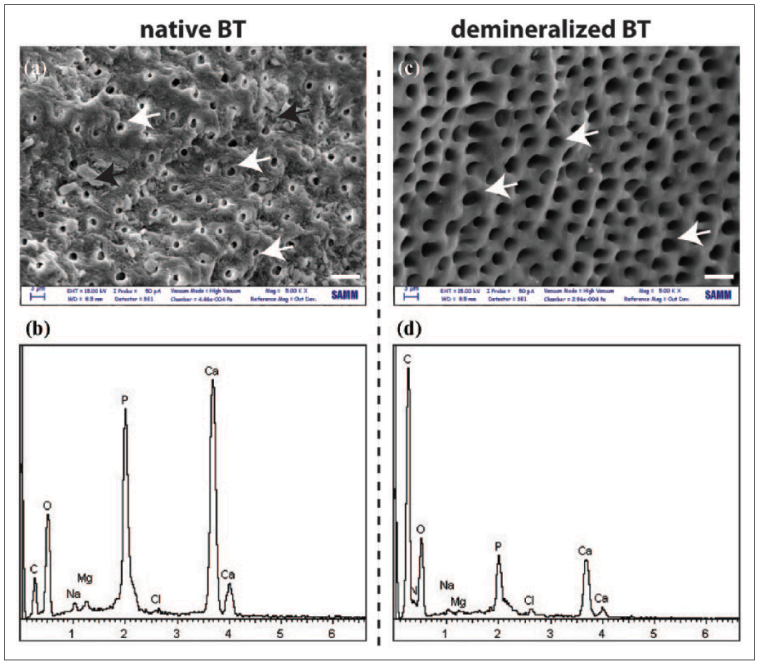
TOOTH TRANSFORMER



Original research article

JABFM | Journal of Applied Biomaterials & Functional Materials

Journal of Applied Biomaterials & Functional Materials
1–8
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DOI: 10.1177/2280800018784330
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BMP-2 and type I collagen preservation in human deciduous teeth after demineralization

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Abstract

Background: Great interest has recently been focused on tooth and tooth derivatives as suitable substrates for the treatment of alveolar bone defects. Here, we propose the use of demineralized baby teeth (BT) as potential grafting materials for bone augmentation procedures.

Methods: Particles of human BT (*Ø* < 1 mm) were demineralized by means of a chemical/thermal treatment. Demineralized BT particles were thoroughly characterized by scanning electron microscopy/energy dispersive X-ray analyses to evaluate the effects of the demineralization on BT topography and mineral phase composition, and by enzyme-linked immunosorbent assays (ELISA) to quantify collagen and bone morphogenetic protein-2 (BMP-2) protein contents. The response of SAOS-2 cells to exogenous BMP-2 stimulation was evaluated to identify the minimum BMP-2 concentration able to induce osteodifferentiation in vitro (alkaline phosphatase (ALP) activity).

Results: The demineralization treatment led to a dramatic decrease in relative Ca and P content (%) of ~75% with respect to the native BT particles, while preserving native protein conformation and activity. Interestingly, the demineralization process led to a rise in the bioavailability of BMP-2 in BT particles, as compared to the untreated counterparts. The BMP-2 content found in demineralized BT was also proved to be very effective in enhancing ALP activity, thus in the osteodifferentiation of SAOS-2 cells in vitro, as confirmed by cell experiments performed upon exogenously added BMP-2.

Conclusions: In this study we demonstrate that the BMP-2 content found in demineralized BT is very effective in inducing cell osteodifferentiation, and strengthens the idea that BTs are very attractive bioactive materials for bone-grafting procedures.

Keywords
Baby teeth, demineralization, BMP-2, collagen

Date received: 16 May 2018; revised: 21 May 2018; accepted: 30 May 2018

Introduction

Over recent years, the field of biomaterials has made significant progress in the search for functional and bioactive materials for bone repair procedures and regeneration. Current clinical approaches for bone defect treatments involve the grafting of autologous (autograft), homologous (allograft), and heterologous (xenograft) bone.[1] Among them, autografts are considered the gold standard because they are biocompatible and non-immunogenic, and they contain every essential component to trigger osteoinduction, osteogenesis, and osteoconduction. As an autologous bone transplant involves the harvesting of bone from the patient's body, however, it relies on a relatively

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