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Electrospun Nanostructured Scaffold of Carbon Nanotubes and Hydroxyapatite Composite for Bone Tissue Engineering

Khalid P
Department of Biotechnology, P.A. College of Engineering, India
Department of Biosciences, Jamia Millia Islamia University, India

Large bone defects caused by trauma, tumor resection, deformity, and infections are increasing year by year, but the rare resources for autogenous bone grafts and allograft rejections make it difficult to treat all of these deficiencies. In spite of high request in clinical medicine, nature's capability to self-organize the inorganic component with a preferred alignment in the bioorganic matrix is still not reproducible by synthetic techniques because of its complex nature. Therefore, in fields ranging from biology and chemistry to materials science and bioengineering a large developmental effort is essential in order to fabricate bone and dentin-like bio-composite materials, which may permit the in growth of hard tissues though improving mechanical properties with respect to the hard tissue regeneration. In recent years, certain attention has been paid to bio-mimetic approaches, which allow us to mimic such natural bio-inorganic and bio-organic composite materials. The main idea in bio-mimetic methodologies is to control and fabricate the morphology and composition of developed biomaterials, in which the nano crystallites of inorganic compounds are spread with special orientation in the organic matrices due to its large potential in biomedical applications. In the present work, we successfully mimicked electrospun bio-nanocomposit fibers on the basis of Poly Vinyl Alcohol (PVA) as matrix and Hydroxy Apatite (HA) nanoparticles with a highly anisotropic three-dimensional structure, microscopically the same as a substructure of bone. We have used two-step methodology that combines an in situ co-precipitation synthesis route with electrospinning process to prepare a unique type of bio-mimetic nanocomposite nanofibers of HA/PVA. The fibers produced by the electrospinning machine were in 100-200 nm. The result obtained from UTM analysis highlights the great tensile strength and young's modules of the nanofibers. A combination of structural, mechanical and biological properties of bone graft play a critical role in cell seeding, proliferation and new tissue formation in orthopaedic research. Nano-biomaterials should promote cell adhesion and be optimized for ECM production, mineralization and subsequent tissue regeneration. Hence, electrospun biomimetic HA/PVA/CNT nanofibers hold great potential for adhesion, proliferation and mineralization of osteoblasts and are favourable bio-composite scaffolds suitable for bone tissue redevelopment.

Biography:

Dr. Khalid Parwez, is working as an Associate Professor in the department of Biotechnology, P.A. College of Engineering, Mangalore and as guest teacher in the department of Biosciences, Jamia Millia Islamia, New Delhi. He has been teaching undergraduate and post graduate since 2009. His area of research includes Nanomaterial synthesis and characterization, nanocomposite (Advance nanomaterials), Nanomaterials as diagnostic tools and bone tissue engineering. He received PhD degree from Yenepoya University in the department of Allied Health and Basic Sciences in 2015 and Master of Science degree from Manipal University in 2008. He has total 14 research paper published in peer reviewed journals, attended many national and international conferences, given invited talk, received Young Scientist award from state government for the year 2015-16. Received a research grant from Govt. of India for three years from 2017-2019 for development of carbon nanotubes based on diagnostic kit for *Leptospirosis* and currently working on it.