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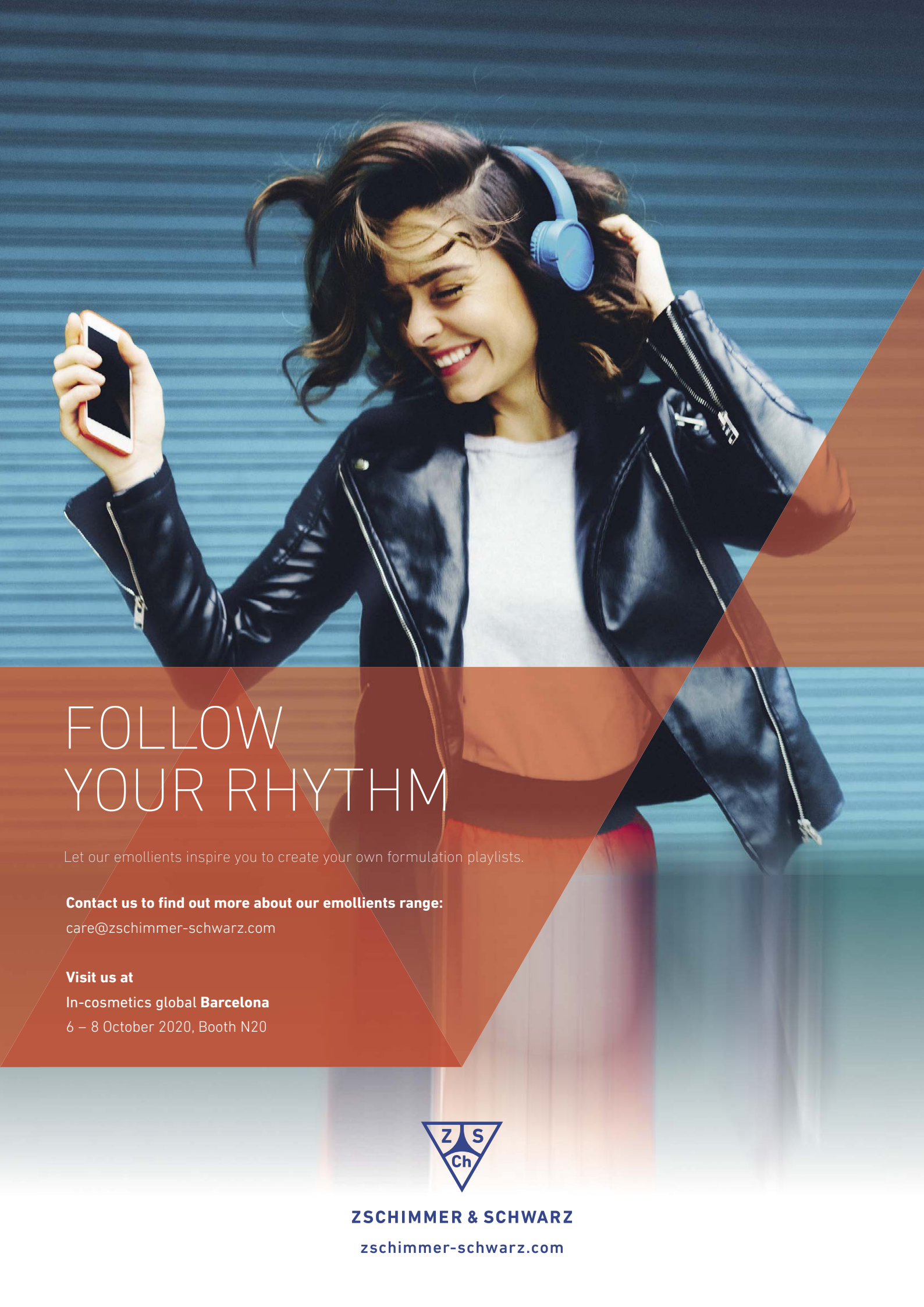

