistant Professor in the Departments of Biomedical Engineering and Orthopedic Research at Mayo Clinic upon completion of his post-doctoral training at Monsanto and Rice University. Jabbari's research is focused on engineering 3D multi-cellular co-culture systems and the effect of spatiotemporal delivery of growth factors and physico-mechanical factors in the microenvironment on function and fate of stem cells for applications in skeletal tissue regeneration and cancer stem cell therapy. He received the Berton Rahn Award from the AO Foundation in 2012 and the Stephen Milam Award from the Oral and Maxillofacial Surgery Foundation in 2008. He was elected to the College of Fellows of the American Institute for Medical and Biological Engineering (AIMBE) in 2013. He has published >250 books, book chapters, refereed journal articles (107 peer-reviewed), and conference proceedings, and presented >260 seminars at national and international conferences (67 plenary, keynote, and invited seminars). He currently serves as the Technical Chair as well as the Programming Chair for Bionanotechnology theme of the annual conference of Engineering in Medicine & Biology Society (IEE-EMBS). He serves as the Academic Editor for PLOS ONE, Editor of International Journal of Biomaterials, and North America Editor of Journal of Biomaterials and Tissue Engineering. Dr. Jabbari has mentored >130 visiting scholars, medical residents, post-doctoral scientists, and engineering students. He is a member of numerous scientific organizations including AICHE, BMES, ACS, EMBS, SFB, TERMIS, MRS, ACS, and AACR.

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