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Functionalized polymeric electrospun nanoscaffolds for bone regeneration and tissue healing

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There is currently an unmet need for an optimal biomaterial that can substitute for autograft bone or serve as a temporary matrix that can induce regeneration of native bone at implant sites. Developing scaffolds that mimic the architecture of bone tissue at the nanoscale level and that parallel the physical properties of bone tissue in the categories of mechanical strength, pore size, porosity, hardness, and overall three-dimensional (3D) architecture is one of the major focuses in the field of tissue engineering. Our specific objective is to design 3D synthetic biodegradable scaffolds comprising electrospun nanofibers that will not only be osteoconductive but also contain porosity for bone cell ingrowth enhanced with Mesenchymal Stem Cells (MSCs) and a sufficient amount of bioactive ingredients such as Demineralized Bone Matrix (DBM) that would serve as a more conducive framework for cell adhesion, proliferation, and differentiation. Our central hypothesis is that the MSCs can migrate inside the functionalized 3D nanoscaffold to produce abundant extracellular matrix and differentiate into bone cell lineages, and that incorporation of DBM into the network of nanofibers will enhance osteogenesis and bone formation. The rationale for the proposed research is that if such complex constructs can mimic the native *in vivo* microenvironment, they could provide a promising nanotechnology based surgical tool for bone tissue engineering directed at orthopedic and bone tissue clinical applications.

Biography

Anand Gadre graduated with his BS and MS degrees in Applied Physics from the University of Mumbai. He completed his Doctorate from the Institute of Chemical Technology (ICT), India. In 2001, he joined University of Maryland as a Post-doc and later worked as Research Associate in the Nanoscience and Microtechnology Laboratory (GNuLab) at Georgetown University. In 2004, he joined as an Assistant Professor of Nanobioscience in the State University of New York at Albany and later was promoted as an Associate Professor with tenure. He achieved his MBA degree from the University at Albany in 2009. In 2011, he joined as the Director of a core Nanofabrication and Stem Cell Research Facility in the University of California, Merced, where he is currently pursuing his research in Nanobiotechnology. He has published several peer-reviewed papers, co-authored book chapters and served as a Referee for several national/international journals.

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