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Effect of BMP-2 peptide conjugated TiO₂ nanoparticle on osteogenic expression through biomimetic Zein PDA nanofibrous scaffold

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A biomimetic Zein polydopamine (PDA) based nanofiber scaffold was fabricated to deliver BMP-2 (Bone Morphogenetic Protein) peptide conjugated TiO₂ nanoparticles in a sustained manner for investigating its osteogenic differentiation potential. To prolong the retention time of biomolecules at the target site, BMP-2 peptide has been conjugated to TiO₂ nanoparticles using a hetero bifunctional cross linker owing to its high surface to volume ratio. The conjugation efficiency was confirmed by various characterization techniques such as XPS, FT-IR and Raman spectroscopic analysis. The effect of biochemical cues from BMP-2 peptide and nano topographical stimulation of electrospun Zein PDA nanofibers were examined for its enhanced osteogenic expression of human fetal osteoblast (hFOB) cells. The highly interconnected nanofibrous matrix with its unique material composition attributes for the sustained delivery of bioactive signals, improved cell adhesion, mineralization and differentiation. Further, Alkaline phosphatase activity, mineralization and the expression of osteogenic markers revealed that the fabricated nanofibrous scaffold possess better cell - biomaterial interactions compared to the control. These promising results demonstrate the potential of the composite nanofibrous scaffold as an effective biomaterial substrate for bone regeneration.

Biography

Babitha Sekar has completed her masters in Bio-informatics from Madras University. She has been awarded INSPIRE fellowship from Department of Science and Technology, Government of India to pursue her doctoral programme. Her interest is on designing biomaterials for various biomedical and environmental applications which has fetched her two publications in reputed journals. She is presently working on developing nanoparticle incorporated nanofibrous scaffolds for tissue regeneration.

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