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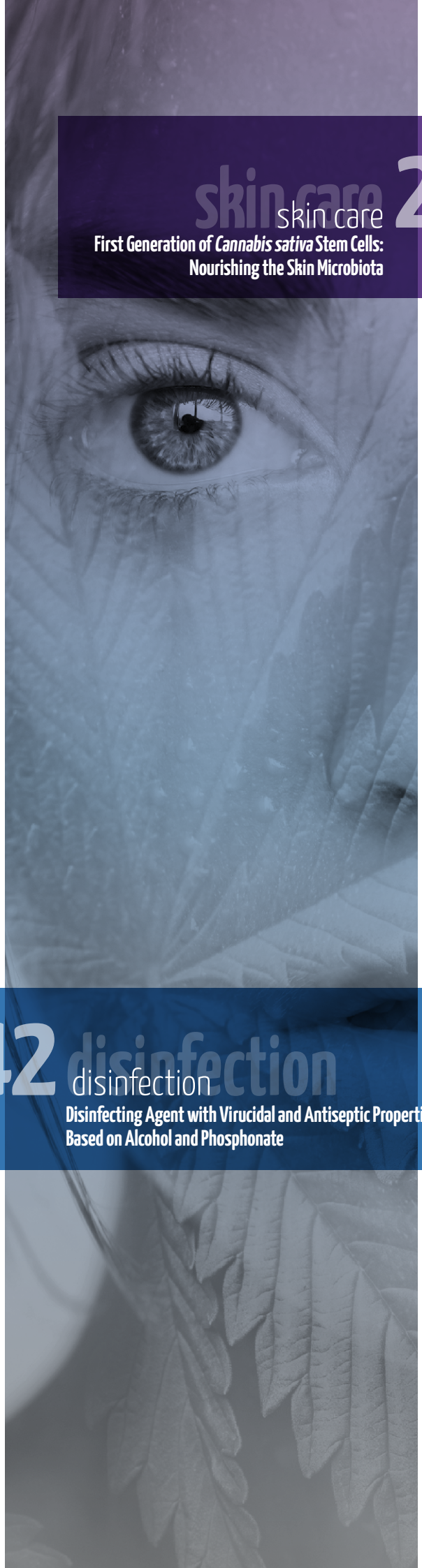

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First Generation of *Cannabis sativa* Stem Cells: Nourishing the Skin Microbiota

Ò. Expósito, A. Guirado, D. Robustillo, A. Gallego, M. Mas, P. Riera, D. Luna, S. Laplana, T. Ruiz, K. Lingen

abstract

The skin microbiota and the brain are connected through an existing natural pathway where the microbiota is the first step. The new active Kannabia Sense[PLF] (INCI name: Cannabis Sativa Callus Lysate), is the first generation of *Cannabis sativa* plant stem cells and introduces the concept of *in-situ* postbiotic. Through its mechanism of action, the active modulates the skin commensal microbiota to produce a positive *in-situ* postbiotic cocktail that ignites the synthesis of happiness related neurochemicals from the skin that connects with the brain, turning into a well-being response and a healthier and stronger skin. Several *in vitro* and *in vivo* trials have been carried out to demonstrate the skin well-ageing effect, positive brain activation and modulation of mood state thanks to the active ingredient.

The Skin: The Human Third Brain

The skin is a mirror of your emotional state and internal conflicts because it is linked to the nervous system since its embryonic development [1].

The latest literature describes the skin as the third brain or as the new neuroendocrine organ. It has been demonstrated that cutaneous cells are able to synthesize a plethora of endocrine neurochemicals like dopamine, oxytocin, endorphins, histamine, serotonin, adrenaline [2-7].

The role of the brain includes reception, processing, and transmission of environmental information from sensory organs to the systems of the whole body. The digestive organs have an independent nervous system ('second brain'). We propose that the skin, which forms the interface between the body and the environment, could be considered our 'third brain'.

The skin contains multiple environmental sensors and a sensory information-processing system, what generates a variety of hormones and neurotransmitters with the potential to influence whole-body states and emotions.

Cultured human keratinocytes can generate endocrine neurochemicals. These results are consistent with the hypothesis that the epidermis plays a significant role in adapting whole-body physiology and emotional response to changing environments.

The skin could be considered an expanded brain sensory organ. In addition to the classic senses (touch, taste, smell, sight and hearing), the skin has a great diversity of 'other sensory capabilities' as well as a huge surface of interaction with the environment that helps the brain analyse and adapt better to changing environmental conditions.

The skin is proposed here as a social organ since their neuroendocrine sensorial abilities play a very important role in social perception.

The skin-brain axis is vertebrate through the neuroendocrine system capable of producing signalling molecules at local and systemic level that act as a connection platform between skin and brain. We could also add the social dimension to the skin-brain equation.

The Microbiota-Skin-Brain Axis

The skin is a neuroendocrine organ able to synthesize a plethora of neuropeptides and neurotransmitters such as oxytocin, serotonin, β-endorphin, etc.

The microbiota is the most superficial layer of the skin and has much more metabolization potential than human cells. In fact, this microbiota gives our skin cells an increased metabolism capacity to perceive and manage all information that comes from the environment and within the body.

