



PhytoCellTec™ Malus Domestica
Plant stem cells
to protect skin stem cells



PhytoCellTec™ Malus Domestica

Swiss apple stem cells to protect skin stem cells

A Swiss Apple Variety with Incredible Properties

Uttwiler Spätlauber is a variety of a Swiss apple that derives from a seedling planted in the middle of the 18th century. It was very famous for its excellent storability without shriveling. Today apple cultivars are selected to maximize crop yield and sweet flavor. Thus Uttwiler Spätlauber with its acid taste is now disappearing.

Uttwiler Spätlauber apples are rich in phytonutrients, proteins and long-living cells. This particular composition leads to incredible storability and longevity properties.

Stem Cells and Longevity

Longevity is related to specific cells called stem cells which have a unique growth characteristic. These unspecialized (undifferentiated) cells can make identical copies of themselves as well as differentiate to become specialized cells. Two basic types of stem cells are present in the human body:

- Embryonic stem cells found in blastocysts can grow and differentiate into one of the more than 220 different cell types which make up the human body.
- Adult stem cells located in some adult tissues can only differentiate into their own or related cell types. These cells act as a repair system for the body but also maintain the normal turnover of regenerative organs such as blood, skin or intestinal tissues.

Research on Stem Cells and Applications

Currently in medicine, adult stem cells are already used particularly in transplant medicine to treat leukemia and severe burns.

In the cosmetic field, scientists are focusing their research on adult stem cells located in the skin. They are studying the potential of this type of cells, their functioning and aging. These researches will help to understand how to protect skin stem cells.

Stem Cells in the Human Skin

In the human skin, two types of adult stem cells have been identified:

- Epithelial skin stem cells which are located in the basal layer of the epidermis.
- Hair bulge stem cells located in the hair follicle.

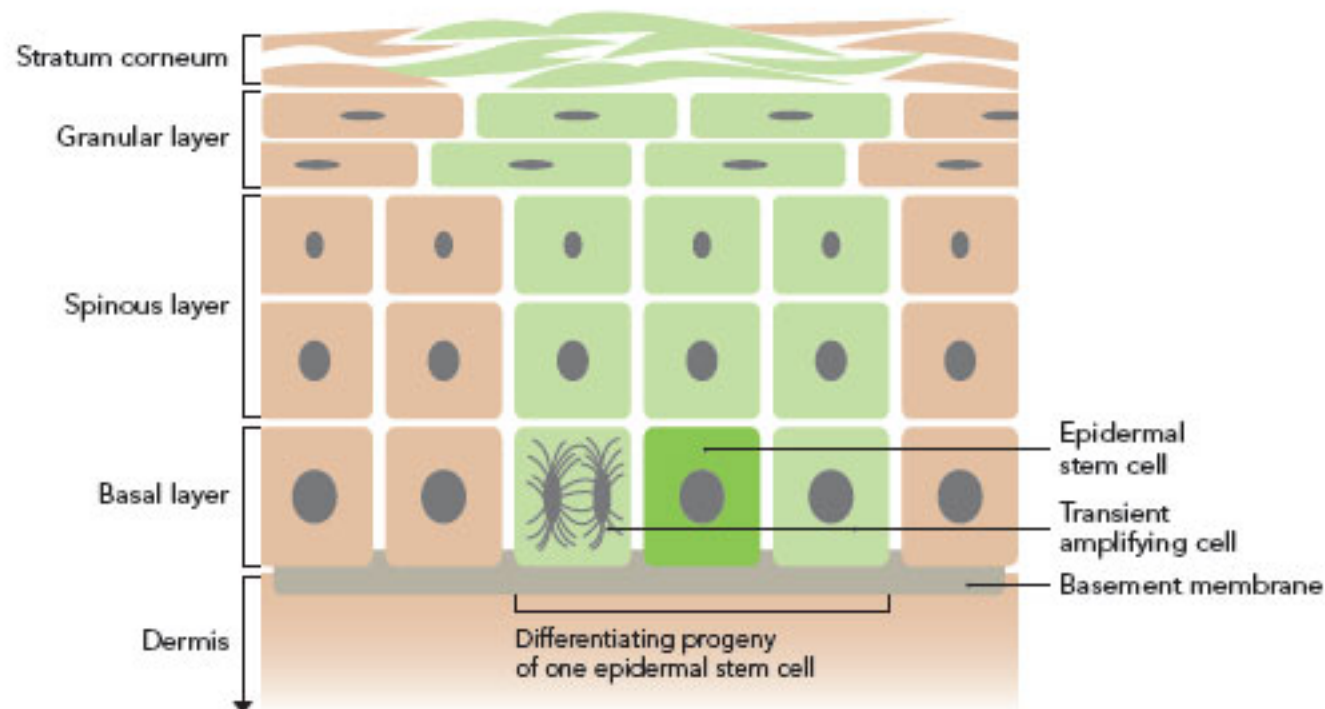
Epidermal stem cells replenish and maintain the balance of cells within the skin tissue and regenerate tissue damages during injury. But with age, the number of skin stem cells decreases and their ability to repair the skin becomes less efficient.

