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A novel bioengineering approach towards functional tissue constructs generation for tissue engineering applications

The increasing incidence of tissue related defects/diseases and lack of appropriate effective therapies leads toward development of highly effective and enduring alternative therapies through bioengineering approaches. The present study reports, the development of chitosan/PLLA/hyaluronic acid-based scaffolds for cartilage tissue regeneration in an airlift bioreactor (ALBR). The uniform chondrocyte distribution in the scaffold using various growth modes in the ALBR was studied by glycosaminoglycans (GAGs) quantification, MTT assay and mixing time evaluation. A designed ALBR has been used to improve the growth of the engineered cartilage in vitro. Large amount of extracellular matrix (ECM) deposition has been seen in to a novel ALBR. It is shown that, ALBR with wavy walled riser sense to enhance the nutrient transfer provide the hydrodynamic environment that induced a shear stress to promote the synthesis of chondrocyte ECM. The experimental results supported the fact that the reason for better growth of the cells might be due to enhanced mixing with controlled shear in the wavy form, which ultimately affects the better oxygen transfer and mass transfer of nutrients through diffusion leading to better growth. The cell scaffold constructs grown for 28 days, flushed with PBS to remove serum content and harvested further to get a novel cartilage product. The product was optimized on the basis of clinical optimal parameters and clinical quality attributes of the construct including its viability, strength and GAG content.

Biography

Pradeep Srivastava currently working as an Professor at the School of Biochemical Engineering, IIT (BHU), Varanasi has an impressive track record as an academician as well as has a strong experience of working in Biotechnology industries (09 years) prior to joining academics, on technologies like lactic acid production (fermentation process), enzyme production (fermentation process), low molecular heparin derivatives (de polymerization process), and r-DNA technology products and herbal formulations development. Currently, he is serving at a premier Institute, IIT (BHU), Varanasi has a total experience of 09 years in industry, 02 years in Post-Doctoral program and 15 years in teaching UG/PG courses. His research primarily focuses on health care derivatives/products and process development, including novel bioreactor development. The research includes secondary metabolites production (cephalosporin-C, lincomycin, lovastatin, Co Q 10, rapamycin, ethanol, etc.), reactor design (air lift reactor), tissue engineering (cartilage and bone tissue generation), bio scaffolds, stem cells and poly herbal formulations. His research looks forward towards evaluation and development of platform technologies in translational health sciences which include stem cell regeneration, wound healing process, cancer research, and acute kidney failure in children.

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