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International Master Course on Aging Science Bali, Indonesia - July 21 - 23, 2017



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Webcast lecture - "Immunology behind the fillers which cause granulomas"

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# Stem Cell for Aesthetic and Antiaging Ago Harlim IMCAS, 2017

## Stem cells for aesthetics and anti-aging

## Introduction

Stem cell is a cell that has ability to continuously divide, differentiate, and develop into various other kinds of cells/tissues. Stem cell nowadays is widely used for aesthetic and anti aging therapy.

## Methods

We used adult stem cell which found in adipose tissue, which collected from liposuction, and then we made SVF (stromal vascular fraction) from the fat. The intravenous SVF injection technique used for anti aging therapy and some mixed with fat used for fat transfer as a aesthetic filler.

## Result

Fat with SVF may improved the fat graft survival rate, producing longer lasting aesthetic result. SVF intravenous also can be used as anti aging therapy.

### Conclusion

Stem cell as SVF can be used for aesthetic and anti aging

Key words : stem cell, SVF, aesthetic, anti aging

## Introduction

Stem Cell is a cell that has the ability to keep changing and different (developing) into various types of cells or other tissues. All cells in the body come from stem cells.

Stem cells can renew themselves to make more stem cells and differentiate into special cell types. As an individual ages, genetic and environmental factors can affect the skin, such as irregular pigmentation, thinning and loss of elasticity. These changes that occur can worsen, develop into precancerous diseases and cancer. Various medical treatments and topical treatments have been used to produce some photoaging, but the results are less satisfying. Mesenchymal stem cells in the stromal vascular fraction of subcutaneous adipose tissue, adipose-derived stem cells (ADSC), the appearance of multilineage developmental plasticity, and secretion of various growth factors that control and manage damaged neighboring cells. The latest about ADSC, reporting on the production and secretion of growth factors is an important function of ADSC, and the regenerative effects of ADSC have been demonstrated in the skin. For example, conditioned media from ADSCs (ADSC-CM) stimulate collagen synthesis and dermal fibroblast migration, which will increase wrinkles and accelerate wound healing in animal models. In addition, in B16 melanoma cells, ADSC-CM inhibits melanogenesis and protects skin fibroblasts from oxidative stress caused by chemicals and UVB radiation. Therefore, there is hope for treating photoaging shown by ADSC and soluble factors. This review introduces the latest research developments from ADSC, and the secretion factors originating from ADSC regarding this issue.

Stem cell Potency is the ability to differentiate into all possible cell types. Examples are the zygote formed at egg fertilization and the first few cells that result from the division of the zygote.

- Pluripotent
  - The ability to differentiate into almost all cell types.
  - Examples include embryonic stem cells and cells that are derived from the mesoderm, endoderm, and ectoderm germ layers that are formed in the beginning stages of embryonic stem cell differentiation.
- Multipotent
  - The ability to differentiate into a closely related family of cells.
  - Examples include hematopoietic (adult) stem cells that can become red and white blood cells or platelets.
- Oligopotent
  - The ability to differentiate into a few cells.
  - Examples include (adult) lymphoid or myeloid stem cells.
- Unipotent
  - The ability to only produce cells of their own type, but have the property of self-renewal required to be labeled a stem cell.

Examples include (adult) muscle stem cells

### History Adult Stem Cell

It is start about 60 years ago. They found Bone marrow contains at least 2 kinds of stem cells, and then they found hemopoietic stem cell and stromal stem cell

Hematopoeitic stem cells is stem cell forms all types of blood cells in the body and Stromal stem cells is from mesenchymal stem cells which can generate bone, cartilage and fat cells – support the formation of blood and fibrous connective tissue.

In 960, most scientists believed adult brain could not generate new nerve cells

In 1990s, scientists agreed that adult brain does contain stem cells that are able to generate the brain's three major cell types : astrocytes, oligodendrocytes and neurons / nerve cells



# Stem Cells: Origins and Types

Figure 1. Stem cell: origins and type

Adipose-derived stem cells (ASCs) are able to differentiate into multiple cell lineages, including endothelial, adipogenic, osteogenic, chondrogenic, and myogenic cell lines. This has previously been reported to be the result of a cellular milieu of various soluble factors produced by the ASCs themselves. This secretory profile of ASCs is regulated by exposure to different agents.

With the prominent role the cellular environment of ASCs plays, in vitro studies have focused on manipulating the culture medium of the ASCs in an effort to direct differentiation patterns in a lineage-specific pattern<sup>-</sup>

Adult Stem Cell can be divided by 3 kind of stem cell source:

**Hematopoietic stem cells** from Red blood cells, B lymphocytes, T lymphocytes, natural killer cells, neutrophils, basophils, eosinophils, monocytes, and macrophages.

**Mesenchymal stem cells** from Bone cells (osteoblasts and osteocytes), cartilage cells (chondrocytes), fat cells (adipocytes), and stromal cells that support blood formation.