Plant Stem Cells to Protect Skin Stem Cells

In contrast to human, plant cells are totipotent, meaning that every cell has the ability to regenerate new organs (leave, flower, seed...) or even the whole plant. Besides, all plant cells can dedifferentiate and become a stem cell.

All stem cells, independently of their origin (plant, animal or human) contain specific epigenetic factors whose function is to maintain the self-renewal capacity of stem cells.

Epidermal Stem Cells in the Human Skin



PhytoCellTec™

A high-tech biotechnology to cultivate cells from rare plants

PhytoCellTec™ by Mibelle Biochemistry

Mibelle Biochemistry developed a novel technology (PCT) enabling the cultivation of cells from rare and endangered plant species. This PCT technology, based on the unique totipotency of plant cells uses the wound healing mechanism of plants. A part of a plant is wounded to induce the formation of callus cells. This wound healing tissue consists of dedifferentiated cells which are stem cells. Callus cells are harvested and cultivated in a suspension and a novel bioreactor system enables a large scale culture. To obtain the PhytoCellTec™ Malus Domestica cosmetic ingredient, these stem cells are harvested and homogenized at 1200 bar together with liposomes to encapsulate and stabilize oil- and water soluble components.

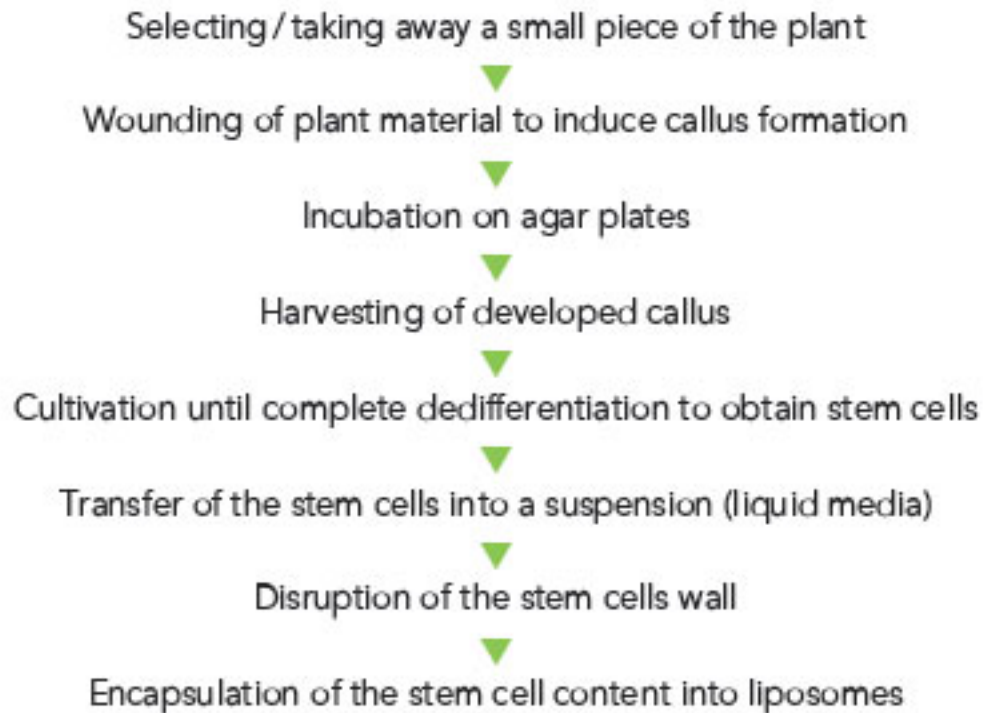
PhytoCellTec™ Malus Domestica is thus rich in epigenetic factors and metabolites which assure the longevity of cells and protect stem cells.

