Cistanche deserticola extract increases bone formation in osteoblasts.

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Objectives: Cistanche deserticola Me (CD), a native herb in China, is widely used in traditional medicine for various therapeutic treatments due to its sedative, analgesic and immunostimulatory activity. However, the effect of CD on bone cell function has not been determined yet. We investigated the effect of CD on bone formation by cultured osteoblasts.

Methods: Cistanche deserticola extract
CD extract was purchased from Chung Song-Zing Pharmaceutical Company (Kaohsiung, Taiwan). Extraction and isolation of CD were followed as previously described (on the basis of spectral data they identified the chemical composition including: beta-sitosterol, daucosterol, succinic acid, trisaccharides, oleic acid, betaine and polysaccharides).

Measurement of mineralized nodule formation
Osteoblasts were cultured in medium containing vitamin C (50 mg/ml) and dibutyryl cAMP (10 mM) for 2 weeks. After incubation with CD extract for 12 days, cells were washed and fixed in ethanol for 30 min. Calcium deposition was determined using alizarin red S (pH 4.2) and eluted with 10% nitric acid. The cells were quantified by measuring absorbance at 550 nm and compared with a standard curve.

Ovariectomy-induced osteoporosis
Female ICR mice, four weeks old, 22–28 g, were used for this study. Mice were ovariectomized bilaterally under trichloroacetic acid (100 mg/kg) anesthesia and control mice were sham-operated (Sham) for comparison. Bone mineral density and bone mineral content were measured after oral administration of various concentrations of CD extract every two days for four weeks. Total body bone mineral density and bone mineral content were determined by dual-energy X-ray absorptiometer (DEXA; XR-26, Norland, Fort Atkinson, USA).

Results: Here, we report that CD extract did not affect the proliferation, migration or wound healing activity of cultured osteoblasts, but did increase ALP, BMP-2, and OCN expression and bone mineralization. In addition, we show that the MAPK and NF-κB signaling pathways may be involved in the CD-mediated increase in gene expression and bone mineralization. In contrast, the CD extract did not suppress osteoclastogenesis in vitro. Notably, treatment of mice with CD extract prevented bone loss induced by ovariectomy in vivo.

Conclusions: This study demonstrated that CD extract induced osteoblasts differentiation and maturation but not proliferation or migration. CD extract also increased ALP, BMP-2 and OCN expression and bone mineralisation. We showed that the ERK, p38, JNK and NF-κB pathways are involved in CD extract-mediated bone formation and ALP, BMP-2 and OCN expression. Furthermore, CD extract prevented in vivo bone loss induced by ovariectomy. Therefore, CD may be beneficial in stimulating bone formation in the treatment of osteoporosis.