PHYSICOCHEMICAL CHARACTERIZATION OF RGD PEPTIDE IMMOBILIZATION ON HA DISC SURFACE

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Hydroxyapatite (HA) is a biomaterial widely used on bone tissue engineering due to its similarity with inorganic phase of bones and teeth. It is bioactive but adding functional groups on its surface can enhance cell adhesion. The use of biomolecules associated with biomaterials arises from the need of proposing new models of controlled drug release, carriers and biomarkers as well as to improve the biomaterials biocompatible. Biomaterials surface modifications through the immobilization of proteins can improve the interaction with cells. RGD is a tripeptide composed by the Arg-Gly-Asp sequence, which the domain site recognized by the cells that are presented in a large number of extracellular matrix protein. The immobilization of this peptide on HA surface could promote binding domains to improve cell – biomaterial adhesion. In this work, HA discs were chemically modified by the silanization through organosilane 3-aminopropyltriethoxysilane (APTES) in absolute ethanol and soon after immersed in 0.3% (w/v) 1-ethyl-3-(3-dimethylaminopropyl) carboidiimide hydrochloride solution. Then RGD peptide 100µg/mL in milli-Q water was covalently bound on the treated discs (q-RGD/HA). RGD physically immobilized (f-RGD/HA) on the HA discs were obtained by soaking the biomaterial in a RGD 100µg/mL aqueous solution overnight. Next all discs were cleaned and sonicated in milli-Q water to remove the RGD weakly immobilized on HA surfaces. The aim of this study was to modify hydroxyapatite (HA) surface with APTES in order to covalently immobilize RGD peptide to increase HA biocompatibility, comparing the results with the physical adsorption. The biomaterial physicochemical characterization, before and after, the surface modification were obtained by Fourier transform infrared spectroscopy (FTIR), atomic force microscopy (AFM) and contact angle (CA). FTIR confirmed the characteristics bands of HA phosphates groups but no changes in the spectra after the chemical and physical immobilization were observed. AFM evaluated the HA discs morphology and the differences of the surface topography after both immobilization methods. The AFM image revealed a surface height distribution for HA (0-240nm), to p-RGD/HA (0-310nm) and to q-RGD/HA (0–210nm). The analysis showed a less roughness nanotopography on q-RGD/HA discs compared to f-RGD/HA. The contact angle showed that the RGD immobilization both chemically (73 ± 5.7) and physically (66 ± 2.2) do not alter the HA wettability (78 ± 1.5).
References


