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Hydroxyapatite/cyclodextrin carriers to enhance osseointegration of titanium implants

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Titanium (Ti) and its alloys have been widely used as implant materials in dental and orthopedic fields owing to their superior mechanical properties and biocompatibility. However, Ti implants have a major problem related to their osseointegration success. One of the effective approaches to overcome this issue is the biomimetic coating of implant surfaces with hydroxyapatite (HA) due to its osteoconductive and osteoinductive properties. Furthermore, many studies have reported that biosignals such as melatonin and BMP-6 had positive effects on osseointegration. Thus, integration of growth factors with HA coated Ti based implants is a promising approach which have not been investigated yet. The search of ideal carrier systems to control the rate and the time profile of biosignal release is also an important issue. Cyclodextrins (CD) have gained prominence because of their capability of binding biosignals due to their hydrophobic cavity. The aim of this study is to develop HA-CD composite carriers which support the formation of CD-biosignal inclusion complexes to improve osseointegration in Ti based implant surfaces. For this purpose, polished Ti alloy surfaces were etched with NaOH and then coated with biomimetic HA by 10x Simulated Body Fluid (SBF) treatment. Following this, (2-Hydroxypropyl)- β -cyclodextrin (HP β CD) was impregnated on HA-coated Ti surfaces. Finally, melatonin and BMP-6 were used as biosignal molecules to make inclusion complexes with cyclodextrin. Fabricated implant materials were characterized by TGA, ATR-FTIR, XRD, SEM analysis and water contact angle measurements. Melatonin and BMP-6 release studies were also performed. *In vitro* cell culture studies were carried out with pre-osteoblastic MC3T3-E1 cell line to investigate the effect of HA-HP β CD-composite carriers on osseointegration.

Biography

Meryem Sumeyye Akdemir has completed her BSc degrees from Karedeniz Technical University, Department of Chemistry. Currently she is MSc student at the bioengineering and biochemistry departments. She is a member of Hacettepe University Cell and Tissue Engineering Research Group, being coordinated by Prof Dr Menemse Gumusderelioğlu and Bio-chromatography and Bio-diagnostics Research Group, being coordinated by Prof Dr AdilDenizli.

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