Aesthetic Surgery Education and Research Foundation (ASERF)
Final Project Report
December 14, 2010

Project Title: "Anti-inflammatory properties of adipose derived mesenchymal stem cells"

PI: Summer E. Hanson, MD
University of Wisconsin School of Medicine and Public Health, Division of Plastic and Reconstructive Surgery, Madison, WI 53792
shanson2@uwhealth.org

Grant number:

Summary:
Background: Adipose tissues, similar to other human tissues, contain a special type of multipotent cell called mesenchymal stem cells (MSCs), which can give rise to adipocytes, among other cell lines. Since MSCs play a significant part in matrix deposition and tissue support through their many physiological roles, there is increasing interest in their potential use to improve the results of autologous fat transfer in plastic surgery. Surgeons have used autologous fat for reconstruction for over a century. However, the current methods available are not without limitations. It is thought that the population of MSCs that reside within autologus fat differentiates *in vivo* into adipocytes, potentially compensating for the volume of mature adipocytes lost during transfer. It has also been proposed that MSCs have immunomodulatory properties that may play a role in the physiologic immune response of their resident tissue. Our **hypothesis** was that MSCs isolated from different adipose tissue sources possess different anti-inflammatory properties. **Methods:** MSCs were derived from adipose tissue (AT), and BM of healthy donors, based on their attachment to culture dishes and their morphology, and expanded in culture. We analyzed these cells for standard cell surface markers identified on BM-derived MSCs as well as the ability to differentiate into cells of mesenchymal lineage, i.e. fat, bone and cartilage. Additionally, we investigated the immunophenotype of these cells before and after interferon-γ (INF- γ) stimulation. Lastly, given the potential interactions between MSCs and macrophages in orchestrating the reparative processes in tissue healing, we investigated the effect of MSCs co-cultured with peripheral blood CD14+ monocyte-derived macrophages plated in direct contact with the MSCs. To determine the immunophenotype of macrophages, we looked at the expression of pro-inflammatory cell surface markers by flow cytometry. **Results:** During the study period, we characterized and compared MSCs isolated from breast and abdominal fat in terms of surface marker expression, differentiation, immunophenotype and immunomodulation of monocyte derived macrophages. Overall, we did not find a significant difference between cells isolated from abdominal fat compared to breast. There was no difference in surface marker expression or differentiation capabilities between the tissue sources and we were able to define both cell populations as MSC. Macrophages cocultured with breast and abdominal MSCs showed higher expression of CD206, an anti-inflammatory marker in macrophage differentiation; there was a slightly higher expression in abdominal tissue derived MSCs though this was not statistically significant. More work is being done to delineate this potential interaction as well as look at cytokine expression and mixed lymphocyte reactions. **Conclusions:** This work has set the

foundation for additional funding applications by our group. We propose that potential differences in markers or modulators of inflammation could play a significant role in the tissue pathology often observed after autologous fat grafting for breast augmentation.

Presentation(s) [derived from this grant]:

Title: **Immunomodulation of mesenchymal stem cells**
Organization: University of Wisconsin Stem Cell and Regenerative Medicine Core
Meeting: Fall Research Meeting
Location: Madison, WI
Date: Nov 2010

Organization: ASPS (in submission)
Meeting: ASPS Annual Meeting (Fall, 2011)
Location: Denver, CO
Date: Fall 2011

Publication(s) [derived from this grant]:

Title: **Clinical Applications of Mesenchymal stem cells for soft tissue augmentation**
Journal: Aesthetic Surgery Journal
Issue/Vol.:
Date:

Additional manuscript is in preparation.