Microbiota can interfere in the skin neurochemical networks and enhance the production of wellbeing linked molecules like oxytocin (the happiness hormone) by the synthesis of an *in-situ* postbiotic cocktail.

The skin microbiota can metabolize a plant cell culture derived ingredient and produce an *in-situ* postbiotic that significantly increases the synthesis of oxytocin by the skin keratinocytes and sensory neurons. This postbiotic is produced by the commensal microbiota locally (*in-situ*) and directly on the skin and stimulates the skin cells to ignite the synthesis of positive neurochemicals. Those 'excited' keratinocytes could stimulate the skin nerve endings and connect the skin directly with the brain with the aim of stimulating and reinforcing a positive loop of communication between the skin and the brain that ends up in a skin with a better health and appearance.

Considering the great impact of emotions and wellbeing on the skin homeostasis and appearance, it is essential to consid-

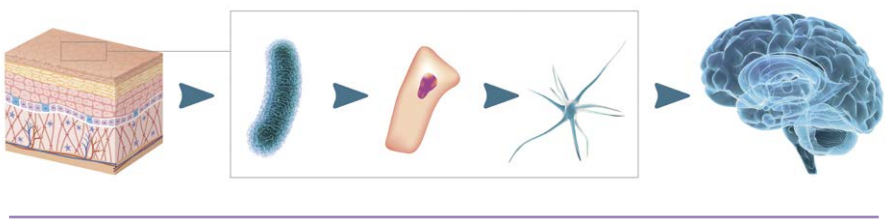

Fig. 1 Microbiota-Skin-Brain axis.

er the microbiota-skin-brain axis in this new cosmetic strategy (**Fig. 1**).

The concept of *in-situ* postbiotic

Postbiotic is a relatively new term coined to refer to the metabolic by-products of probiotic bacteria. It is widely recognized the use of different kinds of prebiotics, probiotics and postbiotics in dermocosmetics due to its contrasted beneficial effects on both skin cells and microbiota.

The concept of *in-situ* postbiotic is based on a simple fact: who better than our own commensal symbiotic microbiota to take care of our skin? The skin microbiota continuously captures nutrient elements from its surroundings, transforms them and generates an *in-situ* postbiotic mantle, rich in bioactive metabolites that can interact with the epidermal cells and sensory neurons nerve endings.

This approach takes profit of the high metabolization of skin commensal microbiota to obtain a cocktail of neuroactive by-products. The cocktail of neuroactive by-products significantly ignites the synthesis of happiness related neurochemicals (oxytocin) from skin cells by metabolizing a plant stem cell derived product.

Kannabia Sense^{PLF}: The First *Cannabis sativa* Stem Cells

The research around the biotechnological culture of *Cannabis sativa* stem cells redefines the concept of cosmetics and incorporates a transgressive vision of 'emotional cosmetics'.

The scientific evidence of our studies shows the great capacity of cellular factors from *Cannabis sativa* stem cells to connect in multidimensional cascade with the microbiota-skin-brain axis and from which oxytocin plays a crucial role in the way in which the individual relates to others. Thus reaches the emanated beauty, which is going beyond the results conventionally obtained through skin nutrition. In other words, depending on the reaction generated (oxytocin production), the individual and skin appearance may change.

Based on plant cell culture technology, this new active ingredient opens a new paradigm in the field of well-ageing: use the microbiota to increase the skin happiness neurochemical networks in order to enhance the feeling of comfort and self-confidence.

Through the new active Kannabia Sense^{PLF}, it is possible to stimulate the skin microbiota to produce an *in-situ* post-biotic cocktail that stimulates the synthesis of cutaneous oxytocin. The oxytocin generated in the keratinocytes connects with the sensory neurons and communicates with the brain turning into a well-being response that ends up in a healthier, stronger, and more beautiful appearance.

This active (INCI name: Cannabis Sativa Callus Lysate) is the first active made from *Cannabis sativa* plant stem cells and has been obtained through the proprietary Technology Platform Phyto-Lipidic Fractions. It has been enriched with a great and diverse cocktail of plant terpenes and polyphenols while avoiding the production of the controversial cannabinoids THC and CBD. Once metabolized by the skin commensal microbiota, this synergic cocktail can stimulate the synthesis of well-being related neurochemicals (oxytocin) through an *in-situ* produced postbiotic.

In vitro efficacy

Several *in vitro* tests were performed to demonstrate the modulation of the skin microbiota *in-situ* postbiotic thanks to the active.

