TITANIUM NANOTUBES FUNCTIONALIZED WITH CRAMOLL LECTIN AND EVALUATION OF EFFECTS OF LECTIN ON CELL VIABILITY AND PROLIFERATION

Oliveira, W. F.1; Anjos, K. F. L.2; Silva, G. M. M.2; Machado, G.2; Oliveira, M. D. L.1; Correia, M. T. S.1

1Department of Biochemistry, Federal University of Pernambuco, Pernambuco, Brazil;
2Nanotechnology, Northeast Strategic Technology Center, Pernambuco, Brazil.

INTRODUCTION AND OBJECTIVES: Titanium nanotubes (TNTs) are widely used as dental implants able to mimic as close to the nanoscale architecture of human bone and by excellent biocompatibility. The success of rehabilitation with osseointegrated implants is dependent of stronger bone formation in the bone/implant interface. Cramoll is a lectin extracted from seeds of leguminous Cratylia mollis whose biotechnological potential was demonstrated in several studies. This research aims to obtain arrays of titanium nanotubes incorporated with Cramoll and evaluate the effect of this on the viability and proliferation of human gingival osteoblasts.

MATERIALS AND METHODS: TNTs were developed by anodizing electrochemical that was used as the electrolyte a mixture of ethylene glycol, distilled water and NH₄F. The functionalization of the nanotubes occurred by deposition Layer-by-Layer (LbL), using as polyelectrolytes the polyacrylic acid (PAA) and polyallylamine hydrochloride (PAH). The surfaces of the substrates were characterized by electrochemical impedance spectroscopy (EIS) and fourier transform infrared spectroscopy (FTIR). The cell viability and proliferation were determined by MTT method. RESULTS: The functionalization of TNTs occurred by building five alternate layers, by immersion of PAA and PAH, yielding in the last layer NH₂ groups to link Cramoll carboxyl groups. Through the FTIR, it was visualized the band corresponding to covalent bond C=O and by the EIS it was observed a semicircle corresponding to the higher interfacial charge transfer resistance by the lectin. The Cramoll’s concentration that enabled better viability and less inhibition of cells was 20 µg/mL at different times (24, 48 and 72 h). CONCLUSIONS: The study showed the deposition of polyelectrolytes on TiO₂ nanotubes and their effectiveness in linking to Cramoll and that this lectin maintains the viability and proliferation of osteoblasts, which can improve the efficiency of the implants.

Keywords: Cramoll, osteoblasts, titanium nanotubes.