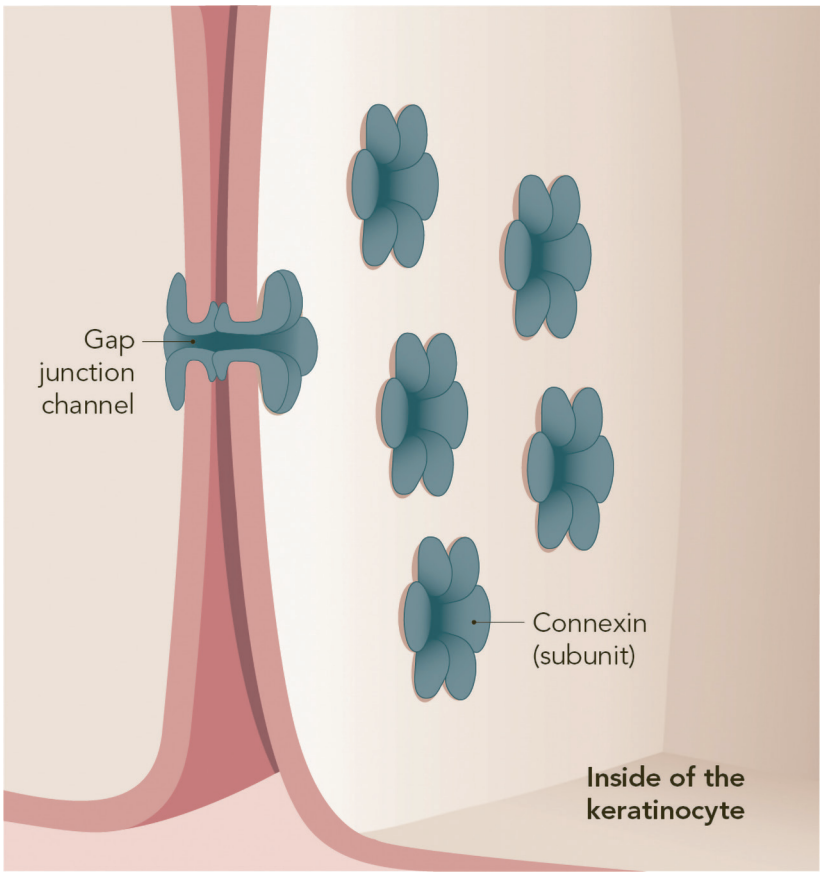
Harmonizing the flow with MossCe

Mibelle Biochemistry's novel active ingredient MossCellTec™ Aloe is based on the rare but resilient aloe-moss *Aloina aloides*. MossCellTec™ is a technology that enables the large-scale cultivation of moss cells in sterile conditions and in both a reproducible and sustainable way. MossCellTec™ Aloe directly promotes the cell-cell communication and actively contributes to an even moisture distribution in the skin while reducing the volume and depth of wrinkles

We nowadays live far from nature and the exposure to indoor and outdoor pollution affects our skin by accelerating the ageing process and leading to a deregulation of skin moisture. The unavoidable ageing process and habits such as smoking and exposure to blue light from electronic devices lead to additional loss of skin water content. The passing of time and living conditions not only affect the psychological mood but also the hydration and unity of our skin at a deeper level.

The keratinocyte network as a unity against moisture loss

The moisturization level of skin is far from stable and is compromised by external conditions as well as during the ageing process. In this respect, the epidermis can be seen as a two-faced barrier that on one side protects from environmental aggressors while preventing excessive water loss on the inside. Keratinocytes are the primary cells found in the epidermis. Keratinocytes naturally form a network in which their cytoplasm is connected through small channels, called gap junctions, that enable communication. Gap junctions are formed by connexins and allow the flow of water and small molecules such as ions and signalling molecules from one cell to the adjacent one.



The possibility for a small molecule to travel from a cell to the adjacent one is necessary for an efficient communication of skin cells and a healthy skin status. Dysregulation of connexins patterns and expressions can result in clinical skin syndromes. Similarly, calcium is a small ion with a big role in skin, as its concentration and gradient are key for many skin functions, skin barrier formation, and for an optimal skin homeostasis. For example, the mechanical stimulation of keratinocytes leads to an ATP-mediated signal the propagates through the tissue using gap junctions and leads to a release of ions within the cells. The skin forms a barrier facing the external environment and, as in all defences, a rapid communication, coordination, and unity are crucial.

A tiny moss with a great resilience

Few organisms can cope with extreme conditions of environmental dryness. The aloe-moss is classified as a bryophyte and is scientifically known as *Aloina aloides*. The aloe-moss grows in the wild on rocks and in dry environments with succulent-like leaves arranged in rosettes whose appearance recalls that of *Aloe vera*. The aloe-moss is especially tolerant to desiccation and can stand remarkably long periods of drought only to quickly regain vitality when touched by waterdrops. Plants able to live in extreme environments often developed uncommon cellular mechanisms and structures that have always attracted the curiosity of the scientific community for possible applications in the biotech and medtech sectors.

Tiny and often in a dried state, the aloe-moss is endangered in some locations and benefits from a protected status in Switzerland. Its ability to resist drought has attracted the interest of our experts as the basis of a potential new cosmetic ingredient. The challenges posed by its slow growth rate and the impossibility of harvesting it in the wild without harming its population have been successfully overcome by our MossCellTec™ technology.

