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# Differentiation of dental pulp stem cells into a neural lineage

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**Abstract** We previously investigated whether dental pulp-derived cells possess similar pluripotency to bone marrow cells, and reported their capacity to differentiate into osteoblasts, as well as the characteristics of the stem cells present in dental pulp. In the present study, we hypothesized that neural stem cells would also exist in rat dental pulp, similar to bone marrow and the brain, and attempted to induce their differentiation into a neural lineage by applying an *in vitro* study design previously reported to induce differentiation of human bone marrow cells. Before inducing differentiation, we detected cells expressing nestin (Nes), which is known to be a marker for neural stem cells, within primary cultures of rat dental pulp-derived cells, suggesting the existence of neural stem cells in dental pulp. Quantitative analyses of the mRNA and protein expression levels revealed downregulation of both the Nes mRNA and protein levels to about 68.1% and 12.4%, respectively, after the induction of differentiation compared to the corresponding levels before induction. Conversely, the glial fibrillary acidic protein (Gfap) mRNA level was elevated by 1.3-fold after the induction of differentiation compared with the level before induction. The reduced number of Nes-positive cells and decreased Nes mRNA and protein levels after the induction of differentiation may be attributed to differentiation of neural stem cells into a neural lineage. Moreover, the increased number of Gfap-positive cells and increased Gfap mRNA level after the induction of differentiation most likely support their progressive differentiation into a glial cell lineage, since Gfap is a marker that is upregulated in glial cells. Our present data demonstrate the existence of neural stem cells in tissues other than the central nervous system, and may represent a significant step toward providing more diverse and multiple sources of stem cells for future regenerative medicine.

**Key words** Dental pulp, Differentiation, Neural lineage, Stem cell

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