White Paper:
Introducing the Use of Peptide Enriched Media in Skin Care Products
By Dr. David Scharp, MD

Executive Summary

There is a movement in the skin care market today with manufacturers claiming to be able to rejuvenate, regenerate, renew, and reinvigorate skin that is aging, thinning, and becoming damaged and wrinkled from excessive exposure to the sun. While there certainly is a need for this type of revolutionary product, to date, it has not been achieved, in spite of the many claims and products. Granted, there has certainly been some improvement in the quality of skin care products that are designed to improve the quality of aging skin over the years. To date, such a revolutionary skin care product has yet to be created, leaving the marketing claims for these products filling the relative void of adequate efficacy. Thus, Botox and its substitutes remain the mainstay of the products that clearly result in observable outcomes, at least when it comes to wrinkles.

There is a solution to this problem, which is currently being used in a number of medical applications, other than those involving the skin. This is the injection of unique human adult stem cells into the body for the treatment of a broad number of human diseases and disorders. These cells are known as mesenchymal stem cells (MSC's). While it is not practical to inject the MSC's directly into the skin for the desired effect, the important peptides produced by these adult stem cells, which we refer to as MDFc19, can be combined with advanced skin care products for application to damaged and aging skin. It is this use of these critical MSC peptides, in combination with superior anti-aging skin formulations, that represent the next major paradigm shift in the anti-aging skin care market.

The Problem

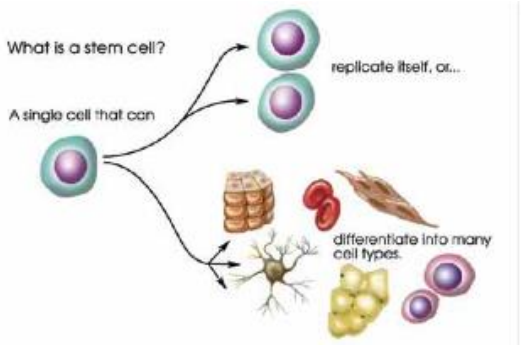
Listening to the numerous advertisements being presented today, one would think that the problems, secondary to aging skin, are actually being eliminated with a number of different approaches and compounds. The "Anti" movement, as in Anti-aging, Anti-oxidants, Anti-wrinkle and others, appears to be waning with the marketers looking for a new approach. It appears that newly focused marketing activities are replacing the "Anti" words with the use of the "Re" words: Rejuvenate, Renew, Regenerate, Reinvigorate and others. But what is missing in these "Re" products is a new, primary active ingredient that will justify the improved claims. While many of these new products are generating new interest from the "Re" marketing efforts, the ability to sustain these products may not be possible by the new labels alone. What is needed is a new product component that can produce readily observable results. The question is what product component can achieve such results in aging skin? Some have jumped onto the stem cell approach, but using a stem cell agent derived from an apple. It has not been proven that using the stem cells that make an apple shiny and brightly colored will translate over to the human skin. What is needed is an effective component directly from adult human stem cells that can work for the skin. We believe this product is generated by growing human MSC's in tissue culture flasks and collecting the many peptides that are generated during cell expansion (MDFc19).

The Research to Solve the Problem

Human Stem Cells

The topic of human stem cells is a complicated one to discuss, due to different sources of human stem cells and the many different types of stem cells. But, as will be presented, the human mesenchymal stem cell is uniquely qualified for its task to produce effective peptides to be applied to challenged skin.

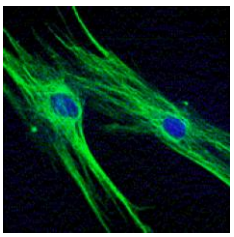
Stem Cells

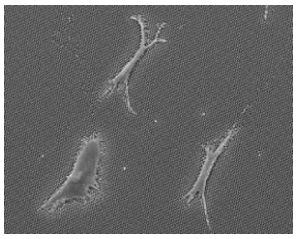
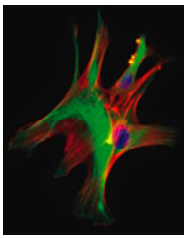
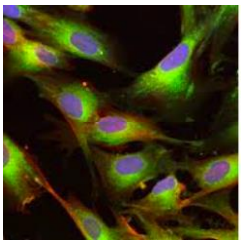


Stem cells are those unique cells that can replicate themselves without any changes, producing many generations of identical self-replicating stem cells. Stem cells can also differentiate into new stem cells that are more restricted in the number of different types of cells they can produce. For example, bone marrow stem cells produce the stem cells that make red blood stem cells, as well as producing stem cells that can make all the different types of white blood cells. Yet, stem cells under specific circumstances can also differentiate into many different kinds of cells that are far more differentiated, and at the same time, limited to specific functions. For example, mesenchymal stem cells can directly produce cartilage and bone cells, muscle and fat cells, as well as blood vessel cells.

Adult Mesenchymal Stem Cells

Adult mesenchymal stem cells (MSC's) are located in every organ and tissue in the body and also circulate in the blood. Some consider them the mother ship of circulating cells in that they are attracted to damaged cells, sites of injury and infection, and altered cellular environments. When they encounter abnormalities, they are able to deliver important peptides to the damaged area that not only attract inflammatory cells, but also stimulate local cells to undergo changes to bring about healing. The MSC's can also contribute directly to healing by inducing local cells to differentiate into new cells, which then themselves can differentiate into new cells, as needed.. MSC's can also be differentiated into number of other things. These include the heart muscle, bone and cartilage, blood vessels, fibrous cells and fat cells. The ability to differentiate into these supporting and functional tissues is critical in responding to injuries and triggering healing.