MossCellTec™ technology to harness the potential of rarities

MossCellTec™ Aloe benefits from Mibelle Biochemistry's unique MossCellTec™ technology, a sustainable and reproducible approach to mastering the demand for high-potential cosmetic ingredients from rare moss species. After its success with MossCellTec™ No.1, the first

skin's moisture
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ever active ingredient based on biotechnologically produced moss, MossCellTec™ Aloe has pushed back the boundaries by cultivating the endangered aloe-moss. MossCellTec™ Aloe is based on the extract of the *Aloina aloides* moss, that is remarkable for its ability to grow on dry grounds and for its efficient water retention and distribution mechanisms. The MossCellTec™ technology is the perfect answer to provide large-scale amounts of aloe-moss to be used as a cosmetic ingredient. MossCellTec™ technology offers an optimal controlled environment for the reproduction of aloe-moss tissue in a sustainable process.

MossCellTec™ Aloe improves cell communication compromised by ageing

An *in vitro* study was designed to evaluate the influence of MossCellTec™ Aloe directly on skin cells, in terms of communication as calcium signal transmission, also under simulated aged-cell conditions. The cellular ageing process can be reproduced *in vitro* by using the chemical glyoxal.

A first group of samples made of progenitor epidermal keratinocytes were grown in a medium with low calcium and later treated with 0.25% of aloe-moss extract for 4 days. Exposure to aloe-moss extract resulted in a more than two-fold increase in final calcium signal compared to untreated cells.

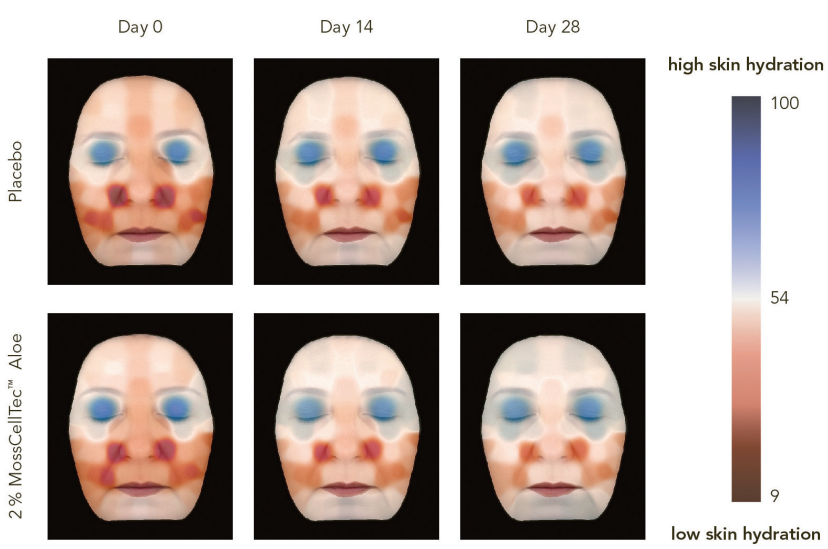
In a second group of samples, the addition of glyoxal to primary progenitor epidermal keratinocytes *in vitro* resulted in an immediate reduction of the calcium signal. Under these simulated ageing conditions, the supplementation with aloe-moss extract not only restored the cellular communication but led to a three-fold increase in the calcium signal compared to the control. With aloe-moss extract, the calcium signal wave was transmitted more quickly and was completed in a shorter time. Control conditions with the calcium chelator EGTA or the gap-junctions-blocker carbenoxolone, resulted in the complete inhibition of the calcium signalling, thus confirming that the signal was calcium-and gap-junctions-dependent.

In vitro studies clearly demonstrated the efficacy of MossCellTec™ Aloe in enhancing communication among skin cells through gap-junctions and calcium signalling.

MossCellTec™ Aloe unifies the skin's response against moisture loss and ageing

The efficacy of MossCellTec™ Aloe in supporting the response in fighting the loss of moisture as a unity and ageing was tested in a controlled clinical study. The clinical study was particularly designed to assess the hydration of the skin of the face and against the facial signs of ageing such as crow's feet wrinkles. The study involved forty-three Caucasian women aged between 37 and 65 years and the hydration of the skin of the face was measured over 53 different points.

The application of MossCellTec™ Aloe always resulted in increased skin hydration. In particular, two weeks of twice daily application of a cream containing 2% MossCellTec™ Aloe was sufficient to achieve a 14% more even skin hydration all over the face, reaching a 20% increase after a four-week application period. Most significantly, less than one month of regular application (28 days) of a cream containing 2% MossCellTec™ Aloe reduced wrinkle volume and wrinkle depth, by 13.1% and 8.2% respectively, compared to initial conditions and placebo.



In summary, MossCellTec™ Aloe improves the skin status at both the visible and the cellular level by harmonizing the hydration status, while boosting the intercellular communication. MossCellTec™ Aloe restores and enhances communication through gap junctions among keratinocytes even under simulated ageing conditions. The regular application of MossCellTec™ Aloe resulted in a more even hydration of the face and a reduction of wrinkle volume and depth. Powerful in boosting and harmonizing skin hydration and the response to stimuli, MossCellTec™ Aloe (recommended: 2%) is the perfect ingredient for moisturizing, balancing, and healthy-ageing products wishing to give an inspiring forest-bathing experience.

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