Advantages of PhytoCellTec™ Technology

This innovative technology developed by Mibelle Biochemistry offers the following advantages:

- Possibility to cultivate cells of rare and endangered plants while respecting the environment
- Availability of plant material independent of the season and market's demand
- Plant material completely free of environmental pollutants and pesticides
- Constant concentrations of metabolites in the stem cells

PhytoCellTec™ Process



PhytoCellTec™ Malus Domestica

Study results



Maintenance of Stem Cell Growth

An in vitro test was conducted on umbilical cord blood stem cells with Malus Domestica stem cell extract which is the active component of PhytoCellTec™ Malus Domestica. Umbilical cord blood stem cells (UCBSC) are the “youngest” safely available stem cells for research.

The influence of Malus Domestica stem cell extract on UCBSC artificial growth was evaluated by counting the cell number after incubation.

Results showed that Malus Domestica stem cell extract has a positive effect on UCBSC’s artificial growth thus maintaining the growth and the proliferative activity of UCBSC.



Protection against UV Radiation

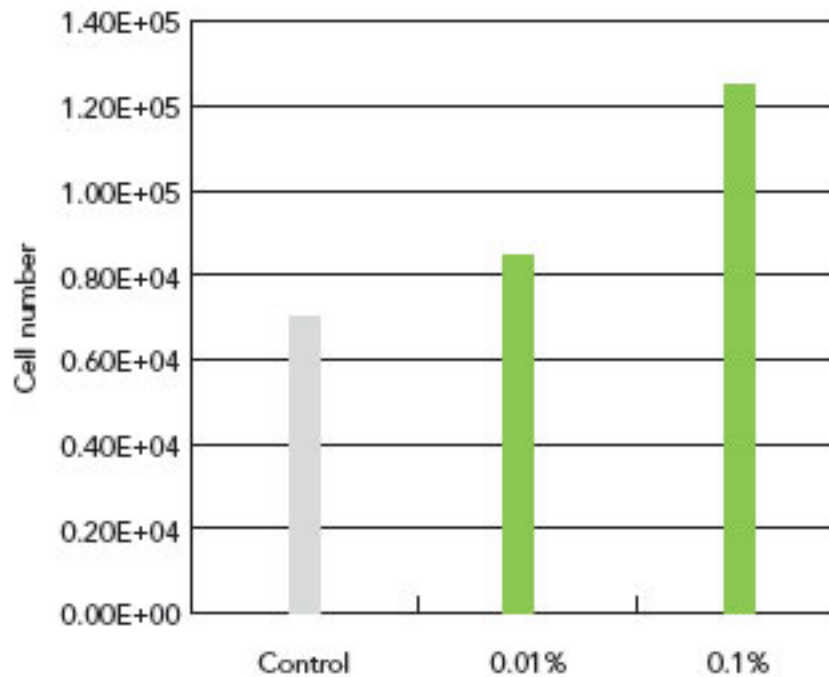
A second in vitro test was conducted on umbilical cord blood stem cells with Malus Domestica stem cell extract which is the active component of PhytoCellTec™ Malus Domestica.

The protective effect against UV damage of Malus Domestica stem cell extract on UCBSC was evaluated by an MTS assay. UCBSC were incubated with different concentrations of Malus Domestica stem cell extract for 24h and were then exposed to UV radiation. The MTS assay, which measures the number of living cells and therefore the damage from UV, was performed 48h after UV radiation.

