

Human platelet lysate permits scale-up of dental pulp stromal cells for clinical applications

ABSTRACT

Dental pulp stromal cells (DPSC) are considered to be a promising source of stem cells in the field of regenerative therapy. However, the usage of DPSC in transplantation requires large-scale expansion to cater for the need for clinical quantity without compromising current good manufacturing practice (cGMP). Existing protocols for cell culturing make use of fetal bovine serum (FBS) as a nutritional supplement. Unfortunately, FBS is an undesirable additive to cells because it carries the risk of transmitting viral and prion diseases. Therefore, the present study was undertaken to examine the efficacy of human platelet lysate (HPL) as a substitute for FBS in a large-scale set-up. Methods. We expanded the DPSC in Dulbecco's modified Eagle's medium-knock-out (DMEM-KO) with either 10% FBS or 10% HPL, and studied the characteristics of DPSC at pre- (T25 culture flask) and post- (5-STACK chamber) large-scale expansion in terms of their identity, quality, functionality, molecular signatures and cytogenetic stability. Results. In both pre- and post-large-scale expansion, DPSC expanded in HPL showed extensive proliferation of cells (c. 2-fold) compared with FBS; the purity, immune phenotype, colony-forming unit potential and differentiation were comparable. Furthermore, to understand the gene expression profiling, the transcriptomes and cytogenetics of DPSC expanded under HPL and FBS were compared, revealing similar expression profiles. Conclusions. We present a highly economized expansion of DPSC in HPL, yielding double the amount of cells while retaining their basic characteristics during a shorter time period under cGMP conditions, making it suitable for therapeutic applications.

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