EuroSciCon

15th Edition of EuroSciCon Conference on

Advanced Stem Cell & Regenerative Medicine

December 03-04, 2018
Valencia, Spain

Susi Zara, J Stem Cell Biol Transplant 2018, Volume 2
DOI: 10.21767/2575-7725-C1-001

Dental pulp stem cells osteblastic differentiation on graphene oxide-coated titanium surfaces: an in vitro study

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Titanium implants surfaces are continuously modified to improve biocompatibility and to promote osteointegration. Graphene oxide (GO) has been successfully used to ameliorate biomaterial performances in terms of implant integration with host tissue. The aim of this study is to evaluate dental pulp stem cells (DPSCs) cell viability, cytotoxic response and osteogenic differentiation capability in the presence of GO-coated titanium surfaces. Experimental discs were divided into: standard titanium (control), titanium treated with inorganic ions (test), both coated with GO (ctrl+GO and test+GO, respectively). Surface analysis was realized by atomic force microscopy (AFM), morphological analysis by scansion microscopy (SEM), proliferation rate by MTT, cytotoxic response by LDH assay, osteoblastic differentiating potential by real-time RT-PCR of BMP2, RUNX2, SP7 and Collagen I, and by measuring the secretion of PGE2. SEM analysis shows extracellular matrix deposition in all samples, in test and test+GO more evident after 14 days of culture. MTT analysis shows, after 7 and 14 days of culture, a significant viability increase on test+GO sample; LDH assay reveals no cytotoxic response in all the experimental points. An increase of osteogenic markers, and of PGE2 secretion level at later stages, is recorded on test+GO. The obtained results evidence that the tested biomaterials stimulate cell viability and that they are not cytotoxic. However, GO enrichment of the test surface is also capable to better and faster induce osteogenic differentiation, thus suggesting this biomaterial as a new promising surface to promote bone remodeling process improving dental implants integration with host tissue.

Biography

Susi Zara pursued her graduation (2006) in Pharmacy; PhD in 2009 from the University of G d Annunzio of Chieti Pescara, Italy. She is now a permanent researcher in the Pharmacy Department at the same university. She has published more than 50 full length papers in international peer-reviewed journals. Her fields of research are represented by intracellular signaling driving differentiation of dental pulp mesenchymal stem cells in the presence of innovative biomaterials with a potential use in dental and orthopedic regenerative medicine.

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