Results showed the capacity of Malus Domestica stem cell extract to protect UCBSC from UV damage even at low concentrations.

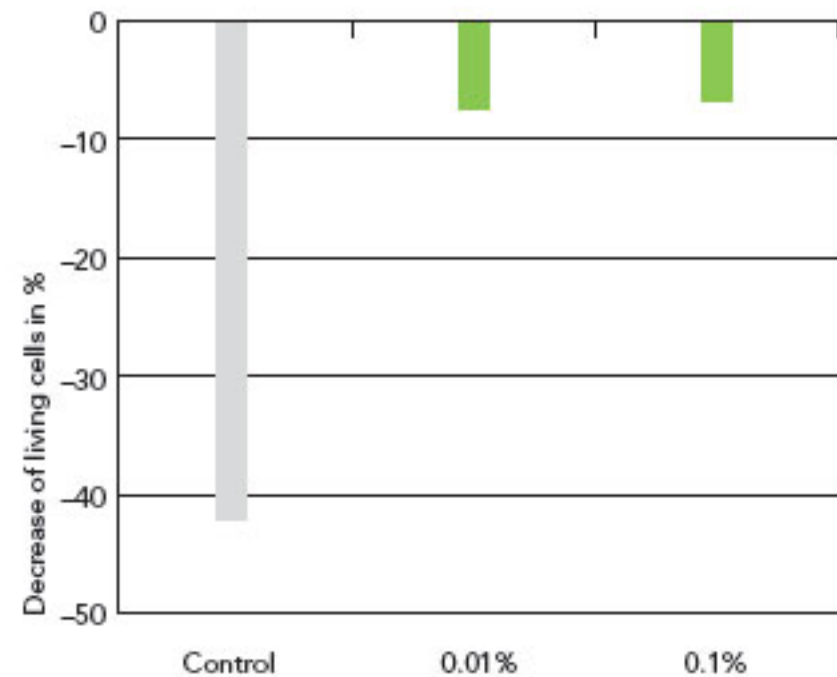
Maintenance of Stem Cell Growth

■ Malus Domestica stem cell extract



Protection of Stem Cells against UV Damage

■ Malus Domestica stem cell extract



PhytoCellTec™ Malus Domestica

Study results



Enhancement of Epidermal Stem Cells

Characteristics

A novel Progenitor Cell Targeting technology was used to prepare human epidermal stem cells.

The method consists essentially of culturing primary human keratinocytes in a medium specifically designed to mimic the micro-environment of the in vivo stem cell niche. This special, fully defined cell culture medium leads to an enrichment of so called keratinocyte progenitor cells that can be considered as activated stem cells. Compared to freshly isolated cells, the cell population of passage 4 is characterized by a 10-fold increase of CD34/alpha6 integrin double labelled cells. CD34 and alpha6 integrin are known markers of epidermal stem cells.

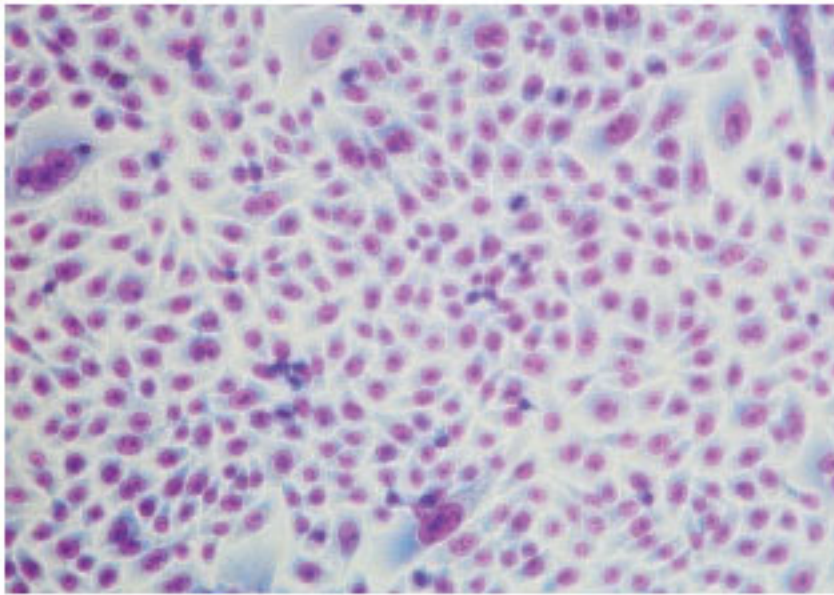
Another characteristic of stem cells is their high colony-forming efficiency (CFE). For analysis of CFE, cells are seeded at low density. The number of colonies formed is a value of the concentration of progenitor/stem cells, because differentiated keratinocytes have lost the capacity to divide.

