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PARP-1 inhibition enhances BDNF secretion in dental pulp stem cells derived odontoblast-like cells

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The nuclear enzyme poly(ADP-ribose) polymerase (PARP-1) has been implicated its role in several stem cells fate determination and differentiation. The role of PARP-1 in dental pulp stem cell (DPSC) differentiation especially in the context of its ability to modulate nerve regeneration factor has not been ivestigated. Neurotrophins are an essential group of nerve regeneration signals. In this study, we investigated the role of PARP-1 in the modulation of brain-derived neurotrophic factor (BDNF) in DPSCs derived odontoblast-like cells. Human DPSCs were prepared from healthy molars at the 2/3 root formation stage by the explant outgrowth method. DPSCs were cultured in regular media and osteogenic media and treated with PARP-1 antagonist and PARP1 exogeneous protein for 72 hours in regular media (regular growth media), and then swapped with osteogenic media for 21 days. The PARP-1 inhibitor and protein were treated every three days during the whole differentiation process. Immunohistochmistry, PCR and western analysis for the BDNF and various differentiation markers were performed. Our PCR results demonstrate that differentiated cells show odontoblast-like properties as they express odontogenic markers such as DSPP and RUNX. There is possibility that the PARP1 treatment induces DPSCs into other cell types. Some show very unique morphology with large cytoplasm and oval nucleus. PARP-1 inhibition significantly increased BDNF secretion in the diffentiated cells. This observation was confirmed by both immunohistochemistry and western blot. Taken together, our results indicate that PARP-1 constitutes a negative regulator of the BDNF secretion during odontogenic DPSC differentiation demonstrating its potential for successful nerve regeneration engineering strategies.

Biography

Yessenia Valverde has completed her PhD in 2013 from Niigata University Graduate school of Medical and Dental Sciences, Japan and currently persuing postdoctoral research from University of Illinois at Chicago College of Dentistry. She has exemplary training in rodent model of dental nerve denervation with the BDNF modulation.

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