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Mineral Trioxide Aggregate improves healing response of periodontal tissue to injury in mice

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Mineral Trioxide Aggregate (MTA) is a biomaterial used in endodontic procedures as it exerts beneficial effects on regenerative processes. In this study, we evaluate the effect of MTA on healing of periodontal ligament (PDL) and surrounding tissue following injury in a transgenic mouse model, and on differentiation of murine mesenchymal progenitor cells *in vitro*. We used an inducible Cre-loxP in vivo fate mapping approach to examine the effects of MTA on the contributions of descendants of cells expressing αSMACreERT2 transgene (SMA9+) to the PDL and alveolar bone after experimental injury to the root furcation on the maxillary first molars. Col2.3GFP was used as a marker to identify mature osteoblasts, cementoblasts and PDL fibroblasts. The effects of MTA after 2, 17, 30 days of injury, were examined and compared histologically to adhesive system sealing. The effects of two dilutions of medium conditioned with MTA on proliferation and differentiation of mesenchymal progenitor cells derived from bone marrow (BMSC) and periodontal ligament (PDLCs) *in vitro* were examined using presto blue viability assay, alkaline phosphatase and Von Kossa staining. The expression of markers of differentiation was assessed by real time PCR. Histological analyses showed better repair in teeth restored with MTA as shown by greater expansion of SMA9+ progenitor cells and Col2.3GFP+ osteoblasts compared to controls. The *in vitro* data showed that MTA conditioned medium reduced cell viability and osteogenic differentiation in both PDLCs and BMSCs. In addition, cultures grown in the presence of MTA had marked decreases in SMA9+ and Col2.3GFP+ areas as compared to osteogenic medium confirming reduced osteogenesis. Thus, we concluded that MTA promotes regeneration of injured PDL and alveolar bone reflected as contribution of progenitors into osteoblasts. In vitro, MTA conditioned medium fails to promote osteogenic differentiation of both PDLC and BMSC.

Descriptors: Periodontal Ligament; Stem Cells; Dental Materials.

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