In Vitro Characterization of Umbilical Cord Mesenchymal Stem Cells (UC-MSCs) Supplemented With a Novel Xeno-Free, Human Blood-Derived Supplement

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Although UC-MSCs are preferred for clinical administration, they are retrieved in minute amounts. The scale-up requirement for human consumption is 1 million cells/kg of body weight. This demands a reliable source of serum and growth factors and a cost-effective alternative to suffice the demand. Other important considerations include the immunogenicity of MSCs grown in xenogeneic sources such as the Fetal Bovine Serum (FBS), which is unethically harvested from bovine fetuses and is a staple source currently. The source and growth medium conditions of UC-MSCs are of paramount importance as cells gradually lose their stemness during subsequent and late passages posing expansion potential limitations. A xeno-free blood-derived cytokine concentrate containing a rich supply of growth factors may be a suitable alternative to FBS. Produced in-house, this supplement was processed to retain its stability over long periods, and its cost-to-effect ratio in growing UC-MSCs is preferable to FBS-grown UC-MSCs. This work assessed the ability of the xeno-free supplement to propagate UC-MSCs in vitro in comparison with FBS. The functionality of UC-MSCs grown in this supplement and FBS-grown UC-MSCs was evaluated based on the ICST Criteria: cell counts, growth kinetics, morphological changes, pluripotent gene expression (SOX2, NANOG, and OCT4), differential staining (into osteocytes, adipocytes, and chondrocytes), and differential gene expression (ACAN, SPP1, and FABP4). The results demonstrate that UC-MSCs grown in the xeno-free supplement can be maintained in culture till Passage 20 exceeding 120 doublings by fulfilling all the criteria as per ICST guidelines and is a superior alternative to FBS.

Awards Won:

National Anti-Vivisection Society: First Award of $10,000