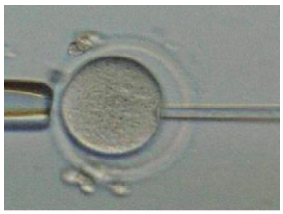


Because of these unique cell characteristics, MSC's have become a major cell type of interest to inject into people with a variety of diseases and disorders. Currently, MSC's are being injected into people in 120 different clinical trials, which have been approved by the FDA. Details for these clinical trials can be found on www.clinicaltrials.gov. One of the most interesting and important of these new studies is the injection of MSC's into people who have had very recent heart attacks. Preliminary findings have demonstrated reduced heart muscle damage and improved heart function in those receiving the MSC injections, as compared with those who had not received them. The choice to utilize MSC produced peptides in skin care products becomes obvious when understanding the wide spread location of these cells in the body and their importance in responding to local injury. Yet, it is not practical, as a product, to inject these cells directly into the skin. Instead, when the peptides produced by these critical cells are combined with advanced skin care products, a new and more effective product is produced. The products appear to provide a simple and efficient way to improve damaged and aging skin that is readily observable within a few weeks.

Embryonic Stem Cells

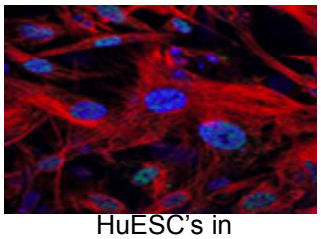
Human embryonic stem cells (HuESC's) are not being utilized or considered for skin care products like MDFc19, but are included for completeness of this discussion of stem cells. These cells are quite different from adult stem cells in almost every way. They only originate from in vitro fertilization and form a cystic structure, the blastula, which contains an inner cell mass that is made up of undifferentiated HuESC's. Access to these stem cells requires the permission of the parents who have completed in vitro fertilization and no longer need the cells (they are usually destroyed if they aren't donated for research). These blastula stem cells are removed and cultured in vitro as cells on top of a feeder cell layer, which results in the formation of a colony of HuESC's. Specific culture conditions are manipulated to force these cells to develop down different pathways including: ectoderm-forming skin and nerve cells, mesoderm for support tissues of bones, blood, muscle and fat, endoderm developing into liver, pancreas, kidneys, and intestine. These undifferentiated and partially differentiated HuESC's will form tumors when implanted into the body, so they remain a risk without every cell being completely differentiated.



In Vitro Fertilization

Blastula Stage with Inner Cell Mass

Tissue Culture of HuESC Colony

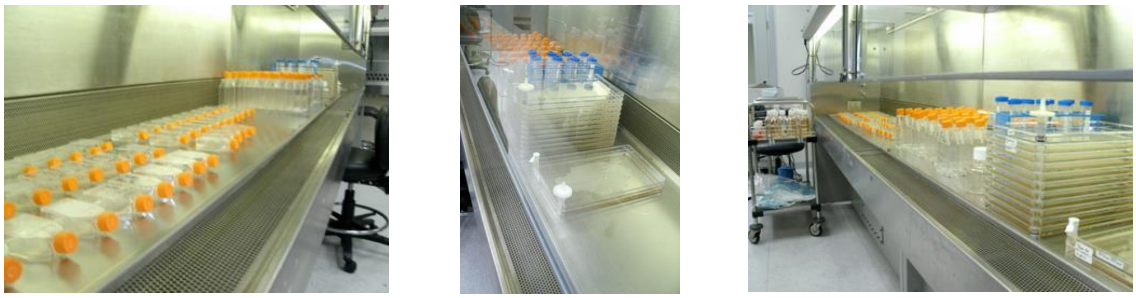


HuESC's in Culture

Large Scale Culture Production of MSC's

To produce high quality MSC's in quantity, while maintaining their non-differentiated state, requires consistent care and feeding, utilizing our proprietary tissue culture media that stimulates on-going growth without differentiation. These cultures have been scaled up from individual flasks to large scale production cell towers that enable

keeping these cells in a growing state, throughout their production. It is this growing phase that produces the peptides that are important for our new skin care component, MDFc19. Production lots are selected for uniformity combining cell passage, confluence, and lack of differentiation of the multiple batches to maintain delivery of a consistent MDFc19 product for the skin care market.



From Flasks to Cell Towers

MDFc19: The Skin Care Product Solution

MDFc19 is the advanced peptide-containing component to be combined with advanced skin care products. Preliminary studies using MDFc19 with an anti-aging component have demonstrated important changes in reducing aging effects on the skin, which in most cases, have been observable within a few weeks. Trials with MDFc19 are ongoing, but thus far, are producing similar results.

Links

MSC Interest Group - http://www.mesenchymal-stem-cells.com/index.html

Cell Medicine Society - http://cellmedicinesociety.org/physicians

Regenerative Medicine - http://www.regenerative-medicine.jp/whitepaper/894.pdf

Stem Cell Resources - http://www.stemcellresources.org/library_white.html

Stem Cell White Paper 2001 - http://stemcells.nih.gov/staticresources/info/scireport/PDFs/fullrptstem.pdf

Stem Cell Update 2006 - http://stemcells.nih.gov/staticresources/info/scireport/PDFs/Regenerative_Medicine_2006.pdf

European Stem Cell - http://www.eurostemcell.org/stem-cells

International Society for Stem Cell Research - http://isscr.org/

National Academy of Sciences Booklet on Stem Cells http://www.stemcellresources.org/library_print/nas_understanding_stem_cells.pdf

California institute for Regenerative Medicine - http://www.cirm.ca.gov/for-the-public