

Differentiation and neuro-protective properties of immortalized human tooth germ stem cells

Yalvaç M., Yilmaz A., Mercan D., Aydin S., Dogan A., Arslan A., Demir Z., Salafutdinov I., Shafigullina A., Sahin F., Rizvanov A., Palotás A.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Stem cells are considered to be promising therapeutic options in many neuro-degenerative diseases and injuries to the central nervous system, including brain ischemia and spinal cord trauma. Apart from the gold standard embryonic and mesenchymal origin, human tooth germ stem cells (hTGSCs) have also been shown to enjoy the characteristics of mesenchymal stem cells (MSCs) and the ability to differentiate into adipo-, chondro-, osteo- and neuro-genic cells, suggesting that they might serve as potential alternatives in the cellular therapy of various maladies. Immortalization of stem cells may be useful to avoid senescence of stem cells and to increase their proliferation potential without altering their natural characteristics. This study evaluated the expression of stem cell markers, surface antigens, differentiation capacity, and karyotype of hTGSCs that have been immortalized by human telomerase reverse transcriptase (hTERT) or simian vacuolating virus 40 (SV40) large T antigen. These undying cells were also evaluated for their neuro-protective potential using an in vitro SH-SY5Y neuro-blastoma model treated with hydrogen-peroxide or doxo-rubicin. Although hTGSC-SV40 showed abnormal karyotypes, our results suggest that hTGSC-hTERT preserve their MSC characteristics, differentiation capacity and normal karyotype, and they also possess high proliferation rate and neuro-protective effects even at great passage numbers. These peculiarities indicate that hTGSC-hTERT could be used as a viable model for studying adipo-, osteo-, odonto- and neuro-genesis, as well as neuro-protection of MSCs, which may serve as a springboard for potentially utilizing dental waste material in cellular therapy. © 2011 Springer Science+Business Media, LLC.

<http://dx.doi.org/10.1007/s11064-011-0546-7>

Keywords

Differentiation, Human tooth germ stem cell, Immortalization, Neuro-protection