Cell Research (2008) 18:s165.

www.nature.com/cr

Adipose-derived stem cell: A better stem cell than BMSC

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Adult stem cells hold great promise to be used in tissue repair and regeneration. And research interests continuously exist in both the biology and potential therapeutic applications of adult stem cells from bone marrow. In recent years, interest has rapidly grown in the developmental plasticity and therapeutic potential of stromal cells isolated from adipose tissue, called adipose-derived stem cell(ADSC). The resources of adipose tissue is much less expensive than bone marrow, with less invasive operation and more quantities. Therefore, adipose tissue represents an abundant, practical, and appealing source of donor tissue for autologous cell replacement. However, the published data about ADSC primary culture and their growth character are quite different. Therefore, the detailed biological characteristics of ADSCs are not well understood to date. To further study the proliferation and multi-differentiation potentials of ADSC, the cells were isolated with the improved methods and their growth curves were achieved with cck-8. Surface protein expression was analyzed by flow cytometry to characterize the cell phenotype. The multi-lineage potential of ADSCs was testified by differentiating cells with adipogenic, chondrogenic, osteogenic and myogenic inducers. The results showed that about 5×10^5 stem cells could be obtained from 400~600 mg adipose tissue. And ADSCs can be continuously cultured *in vitro* for up to 1 month without passage and they have several logarithmic growth phases during the culture period. Also the flow cytometry analysis showed that ADSCs expressed high level of stem cell-related antigens (CD13, CD29, CD44, CD105 and CD166), while didn't express hematopoiesis-ralated antigens CD34 and CD45, and human leukocyte antigen HLA-DR was also negative. Meanwhile stem cell related transcription factors, Oct-4, Sox-2 and Rex-1, were positively expressed in ADSCs. ADSC could differentiate into adipocyte, osteocyte, chondrocyte and endodermal cardiomyocyte successfully. In order to obtain more stem cells, we subcultured ADSCs every 14 days in stead of normal 5 days. ADSCs still kept strong proliferation ability, maintain their phenotypes, and had stronger multi-differentiation potential after 25 passages. By our isolated and culture method, we can obtain more and higher quality ADSCs, hADSCs as a source of stem cells are very appealing, and could also potentially be an alternative source to BMSCs for being used in allogeneic transplants and tissue engineering.

***Keywords*:** adipose tissue, mesenchymal stem cells, proliferation, doubling time, multipotential

Cell Research (2008) **18**:s165. doi: 10.1038/cr.2008.255; published online 4 August 2008

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