The epidermal stem cells obtained thanks to the Progenitor Cell Targeting technology were incubated with the Malus Domestica stem cell extract.

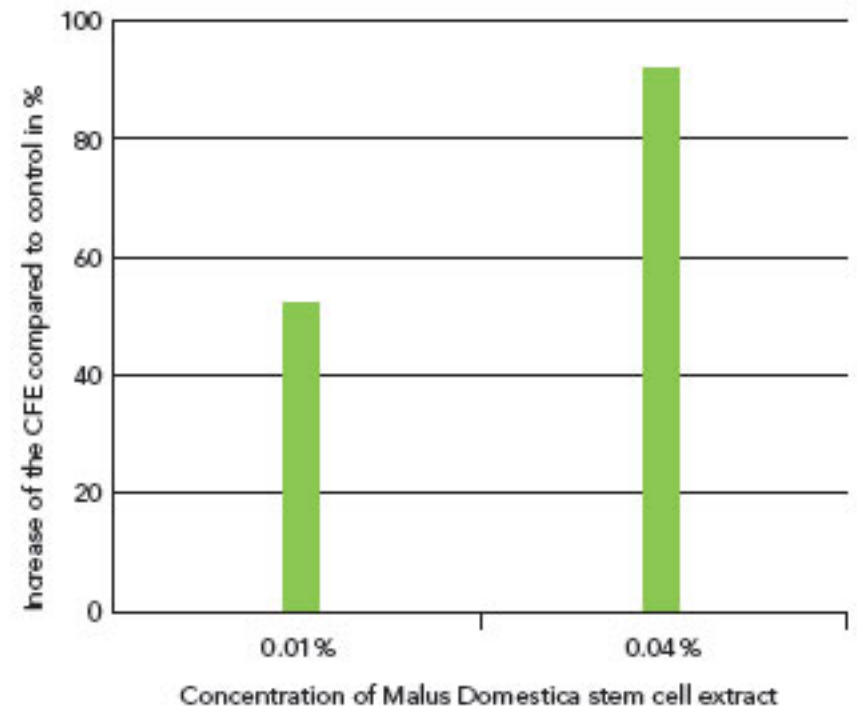
The CFE was determined from cells of different passages and compared to a control culture. Results showed that the CFE was stimulated by 92% in the presence of 0.04% of the Malus Domestica stem cell extract.

This clearly shows an improved maintenance of the stem cell characteristics of epidermal stem cells.

Keratinocyte Progenitor Cells in Culture



Increase of the Colony-Forming Efficiency (CFE)



mibellebiochemistry



PhytoCellTec™ Malus Domestica

Plant stem cells for skin stem cell protection

Claim Ideas for PhytoCellTec™ Malus Domestica

- Protects longevity of skin stem cells
- Delays senescence of essential cells
- Combats chronological aging
- Preserves the youthful look and the vitality of your skin

Applications

- Skin care products to protect skin stem cells
- Real rejuvenation products for face and body care
- Innovative skin care formulations

Marketing Benefits

- First plant stem cell active ingredient on the market (patent pending)
- Innovation in "stem cells" cosmetics
- Breakthrough in anti-aging

The information contained in this publication is provided in good faith and is based on our current knowledge. No legally binding promise or warranty regarding the suitability of our products for any specific use is made. Claim ideas are offered solely for your consideration, investigation and verification. Mibelle Biochemistry will not assume any expressed or implied liability in connection with any use of this information.