In vitro 1: Characterization of the bacterial *in-situ* postbiotic

To better understand the mechanism of action of the microbial *in-situ* postbiotic, screening analyses have been performed on the bacterial SuperNatant (bSN). The composition of those bSN was evaluated with the aim to link this specific metabolic profile with this activation of 'pleasure' neurochemicals.

The active was added to separate cultures of skin commensal microbiota (*Cutibacterium acnes & Staphylococcus epidermidis*). The resulting bacterial culture supernatants were combined in a 1:1 ratio (bSN) (**Fig. 2**).

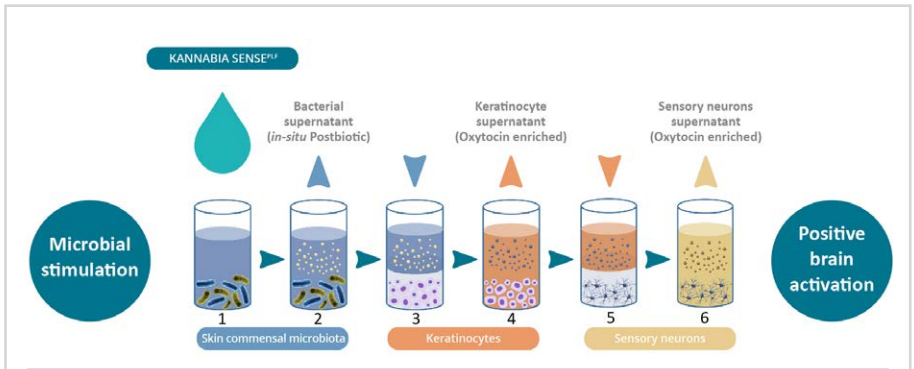

Fig. 2 Analysis of the Microbiota-Skin-Brain axis networks.

The bacterial supernatant (bSN) treated with the active produced less total proteolytic content and biofilm forming exopolysaccharides and had lower antioxidant activity (data not shown).
Compared to placebo, the results of the postbiotic generated after the application of Kannabia Sense^{PLF} were statistically significant by achieving the modulation of microbial stress and virulence related metabolites. Thanks to these positive environmental conditions, the consequently secreted *in-situ* postbiotic will be full of balanced healthy and beneficial molecules for our skin.

In vitro 2: Analysis of the Microbiota-Skin-Brain Axis networks

A series of sophisticated and originally designed studies were performed in order to evaluate the active's ability to activate directly and/or indirectly the neurochemical networks for 'feeling good' through the Microbiota-Skin-Brain Axis (**Fig. 2**).
The active was added to separate cultures of commensal microbiota (*Cutibacterium acnes* & *Staphylococcus epidermidis*) (1). The resulting bacterial culture supernatants were combined in a 1:1 ratio (bSN) (2) and added to a human keratinocyte culture (NHEK) (3). Oxytocin levels produced by the NHEK were analyzed and compared. This way we can study if the active stimulates the microbiome to produce less cellular stress-related markers, and then if the bSN (low in cellular stress markers) can stimulate the NHEK to synthesize more relaxing molecules, such as oxytocin (4).
After that, the supernatant of the treated NHEK (kSN) was added to sensory neurons and the levels of oxytocin were analyzed (5). The production levels of oxytocin of untreated sensory neurons were compared with those treated with the active and with those treated with bSN or with kSN (6).
In the 6 steps of this cell-to-cell communication chain (active ingredient → microbiota → keratinocytes → sensory neurons), the effect of the active was compared with that of the supernatant/s in order to analyze the direct effect at the same time as the indirect activity:

The oxytocin levels were analysed in both keratinocytes and sensory neurons after applying the active:

Oxytocin levels in Keratinocytes (NHEK - Step 4):
The active increased the oxytocin synthesis on NHEK by up to 1.5-fold versus untreated control and the bacterial supernatant (bSN) increased even more the oxytocin synthesis on NHEK, by up to 3-fold versus control (**Fig. 3**).
KANNABIA SENSE^{LF} directly activates the oxytocin production in keratinocytes, but its effects were higher by activating it indirectly through skin microbiome stimulation.
The bSN indirect effect was significantly higher than the direct effect of the active see **Fig. 3**.

Oxytocin levels in sensory neurons (Step 6):
The active increased the oxytocin synthesis on sensory neurons by up to 9-fold versus untreated control. The keratinocytes' supernatant also increased the oxytocin synthesis on sensory neurons NHEK, by up to 8-fold versus control (**Fig. 4**).
Therefore, the active directly activates the oxytocin production in sensory neurons, and indirectly through skin microbiota-mediated keratinocyte stimulation:
The active centers its mechanism of action in activating the cascade of reactions from the skin microbiota to the brain, even having a direct effect.

