

Differentiation of Dental Pulp Stem Cells into Islet-like Aggregates

Abstract

The post-natal dental pulp tissue contains a population of multipotent mesenchymal progenitor cells known as dental pulp stromal/stem cells (DPSCs), with high proliferative potential for self-renewal. In this investigation, we explored the potential of DPSCs to differentiate into pancreatic cell lineage resembling islet-like cell aggregates (ICAs). We isolated, propagated, and characterized DPSCs and demonstrated that these could be differentiated into adipogenic, chondrogenic, and osteogenic lineage upon exposure to an appropriate cocktail of differentiating agents. Using a three-step protocol reported previously by our group, we succeeded in obtaining ICAs from DPSCs. The identity of ICAs was confirmed as islets by dithiozone-positive staining, as well as by expression of C-peptide, Pdx-1, Pax4, Pax6, Ngn3, and Isl-1. There were several-fold up-regulations of these transcription factors proportional to days of differentiation as compared with undifferentiated DPSCs. Day 10 ICAs released insulin and C-peptide in a glucose-dependent manner, exhibiting in vitro functionality. Our results demonstrated for the first time that DPSCs could be differentiated into pancreatic cell lineage and offer an unconventional and non-controversial source of human tissue that could be used for autologous stem cell therapy in diabetes.

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