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# MSM promotes human periodontal ligament stem cells differentiation to osteoblast and bone regeneration

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## Abstract

Periodontal disease is the most common chronic disease of the oral and maxillofacial region, causing alveolar bone loss and ultimate loss of tooth. The purpose of treatment of periodontal disease is to promote the regeneration of periodontal tissue, including alveolar bone, and implantation of fixtures to replace the missing tooth as a result of advanced periodontal disease also requires alveolar bone regeneration. Methylsulfonylmethane (MSM) is a sulfur compound with well-known anti-inflammatory effects but its effects on bone regeneration are unknown. In this study, we investigated the effects of MSM on osteogenic differentiation of human PDLSCs (hPDLSCs) in vitro and in vivo. Our results demonstrate that MSM not only promotes the proliferation but also promotes osteogenic differentiation of hPDLSCs. MSM increased the expression levels of osteogenic specific markers that ALP, OPN, OCN, Runx2, and OSX. Smad2/3 signaling pathway was reinforced by MSM. Runx2, which downstream of Smad pathway, was expressed in accordance. Consistent with in vitro results, in vivo calvarial defect model and transplantation model revealed that MSM induces hPDLSCs to differentiate into osteoblast, which express ALP, OPN and OCN highly and enhance bone formation. These results suggest that MSM promotes osteogenic differentiation and bone formation of hPDLSCs, and Smad2/3 / Runx2 / OSX / OPN may play critical roles in the MSM-induced osteogenic differentiation. Thus, MSM combined with hPDLSCs may be a good candidate for future clinical applications in alveolar bone regeneration and can be used for graft material in reconstructive dentistry.

**Keywords:** Human periodontal ligament stem cells (hPDLSCs); Methylsulfonylmethane (MSM); Osteogenic differentiation.

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