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Covalent functionalization of titanium discs with graphene oxide for the improvement of biocompatibility and DPSCs proliferation

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Graphene, a flat monolayer of carbon atoms arranged in a honeycomb lattice, is one of the most stiffest and strongest materials. Thanks to its structure and its exceptional properties, it became a molecule of interest to promote the development of high-performance devices, such as endosseous titanium implants in oral surgical procedures. The aim of this study was to determine graphene ability to improve implants biocompatibility in terms of osteodifferentiation or osteoinductive capability. Implants were divided into sandblasted/acid-etched (Control) and sandblasted/acid-etched coated with calcium and magnesium ions (CaMg) (Test), and both of them were coated with graphene oxide (GO), a graphene derivate. GO coated titanium discs were used in *in vitro* experiments with dental pulp stem cells (DPSCs). At established times, viability and cytotoxicity were investigated by MTT and LDH assays. GO functionalization of titanium disc surfaces on a nanoscale level was checked by atomic force microscopy (AFM). The cross-sectional AFM image of samples showed that the height of the sample increased and similarly, dissipation energy and adhesion to the tip changed between titanium blank and GO-functionalized titanium. At days 3, 7 and 14, proliferation increased following graphene coating, both on control and on test surfaces. At each experimental time LDH assay showed cytotoxicity reduction on TEST-GO samples, while this trend was not observed on CTRL-GO ones. These results suggest that covalent functionalization of titanium discs with GO improves biocompatibility of the implants and the surface modification of titanium implants by graphene coating can have positive influence on cell growth. In the future, our goal will be to better understand if this surface treatment could have a positive influence on the differentiation of mesenchymal stem cells towards the osteoblastic lineage.

Biography

Roberta Di Carlo graduated in 2016 in Pharmaceutical Chemistry and Technology from University "G. d'Annunzio of Chieti-Pescara and started PhD in April 2017 at the same university. Her fields of research are represented by the development of innovative biomaterials and the mechanisms of interaction between biomaterials, activated surfaces, stem cells and human tissue.

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