Cytotoxicity and bone mineralization properties of novel calcium phosphate-mullite composites

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Abstract

The development of new hydroxyapatite (HAp) based composites demands the improvement in physical properties (strength, toughness) without compromising the biocompatibility aspect. In a recent study, it has been demonstrated that significant improvement in compressive strength as well as modest enhancement in toughness is achievable in CaP-based composites with mullite addition (up to 30 wt. %) to HAp. Herein, we report the results of the *in vitro* biocompatibility assessment using multiple biochemical assays for a series of CaP–mullite (upto 30 wt. %) using human osteoblast-like MG63 and mouse fibroblast L929 cell lines. In our study, *in vitro* cell adhesion experiment with both the cell lines were conducted to assay for cell viability and cell proliferation; while MG63 cells were used for *in vitro* tests to assay for osteocalcin (OC) gene expression and alkaline phosphate activity (ALP). Much emphasis has been provided to discuss the cell viability and proliferation as well as stimulated osteogenic differentiation behavior of the investigated biocomposites in relation to the characteristics of the phase assemblage. The results of the bacteria culture using *Escherichia Coli (E-Coli)* reveal that developed composites do not show anti-bactericidal effect. On the basis of various observations, i.e. the combination of good cell proliferation, ALP activity and osteocalcin production, it has been suggested that CaP-mullite composites are candidate materials for orthopedic bone replacement applications.

Key words*: calcium phosphate, composite, Cell adhesion, MTT, ALP, Osteocalcin*

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