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# body language

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body language

# THREAD LIFTING

WE EXAMINE THE INDICATIONS AND TECHNIQUES FOR FACIAL REJUVENATION USING THREADS

## PDO THREADS

Placement for skin  
rejuvenation and facial  
tissue anti-ptosis

## ANTI-AGEING

A combined approach to facial  
ageing using Aptos threads, PRP,  
fillers and toxins

## EQUIPMENT

The myriad causes and  
treatments for the  
problem of cellulite

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# Demystifying the use of stem cells in cosmeceuticals



DR CHARLENE DE HAVEN demystifies stem cells in the cosmeceutical industry and how they can be effectively applied.

**S**tem cells are undifferentiated cells of an organism, which are capable of giving rise to indefinitely more cells of the same type.

All stem cells have two properties: self-renewal and differentiation. As well as the potential and ability for constant tissue regeneration as a stem cell divides and replicates it can also differentiate. It differentiates into the various

tissue types that are found in the body, and that is where its great potential is found.

There is a hierarchy of stem cells beginning with totipotent. As one moves down the line of stem cells, less of the ability to differentiate into various tissue types is found. Totipotent stem cells occur in the embryo up to one week of gestation. Pluripotent stem cells are found in the embryo from one

week to birth. A newborn infant and an adult both have adult stem cells.

The adult type of stem cells are less versatile than totipotent or pluripotent. If an adult stem cell is harvested, that stem cell is only going to differentiate into a specific type of tissue such as skin, bone, cartilage or muscle.

For example if a bone adult stem cell is harvested, it will differ-

entiate into more bone tissue. If a fibroblast stem cell or adipose stem cell is harvested, it is already committed to differentiate into, respectively, another fibroblast or another fat cell.

**Applications and limitations**

The more versatile totipotent or pluripotent stem cells enable the production of any tissue type desired. Neural tissue and pancreatic islet cells which make insulin are difficult to regenerate from stem cells but the potential is there, as it is with all other types of tissue.

The totipotent is the most versatile of the stem cells and is found in the single-cell embryo up to one week of gestation. It can differentiate into placenta and any type of embryonic tissue. Within a week, it is a little more limited. This pluripotent stem cell can no longer differentiate into placenta but can differentiate into embryo and any type of adult tissue, which means it is still very versatile.

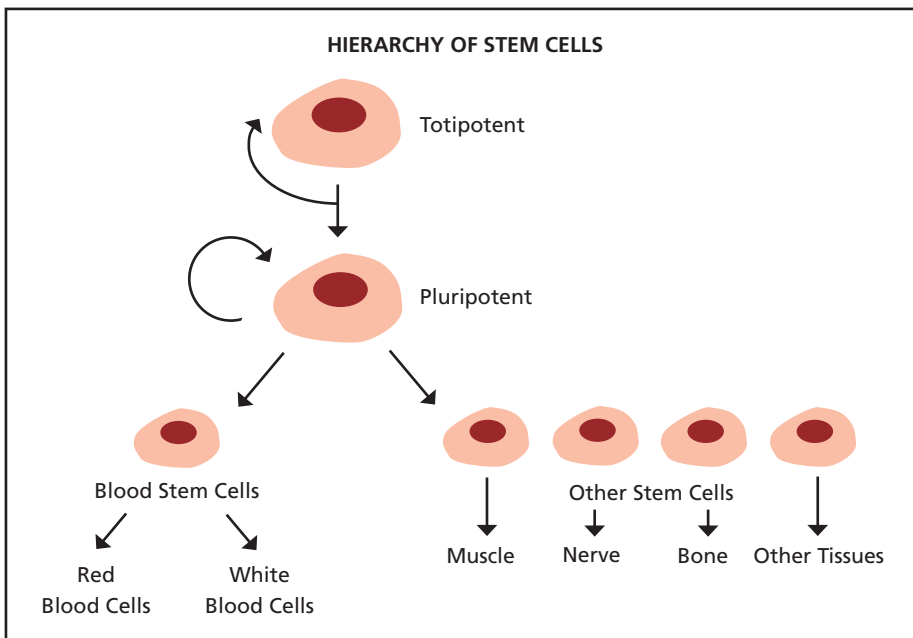
Stem cells obtained at birth from umbilical in cord blood may be “banked” or stored in a frozen state for later use if the baby-turned-adult develops a disease such as cancer. There are several companies that will store a baby’s umbilical cord blood for a monthly fee in case the high concentration of stem cells found within the cord blood are useful in later life.

Science has discovered how to convert adult stem cells which are already committed to a specific tissue type back into pluripotent stem cells which have the ability to differentiate into any tissue type. These are called induced pluripotent stem cells. Potentially one could then make a new knee, a new heart, a new liver, new skin, or any other tissue type that is desired. That was a very important advancement in terms of stem cell technology because previously useless adult committed stem cells, such as those from adipose tissue (fat) could be converted to induced pluripotent stem cells which then have the ability to differentiate into a wide number of extremely useful adult tissue types.

There are huge numbers of peo-



ple across the world needing organ transplants, and there are not enough donors. The advantages of getting a real natural organ or body part, harvested through stem cell technology are amazing and this is





why the media and the public are so excited about stem cells.

