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Osteogenic differentiation of human adipose stem cells cultivated in bioactive glass scaffold and perfusion bioreactor for bone tissue engineering

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Tissue Engineering is a multidisciplinary science where a structural matrix is combined with cells to form a construct able to promote regeneration of injured tissue. Bioactive glass foam (BG) produced by sol-gel is an well know osteoinductive material. The human adipose stem cells (hASC) are capable of differentiating into osteoblasts. The use of bioreactors (BR) in three-dimensional cell culture enables greater efficiency for cell nutrition and application of mechanical forces. The objective of this study is to evaluate the osteogenic differentiation of hASC seeded on BG and cultured in three-dimensional perfusion BR for the production of a functional construct for bone tissue engineering. The synthesis of BG resulted in an interconnected network with pore size range 100-500μm and 88% porosity. The extraction and characterization of hASC were performed and a new protocol for hASC cultivation in Leibovitz CO_2 independent medium (LEI) was developed for use in the perfusion BR. The hASC cultivation on BG in the BR demonstrated a significant increase in cell proliferation and viability at 7 days of culture when compared to static culture, ALP activity peak at 14 days and the immunofluorescence assay revealed expression of osteopontin (OP), osteocalcin (OC), collagen type I and a gradual change in cell shape from spindle to cuboidal from 7 to 21 days of culture. The PCR assay confirmed the expression of OP, OC and FA genes. In conclusion, it can be a promising strategy for cell culture to obtain a functional construct for bone tissue engineering.

Biography

Alexandra Rodrigues Pereira da Silva is graduated in Dentistry, Master and PhD in Materials Science. Currently she is a postdoctoral student at Federal University of Minas Gerais in Brazil. She has published papers in renowned journals and recently is a reviewer of an international journal of Biotechnology and Bioprocessing.

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