Neural stem cells from Nerve cells (neurons) and non-neuronal cells—astrocytes and oligodendrocytes

Past studies reported that the beneficial results of bone marrow-derived MSC-based treatment, such as angiogenesis, anti-inflammation, and anti-apoptosis, are primarily regulated by the trophic activity of cytokines and growth factors secreted by bone marrow-derived MSCs rather than by the division of MSCs into local tissue cell groups. Similarly, in the case of ASCs, it has been found that the beneficial effect on

various organs / tissues within the human body may be attributed to soluble factors provided by ASCs rather than their capacity to distinguish into specific mature line ages. ASCs secretome has the potential to be a important method for use in prospective approaches to the production of cell-/tis-sue therapeutics for regenerative medicine. A number of papers have described the secretive profiles of pre-adipocytes, ASCs, or adipose tissues that have been determined using enzyme-linked immunosorbent assays or related techniques, secrete hepatocyte growth factor (HGF), vascular endothelial growth factor (VEGF), transforming growth factor-b, insulin-like growth factor (IGF)-1, basic fibroblast growth factor (bFGF), granulocyte-macrophage colony-stimulating factor, tumor necrosis factor (TNF)-a, interleukin-6, 7, 8, and 11, adiponectin, angiotensin, cathepsin D, pentraxin, pregnancy zone protein, retinol-binding protein, and CXCL12.Previous studies have shown that the doubling periods for ASCs during the logarithmic growth process vary from 40 to 120 hours are influenced by donor age, type (white or brown adipose tissue) and location (subcutaneous or visceral) of the adipose tissue, the harvesting procedure, culture conditions, plating density and media formulations [35, 56]. Based on the activity of b-galactosidase, senescence in ASCs is similar to that in bone marrow-derived MSCs. ASCs are usually known to be robust in the long-term community because it was recorded that even ASCs with more than 100 population doublings had a regular dip-loid caryotype. On the other hand, one study indicates that human ASCs undergo malignant transformation for a period of more than 4 months; while recent studies indicate the spontaneous transformation of MSCs may tend to be due to cross-contamination with malignant cell lines such as fibrosarcoma and osteosarcoma. Because the topic of spontaneous transformation of ASCs is still contentious, more studies and discussions are expected.

#### Advantages of Adult Stem Cell

- Somewhat specialized inducement maybe simpler
- Not immunogenic recipients who receive the products of their own stem cells will not experience immune rejection
- Relative ease of procurement some adult stem cells are easy to harvest (skin, muscle, marrow, fat)
- Not tumorigenic tend not to form tumors
- No harm done to the donor

New Treatments Mesenchymal Stem Cell is Bone and cartilage repair, Heart and blood vessel repair, Inflammatory and Autoimmune diseases, Aesthetic and anti aging.

The benefit Adipose Stem Cell Therapy:

#### Autologous

- Small sample of adipose tissue (fat) is removed from above the superior iliac spine or abdomen under a local anesthesia
- Much easier and less invasive than performing a bone marrow extraction
- Adipose tissue contains much larger volumes of mesenchymal stem cells than does bone marrow



Figure 2. Procedure collect adipose cells

# Procedure Adipose Stem Cells Therapy

- ✤ Simple Blood test
- ✤ Tumor marker
- AFP, PSA, Ca199, HCG



Figure 3. Procedure of stromal vascular fraction

Benefit of Autologous Fat Transfer with stromal vascular fraction

- Improved the survival of fat cells
- The adipose tissue is less absorbed
- Formation of greater numbers of new blood vessels
- Increased the fat graft viability
- The augmentation effect were superior then the conventional

# Fat transfer

after



# Fat transfer



# Fat transfer



# Fat Transfer



Figure 4. Result of fat transfer with stromal vascular fraction

# 3x SVF + 2x PRP (2 Weeks Apart)





2 mo before treatment 6 mo after xenogeneic SC (sheep)

2 wk after 1st treatment 6 wk after 1st treatment

Courtesy of : Karina F. Moegni

# 3x SVF + 2x PRP (2 Weeks Apart)



Before





6 week after 1sttreatment

Courtesy of : Karina F. Moegni

Figure 5. Result stromal vascular fraction therapy

# Stromal Vascular Fraction (SVF)



### Figure 6. Stromal Vascular Fraction (SVF)

They are different stem cells with SVF and growth factor. Stem cell we have to do cell culture about 2-4 weeks. We need pass 1<sup>st</sup> phase, 2<sup>nd</sup> phase, 3<sup>rd</sup> phase.

Stromal vascular fraction is a cellular extract made in a laboratory from fat. While methods to produce the SVF extract vary, the basic idea is that the wide variety of cells within fat tissue are separated from the actual gloppy fat tissue itself. Those cells are then concentrated to make SVF. Stromal vascular fraction is stem cell with other cells such as Blood cells, Adipocytes, Fibroblasts, Smooth muscle cells

Growth factors are polypeptides or proteins that play a key role in the regulation of physiological processes. Growth factors are produced and secreted by skin cells such as fibroblasts, keratinocytes, and melanocytes. One type of these growth factors is cytokines, which are involved in regulating the immune system and repairing the skin. Many growth factors are involved in wound healing, both chronic and acute in nature. Various signals direct the cellular responses during each phase of healing, but growth factors are among the most important. For effective wound repair, the correct growth factors should be presented within the proper framework. Example of Growth Factor are PDGF, IGF-1, EGF, and TGF- $\beta$ , etc.

## Conclusion

Fat with SVF may improved the fat graft survival rate, producing longer lasting aesthetic result. Stem cell as SVF can be used for aesthetic and anti aging. The promises of cures for human ailments by stem cells have been much touted but many obstacles must still be overcome.

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