Effect of cryopreservation on stem cells

Summary

Background: The topic of this study is the cryopreservation of dental pulp stem cells (DPSCs). Cryopreservation is a process of sustaining the viability of cells and tissues by freezing and storing them at sub-zero temperatures where biochemical reactions do not occur. It eliminates the need to preserve stem cells through long-term cultures, allows the storage of stem cells for potential future clinical use or clinical studies. However, it is necessary to fully understand any adverse effects on cryopreserved cells for full applicability in preclinical and clinical practice. The purpose of this study was to determine the effect of cryopreservation on DPSCs stored for 6 and 12 months using an uncontrolled-rate freezing technique.

Methods: We successfully isolated ten dental pulp stem cell lineages from donors aged 13 – 18 years to be able to observe the effect of an uncontrolled rate freezing technique on cell size, viability, proliferation activity, relative telomere length, and differentiation potential. We used 10 % dimethyl sulfoxide (DMSO) as a cryoprotective agent (CPA).

Results and conclusion: According to the data obtained, the uncontrolled-rate freezing technique is not technically demanding, and it is sufficient for the successful cryopreservation of DPSCs for at least 12 months. Cryopreserved cells kept the same morphology, phenotype and differentiation potential. However, we observed size reduction and decreased viability after cryopreservation. Cryopreserved groups of cells remained proliferatively active, but the population rate was slower immediately after thawing in comparison with fresh stem cells.

DMSO is a frequently used CPA for its versatile effectiveness in cryopreservation of various cell types. On the other hand, there are broadly published concerns about its cytotoxic effect.