In vivo Efficacy

The clinical evaluation was a solid scientific argument to demonstrate the efficacy of the active on several clinical trials performed.

In vivo 1: Evaluation of Skin Well-Ageing effect

The first *in vivo* test was performed on a 40-volunteer panel aged between 46 and 64 years old. The study was a double blind intra-individual vs placebo, with 2 daily applications for 28 days.

Mood wrinkles (Marionette & Frown lines):
The anti-wrinkle effect of the active was evaluated on a subgroup of 30 volunteers by Bio3D Structured-light Scanner, a refined 3D digitalizing system developed by Bionos Biotech, S.L. This unique software is based on structured light projection which uses 290 pictures per second to prevent movement effects and allow very high-resolution images.

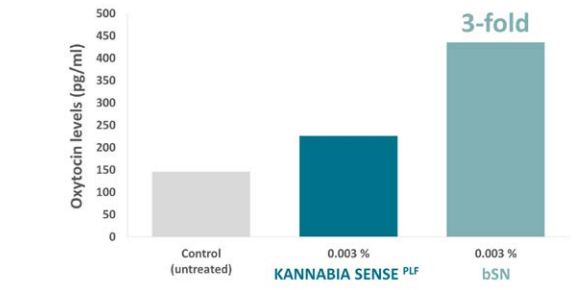

Fig. 3 Oxytocin levels in NHEK.

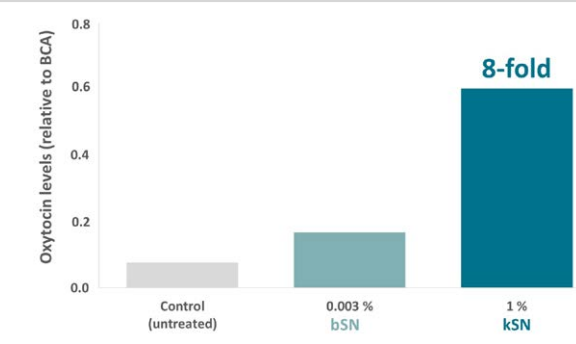

Fig. 4 Oxytocin levels in sensory neurons.

The measured parameters were area and length of the so-called emotional wrinkles after 28 days of treatment (**Fig. 5**). The results showed a reduction of up to 44% and 28% in both area and length of the wrinkles in Marionette lines and up to 27% and 32% of both area and length of wrinkles in Frown lines at 1% dosage.

Skin hydration:
Compared to placebo, the application of a cream containing 1% dosage of the active increased the skin hydration levels of the 40 volunteers at 8% more than at the beginning of the study and by 1.7-fold at 28 days of treatment.

Skin radiance:
Finally, there was another 30-volunteer group who applied a cream containing 2% active, being demonstrated that their skin gloss and radiance increased by 1.2-fold versus placebo at 28 days and up to 50% in glow intensity versus initial time.

In vivo 2: Evaluation of the Emotional Modulation

For this *in vivo* assay, there was a panel compound of 30 volunteers (46 -69 years old) who were applied a 2% active dosage in a double-blind study vs placebo on 2 daily applications.

Analysis of the brain activation by functional Magnetic Resonance Imaging (fMRI)
In order to test the efficacy of the active, the volunteers' brain activity was analysed by functional Magnetic Resonance Imaging (fMRI), a sophisticated technique that measures the changes in brain activity associated with changes in blood flow, which is associated with the neuronal activation of a specific area.
This allows to detect which brain areas are activated after applying the active and the relationships between different brain areas through the calculation of correlation coefficients. For this *in vivo* brain analysis, 132 brain regions were analysed on the 20-volunteer subgroup to evaluate the brain connections after the application of a lotion containing 2% dosage of the active in order to understand how it activates *in vivo* the different brain pleasures areas of the participants. The study was carried out with a consortium between a Quantitative Imaging Biomarkers company and Hospital de la Fe in Valencia (Spain) and an ethical committee approval was required to conduct such study.
A series of correlation coefficient weighted matrices for every pairwise region of the brain was developed where red areas indicated strong brain activation and blue areas indicated a

