

Human tooth germ stem cells preserve neuro-protective effects after long-term cryo-preservation

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Abstract

The use of mesenchymal stem cells (MSCs) has been shown to be promising in chronic disorders such as diabetes, Alzheimer's dementia, Parkinson's disease, spinal cord injury and brain ischemia. Recent studies revealed that human tooth germs (hTG) contain MSCs which can be easily isolated, expanded and cryo-preserved. In this report, we isolated human tooth germ stem cells (hTGSCs) with MSC characteristics from third molar tooth germs, cryo-preserved them at -80°C for 6 months, and evaluated for their surface antigens, expression of pluripotency associated genes, differentiation capacity, karyotype, and proliferation rate. These characteristics were compared to their non-frozen counterparts. In addition, neuro-protective effects of cryo-preserved cells on neuro-blastoma SH-SY5Y cells were also assessed after exposure to stress conditions induced by hydrogen-peroxide (oxidative stress) and paclitaxel (microtubule stabilizing mitotic inhibitor). After long term cryo-preservation hTGSCs expressed surface antigens CD29, CD73, CD90, CD105, and CD166, but not CD34, CD45 or CD133, which was typical for non-frozen hTGSCs. Cryo-preserved hTGSCs were able to differentiate into osteo-, adipo- and neuro-genic cells. They also showed normal karyotype after high number of population doublings and unchanged proliferation rate. On the other hand, cryo-preserved cells demonstrated a tendency for lower level of pluripotency associated gene expression (nanog, oct4, sox2, klf4, c-myc) than non-frozen hTGSCs. hTGSCs conditioned media increased survival of SH-SY5Y cells exposed to oxidative stress or paclitaxel. These findings confirm that hTGSCs preserve their major characteristics and exert neuro-protection after long-term cryopreservation, suggesting that hTGSCs, harvested from young individuals and stored for possible use later as they grow old, might be employed in cellular therapy of age-related degenerative disorders. © Bentham Science Publishers Ltd.

<http://dx.doi.org/10.2174/156720210790820181>

Keywords

Cryo-preservation, Human tooth germs, Mesenchymal stem cells, Neuro-blastoma, Neuro-protection