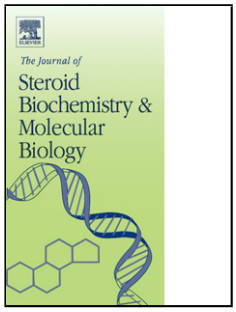

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Oestrogen receptor β (ERβ) regulates osteogenic differentiation of human dental pulp cells.

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Highlights

- Oestrogen receptor expression in dental pulp cells (DPCs) is characterised
- ERβ1 and β2 isoforms are upregulated during osteogenic differentiation of DPCs
- ERβ isoforms activation stimulates differentiation of DPCs

Abstract

Estradiol (E_2) has many important actions in the tissues of the oral cavity. Disruption of E_2 metabolism or alterations in systemic E_2 concentrations have been associated with compromised periodontal health. In many instances such changes occur secondarily to the well characterised effects of E_2 on bone physiology –especially maintenance of bone mineral density (BMD). Despite these important epidemiological findings, little is known about the mechanism of action of E_2 in oral tissues or the expression and function of oestrogen receptor (ER) isoforms in these tissues. We have isolated human dental pulp cells (hDPCs), which are able to differentiate towards an osteogenic lineage under appropriate culture conditions. We show that hDPCs express ERα, ERβ1, ERβ2 and the cell membrane associated G protein-coupled ER (GPR30). Following osteogenic differentiation of hDPCs, ERβ1 and ERβ2 were up regulated approximately 50-fold while ERα and GPR30 were down regulated, but to a much lesser degree (approximately 2-fold). ERβ was characterised as a 59 kDa protein following Western blot analysis with validated antibodies and ERβ was detected in both nuclear and cytoplasmic cell compartments following immunofluorescence (IF) and immunohistochemical (IHC) analysis of cultured cells. Furthermore isoform specific antibodies detected both ERβ1 and ERβ2 in DPC cultures and *in situ* analysis of ERβ expression in decalcified tooth/pulp sections identified the odontoblast layer of pulp cells juxtaposed to the tooth enamel as strongly reactive for both ERβ isoforms. Finally the use of isoform specific agonists identified ERβ as the main receptor responsible for the pro-