THE EFFECTS OF OXYGEN CONCENTRATION ON THE PROLIFERATION OF HUMAN ADIPOSE-DERIVED MESENCHYMAL STROMAL CELLS IN VITRO

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Introduction: Adipose-derived mesenchymal stromal cells (ADMSCs) transplantation has been used in tissue regeneration extensively. In the effort to obtain sufficient cells, ADMSCs are extracted from their environment and cultured in vitro. This environment utilizes 20% oxygen, which is in contrast to the physiological condition of 2 - 9% oxygen. In transferring ADMSCs from high artificial oxygen environment to lower natural levels, cells may reduce its replication potential and even enter into senescence. Such effects on ADMSCs and whether a physiological concentration of oxygen can maintain ADMSCs survival and proliferation in vitro has never been investigated. Hence, the present study aims to investigate the effects of different oxygen concentration on in vitro cellular expansion.

Methodology: Mesenchymal stromal cells (MSCs) from the human fat pads were isolated and sub-cultured in vitro until passage 2. The isolated cells were characterised by their surface markers expression and differentiation capacity. The cells were cultured with varying oxygen level ranging 1% -10% for 1, 3 and 7 days. The cell proliferation at different time point was analysed using alamarBlue® assay while cell morphology was captured using inverted microscope. The cells cultured under ambient condition (21% oxygen) was used as control.

Results: The isolated cells appeared to conform to MSC characteristics: spindle-shaped plastic adherent features; positive expression for CD90 and CD105 while negatively for CD34 and CD45; and able to undergo trilineage differentiation. Cells cultured under lower oxygen conditions exhibited higher proliferation rate. There was no difference in cell morphology between the groups. Higher colony forming was observed in lower oxygen condition.

Conclusion: This study suggests that low oxygen level promotes superior ADMSCs proliferation. The selection of the oxygen concentration is crucial to simulate the in vivo microenvironment and maintain cell proliferation capacity. This preliminary finding may serve as a useful strategy to maintain the function of transplanted human ADMSCs.