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Evaluating the Impact of Bee Bread Extract on Transcriptional Profiles in Primary Rat Osteoblasts

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Abstract

Bee Bread (BB) is a fermented natural product rich in bioactive compounds with antioxidant and antimicrobial properties. Research in a rat model showed its potential to enhance diabetic bone structure, suggesting benefits for bone disorders. The aim of this *in vitro* study was to analyse the effects of BB extract on gene expression in osteoblasts. BB extract was prepared via methanol extraction, filtration, and evaporation, then dissolved in cell culture medium. It was applied to rat osteoblasts at 10, 100, and 200 µg/ml, with untreated medium as a control. After 72 hours, mRNA was extracted, cDNA synthesized, and the expression of 15 target genes (RUNX2, BMP2, BMP7, TGFB1, TGFBR1, BGLAP, ALPL, SPP1, VDR, COL1A1, IBSP, CDH11, VEGFA, TNFSF11, TNFRSF11B) analyzed using real-time PCR, with five reference genes (TBP, HPRT1, PGK1, B2M, LDHA). BB extract upregulated RUNX2, BMP7, TGFBR1, and ALPL in all groups. Dose-dependent effects included increased TGFB1, BMP2, and VDR in BB10; CDH11 in BB10 and BB100; TNFRSF11B in BB100 and BB200; and BGLAP and VEGFA in BB200. SPP1 was downregulated in BB10 and BB100, while TNFSF11, COL1A1, and IBSP remained unchanged. These findings indicate BB extract promotes osteoblast differentiation, bone mineralization, and osteogenesis while inhibiting bone resorption, demonstrating its potential for bone health and therapy.

Keywords: Bee Bread; osteoblasts; gene expression; *in vitro*

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