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Pycnogenol® enhances proliferation and mineralization in osteoblast-like MC3T3-E1 cells

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Abstract

Pycnogenol® (PYC) is a natural plant extract from the bark of *Pinus pinaster* Aiton that has potent anti-oxidant activities. Recent studies have shown that orally administered PYC can increase the biomechanical strength of bone and bone mineral density in ovariectomized rats. However, the effect of PYC on osteoblast mineralization has not yet been examined. We studied the differentiation and mineralization in mouse osteoblast-like MC3T3-E1 cells. PYC enhanced the metabolic activity dose dependently using an MTT assay by 120% (37.5 μg/ml) to 180% (375 μg/ml). The calcium depositions of the cells by alizarin red S staining were increased for 28 days after the culture with 375 μg/ml PYC. PYC activated the expression of estrogen receptor β (ERβ) about 2.8-fold for 28 days after the culture with 375 μg/ml PYC. These results suggest that PYC stimulates osteoblastic differentiation and mineralization via the expression of ERβ.

Keywords: Pycnogenol®; MC3T3-E1 cells; Differentiation; Mineralization, Estrogen receptor

Introduction

Postmenopausal osteoporosis associated with bone loss is a major bone disease among elderly women. Osteoporosis is a skeletal disorder characterized by decreased bone mass as a consequence of enhanced bone resorption relative to bone formation. Recent studies have shown the importance of oxidative stress in bone metabolism and bone loss. Green tea polyphenol, antioxidant vitamin, carotenoid and antioxidant lycopene have been shown to relieve osteoporosis by reducing bone loss in postmenopausal women (Shen, et al., 2009; Sugiura, et al., 2010; Mackinnon, et al., 2010). Pycnogenol® (PYC), a family of flavonoids isolated from French maritime pine bark (*Pinus pinaster* Aiton, synonym *Pinus maritima* Mill.), is standardized to contain 70±5% procyanidins, which consist of condensed catechin and epi-

