

Effect of acemannan, an extracted polysaccharide from Aloe Vera, on BMSCs proliferation, differentiation, extracellular matrix synthesis, mineralization, and bone formation in a tooth extraction model

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Abstrak

Aloe vera is a traditional wound healing medicine. We hypothesized acemannan, a polysaccharide extracted from Aloe vera gel, could affect bone formation. Primary rat bone marrow stromal cells (BMSCs) were treated with various concentrations of acemannan. New DNA synthesis, VEGF, BMP-2, alkaline phosphatase activity, bone sialoprotein, osteopontin expression, and mineralization were determined by [(3)H] thymidine incorporation assay, ELISA, biochemical assay, western blotting, and Alizarin Red staining, respectively. In an animal study, mandibular right incisors of male Sprague-Dawley rats were extracted and an acemannan treated sponge was placed in the socket. After 1, 2, and 4 weeks, the mandibles were dissected. Bone formation was evaluated by dual-energy X-ray absorptiometry and histopathological examination. The in vitro results revealed acemannan significantly increased BMSC proliferation, VEGF, BMP-2, alkaline phosphatase activity, bone sialoprotein and osteopontin expression, and mineralization. In-vivo results showed acemannan-treated groups had higher bone mineral density and faster bone healing compared with untreated controls. A substantial ingrowth of bone trabeculae was observed in acemannan-treated groups. These data suggest acemannan could function as a bioactive molecule inducing bone formation by stimulating BMSCs proliferation, differentiation into osteoblasts, and extracellular matrix synthesis. Acemannan could be a candidate natural biomaterial for bone regeneration.