

C3. An Evaluation Of Adipose-derived Stem Cells For Heart Valve Tissue Engineering

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OBJECTIVES: Adipose-derived stem cells (ADSCs) have been previously shown to possess certain favourable characteristics for heart valve tissue engineering. To evaluate this further we compare the growth characteristics as well as survival and secretory capacity of ADSCs with bone marrow (Bm) MSCs.

METHODS: Human BmMSCs and ADSCs were characterised by immunocytochemistry or flow cytometry. Cell growth curves were derived over 10 days by staining with Trypan blue and manual counting. The capacity of MSCs to withstand oxidative stress induced by hydrogen peroxide or serum deprivation was assessed by annexin V and chromatin staining. The capacity of MSCs to secrete collagen was determined by stretching the cells at 14% for 3 days and measuring the incorporation of [³H]-proline.

RESULTS: Adipose tissue contained MSCs in abundant numbers (frequency in lipoaspirate: 10000/ml, donor age=36±12 years (mean±SD) n=6) in contrast with their reported lower frequency in bone marrow. No correlations were found between donor age and either the number of ADSCs extracted or cell proliferation. ADSCs and BmMSCs displayed a similar mesenchymal phenotype. Growth characteristics of ADSCs and BmMSCs (n=3) were comparable reaching a plateau by day 10, however the proliferation rate of ADSCs was 50% faster. Both were susceptible to oxidative stress, but ADSCs were more sensitive than BmMSCs. Stretch increased the incorporation of [3H]-proline in BmMSCs (n=3) by 234±23% and in ADSCs (n=4) by 240±43% (mean±S.D.).

CONCLUSIONS: Based on these results, ADSCs provide an abundant source of stem cells, phenotypically and functionally similar to BmMSCs, making them more favourable as candidates for tissue engineering applications.