Stem cell therapy is very much still in its infancy, although it is moving along rapidly. Stem cell therapy is being used in disorders like haematology where it is already an accepted therapy. Marrow transplants using harvested stem cells are fairly common in treating leukaemia and some types of anaemia. Stem cells are also presently being used in burn therapy, bone grafting and in corneal plants. Stem cell technology in present development includes many diseases such as Parkinson's Disease for which we are

actually very close to perfecting the science.

Some other neural diseases like Huntington's chorea and even MI and heart attacks are being explored as potential targets for stem cell therapy.

Although the promises of stem cell therapy are impressive, there are also potential dangers. When adult stem cells are combined with a chemical to produce induced pluripotent stem cells they do become more versatile but we have also altered their DNA. This DNA is very long-lived and more versatile. In certain cases the unexpected could happen, such as the development of cancer, other diseases, or unwanted tissue types. Unfortunately, this process is not entirely understood at the present moment.

#### Stem cells in skin

The skin's stem cells are located

both above and below the DEJ as well as in the dermal papillae at the base of hair follicles.

#### Stem cell therapy in cosmeceuticals

When we are detailed by companies about stem cell actives, there is a common communication and subsequent belief that the stem cells go in cosmeceutical products are delivered through the skin. But this is not what happens and is not possible.

Stem cells of any type placed on the skin will not penetrate because all cells are actually quite large structures. This would be analogous to trying to push a skyscraper through the skin; it is much too large. There are problems with getting peptides more than six to eight amino acids long through the skin barrier and cells are monumentally larger than short peptides.

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### WHAT ARE THE KEY STEM CELL ACTIVES THAT CAN AFFECT CHANGE WITHIN OUR OWN STEM CELLS?

There actually are a large number of substances that are potential stem cell actives and that can talk to our own skin stem cells.

A few of these are:

**DNA protectants:** The DNA within the stem cell is very important as it is what causes the division of the cell into daughter cells. Furthermore, DNA serves as the command centre of each cell, directing it in proper functioning. If we protect DNA, we can lessen the rapidity of ageing including the ageing of stem cells themselves. This means DNA protectants are very important potential stem cell actives and are “anti-senescence” agents for stem cells. Extremozymes, a subset of DNA protectants, are enzymes made by plants living in extreme environments. Extremozymes are very effective DNA and protein protectants.

**Growth factors:** Growth factors are some of the most important the substances that message between stem cells. Growth factors are vitally important for any type of tissue growth and regeneration.

**Wound healers:** Substances that encourage wound healing must also up-regulate stem cells since their replication is involved in wound healing. Centella asiatica is an example of a botanical active that has been known and used since Ayurvedic times. It has also been investigated in the western medical literature and found helpful in the healing of burns, leprosy, venous stasis ulcers, and diabetic pressure ulcers, as well as a variety of other wounds.

**Antioxidants and anti-inflammatories:** Stem cells are also exposed to free radical damage and oxidative stress. They become senescent, they age, become less viable and less able to divide. If stem cells within the skin are protected with antioxidants, they remain more viable and more youthful.

Stem cell actives are special, but there are a large number of compounds that affect stem cells in a number of ways. There is no single type of ingredient that is entirely responsible for directing stem cell responses in healthy skin. A multi-tasking pharmaceutical-grade formulation with proven efficacy in achieving the specific goals of the patient is still ultimately key in the ongoing pursuit of anti-ageing and skin health.

Furthermore, a cell is a living thing. If you place it anywhere, it requires a nutrient supply; if it is a collection of cells, it must have a vascular supply. Delivering stem cells of any type through the skin requires a medical procedure. They must be injected or an incision must be made in order to get stem cells into the internal part of the body.

#### Stem cell technology in cosmeceuticals

In our industry we usually talk about using plant stem cells. Plants also have stem cells that are used for regeneration and repair of injured tissue after injury or for

growth. To obtain plant stem cell, the plant is first wounded. This begins the process of healing the wound, which causes stem cells to activate and divide.

The wounded area containing activated stem cells is removed from the plant and grown in a Petri dish with nutrient media and growth factors to encourage the

growth of the cells. Those cells divide, regenerate, and make more stem cells because self-renewal and differentiation are their two universal properties.

As these stem cells differentiate into healed tissue and replicate into more stem cells, they also message each other. Cells send messages via cytokines to tell each other to grow, in which ways to grow and to differentiate into adult tissue types. As stem cells send their cytokine messengers and growth factors back and forth, a significant amount of messaging molecules remain in the nutrient media. We can then separate the cells out from the nutrient media, also leaving the smaller molecules or “actives” in the media.

Those messenger substances are then removed from the nutrient media in concentrated form. These cosmeceutical “actives” are added to a number of other actives in the final formula which may be water or lipid-based. Delivery of the actives through the skin barrier to the site of action at stem cell locations must be achieved. These are each complex processes in formulation technology.

Furthermore, stability within the end-product bottle must be attained to give “shelf life”. Many cosmeceuticals that are very active will be in glass since actives often adsorb onto plastic surfaces thus making the product ineffective when placed on the skin.

Although stem cells cannot be delivered through skin without a medical procedure, stem cell actives in cosmeceuticals can affect stem cells located within the skin. Stem cell technology within formulations to communicate and affects our own stem cells located within our skin.

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