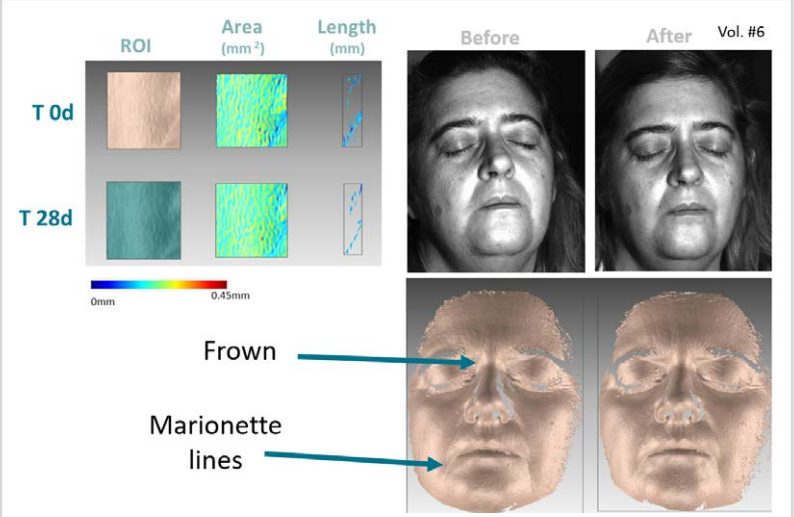

Fig. 5 Clinical evaluation of wrinkles.

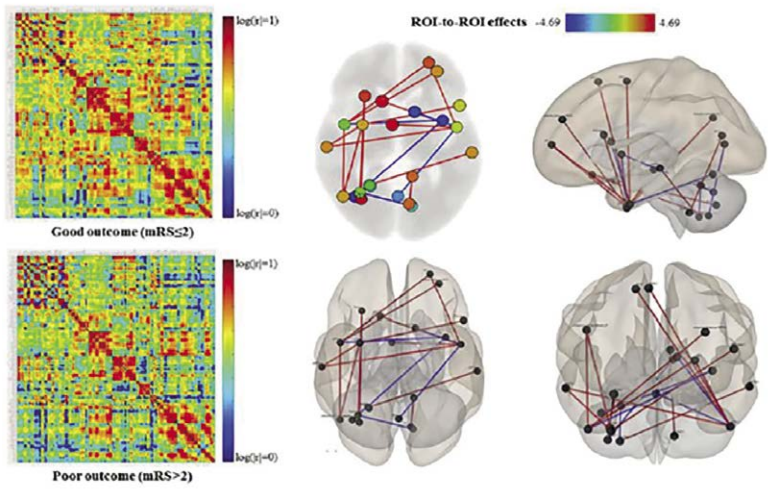

Fig. 6 3D brain model & Correlation coefficient matrices.

low brain activation. From such matrices, 3D brain models were elaborated to illustrate which brain areas were activated and connected (**Fig. 6**)

Compared to placebo, the results showed that the active demonstrated a higher positive brain activation at 15 minutes than placebo after application, while producing an even higher positive activation of the brain pleasure zones at 28 days (**Fig. 7**).

Kannabia Sense[PLF] demonstrated a higher activation of regions and significant brain connections than placebo, being those associated with the touch sense and affective processes, especially being the anterior cingulate cortex (ACC) and pallidum zones (part of the "lentiform nucleus" region which in turn is part of the "striate body") [8], the most relevant parts of the study and, also, a considerable activation of the orbitofrontal cortex (OFC).

It has been demonstrated that the ingredient activates and connects the same brain regions both immediately and in the long-term the subcallosal cortex and the temporal gyrus with the amygdala. Furthermore, the palladium and the amygdala on one hand, and the anterior cingulate cortex and the subcallosal cortex on the other hand, are regions especially involved in in the response to oxytocin and all located in proximity.

The active showed an activation profile like oxytocin, demonstrating its ability to activate the neuroendocrine skin-brain axis, similar to touch and massage and its emotional effectiveness. This activated brain pleasure regions are related to a greater social predisposition and attractiveness of the person.

