

Research and Reviews: Orthopedics

Differentiation of mesenchymal stem cells into Osteoclasts for potential bone regeneration using Vitamin B₃

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Extended Abstract

Abstract

Background and Aim: The bone cells (osteocytes and osteoclasts) do not replicate and thus the maintenance of a healthy bone must rely on an exogenous source of cells. Currently, bone fracture management is effectively done by surgeons and the healing process post-operation relies mostly on self-recovery. In view of the aforementioned inadequacies regarding bone regeneration, we opted to test the efficacy of Vitamin D₃ known to induce bone formation post-operation.

Methods: Rat adipose derived mesenchymal stem cells (RADMSCs) were purchased and cultured for 7 and 14 days. The cells were treated with different concentrations of the Vitamin D₃ metabolites/compounds in vitro. Markers of osteoblast differentiation were measured using RT-PCR, ELISA, histology and immunohistochemistry.

Results: Treatment of MSCs with Vitamin D₃ induced early expression of bone markers mRNA levels in relation to untreated control. A higher induction capacity from the metabolites on bone markers was observed when compared to the positive control BMP-2. Immunostaining and histological assays were in support of the bone markers quantitative assays.

Conclusion: Up to now, evidence in support of the idea of using vitamin D₃ and calcium to stimulate differentiation of RADMSCs into bone cells for potential bone healing and accelerate bone quality and quantity is limited. The study findings prove the hypothesis that Vitamin D₃ can be used for bone rehabilitation have the capacity to induce osteoblast differentiation from MSCs; and these cells may be used during transplantation in bone defects.