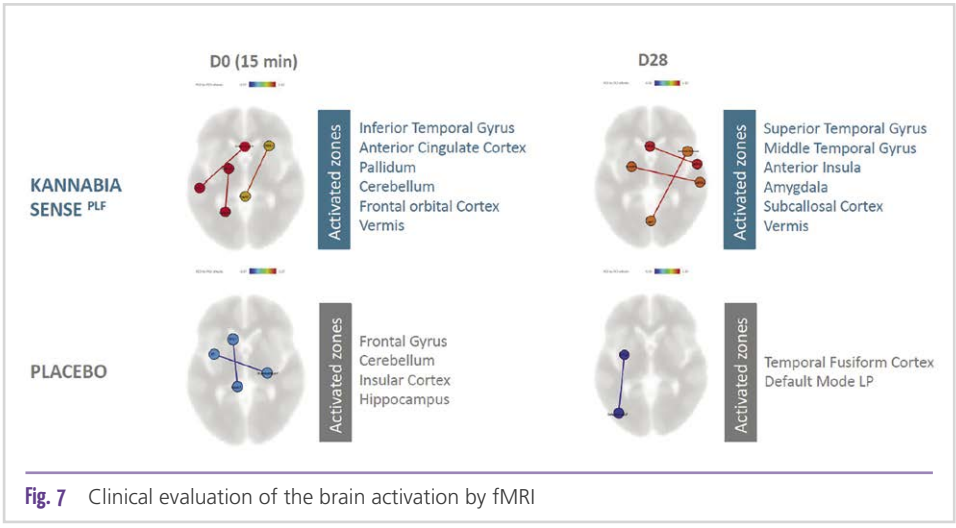

Fig. 7 Clinical evaluation of the brain activation by fMRI

Modulation of mood state:
The emotions generated in the 30 volunteers after the application of a cream containing 2% of the active were also analysed. The positive emotions of the volunteers increased up to 29% and the volunteers declared to feel more relaxed and confident, and happier (**Fig. 8**)

Conclusion

The active ingredient Kannabia Sense[PLF] is an innovative prebiotic treatment that stimulates the skin microbiota to produce a positive *in-situ* postbiotic cocktail that ignites the synthesis of cutaneous oxytocin. This process activates the brain pleasure centers, induces a better self-perception and positive emotional parameters, what ends up in a healthier and prettier skin.
Kannabia Sense[PLF] has a wide range of applications within the cosmetic sector: well-ageing, anti-ageing, and delicate facial treatments, restoring night creams, and uplifting massage lotions, for men and women.

This new Cannabis raw material based on plant stem cells is a step forward in the area of neuro-cosmetics due to an innovative mechanism of action what brings new benefits for the human skin while being respectful with the skin microbiota.

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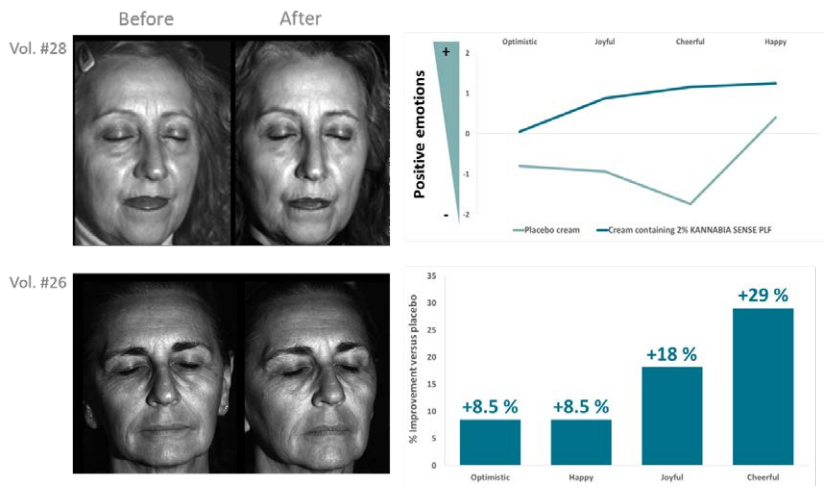

Fig. 8 Clinical evaluation of the positive emotions.

contact

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Dermal Delivery System of the Future

Peptides Steer Efficacy to the Point

S. Christian, V. Krug, A. Hidalgo

abstract

Modern active based cosmetics are characterized by increasing demands on their performance. Therefore, the efficacy of cosmetic active ingredients plays a key role in the development of new technologies. Penetration and the release of the active ingredients in the skin are important parameters in this context. These challenges can already be met successfully with the help of dermal delivery systems, in which the active ingredients are usually encapsulated. The X50 Capsules™ go one step further. By means of specific steering peptides on the capsule surface, it is possible to selectively transport the respective active ingredient to certain cells in the skin and thus directly to its corresponding site of action. The active ingredient is released inside the cell so that its full potential is developed where it is needed. The biocompatible and biodegradable capsule also prevents interactions between the active ingredient and the product formulation and protects the active from functional degradation on its way from the skin surface to its specific site of action in the cell. This selective and efficient approach can also prevent unspecific cell reactions as side effects and reduce dosages cost-effectively. Various *in vitro* and *in vivo* studies confirm the efficacy of this pioneering delivery system, which can revolutionize the efficiency of cosmetic active ingredients in a unique way.

Introduction

Effect and efficacy – a small but crucial difference

Active ingredients form an indispensable pillar for modern cosmetics. They can help to reduce wrinkles, firm contours, moisturize the skin or let it glow through an even complexion. Their diversity and potential are enormous and so they often become leading ingredients and ambassadors for entire product lines.

With constantly increasing demands on the performance and efficacy of cosmetic products, it is not surprising that active ingredients are continuously and extensively developed. Extensive scientific and technical know-how are essential on their way from the source out of the laboratory or nature to the finished product. They are intensively evaluated in efficacy studies and optimized in terms of process technology in order to deliver their full potential.

However, at the centre of the efficacy of a cosmetic active ingredient, there is a very simple connection: For an active ingredient to be efficacious in the skin, it is important that it reaches its specific site of action. As obvious as this may seem at first glance, still it is not that easy regarding the conditions in living skin. Both the penetration of the active ingredient and its bioavailability in the skin are decisive factors that determine its efficacy. Dermal delivery systems, in which the respective active ingredient is usually encapsulated, already offer a very good basis for fulfilling these requirements.

Active availability selectively as far as the cell level

The INFINITEC X50 Capsules™ (INCI: differs depending on the associated target cell and the containing active, see **Tab. 1**) were developed to precisely transport the active ingredient to its specific site of action in the corresponding cells.

These capsules have steering peptides on their surface that bind specifically and thus highly selectively to cell receptors of the specific target cell. In order for this to succeed, the chemical composition and structure of the steering peptides are

Cosmetic application	X50 capsule with active	+ steering peptide + activity	Target cell/receptor	INCI (preservative-free powder)
Anti-wrinkle	Collagen booster	+ peptid A + pro-collagen type I synthesis	Fibroblast/FGF	LACTIC ACID/GLYCOLIC ACID COPOLYMER, POLYVINYL ALCOHOL, HEPTAPEPTIDE-15 PALMITATE, COPPER HEPTAPEPTIDE-14 PANTOTHENATE
Anti-wrinkle	Hyaluronic acid booster	+ peptid A + synthesis of elastin		LACTIC ACID/GLYCOLIC ACID COPOLYMER, PALMITOYL TETRAPEPTIDE-50, POLYVINYL ALCOHOL, HEPTAPEPTIDE-15 PALMITATE
Glow	ATP booster	+ peptid A + pro-collagen type I synthesis		LACTIC ACID/GLYCOLIC ACID COPOLYMER, CHLORELLA VULGARIS (ALGAE) EXTRACT, POLYVINYL ALCOHOL, HEPTAPEPTIDE-15 PALMITATE
Anti-cellulite, reshaping	lypogenic/ adipogenic inhibitor	+ peptid B + lipolysis	Adipocyte/MC4	LACTIC ACID/GLYCOLIC ACID COPOLYMER, POLYVINYL ALCOHOL, COCCOLOBA UVIFERA FRUIT EXTRACT, ACETYL CYCLOHEXAPEPTIDE-34
Anti-expression lines (botox-like)	SNARE inhibitor	+ peptid C + Ca^{2+} blocking	Skin neuron/ delta-Opioid	LACTIC ACID/GLYCOLIC ACID COPOLYMER, PALMITOYL HEXAPEPTIDE-52, POLYVINYL ALCOHOL, PALMITOYL HEPTAPEPTIDE-18
Whitening, anti-age spots	melanin inhibitor	+ peptid D + reduction of UV-induced pigmentation	Melanocyte/MC1	LACTIC ACID/GLYCOLIC ACID COPOLYMER, PALMITOYL SH-OCTAPEPTIDE-24 AMIDE, POLYVINYL ALCOHOL, PALMITOYL SH-TRIPEPTIDE-5 NORISOLEUCYL SH-NONAPEPTIDE-1
Strengthen the skin barrier	ECM-proteins booster	+ peptid E	Keratinocyte/ ß1-Integrin	LACTIC ACID/GLYCOLIC ACID COPOLYMER, POLYVINYL ALCOHOL, PALMITOYL HEPTAPEPTIDE-27, PALMITOYL OLIGOPEPTIDE-78, PALMITOYL OCTAPEPTIDE-24

Tab. 1 Overview of the INFINITEC X50 Capsules™ with various active ingredients, cell selectivity and cosmetic application.

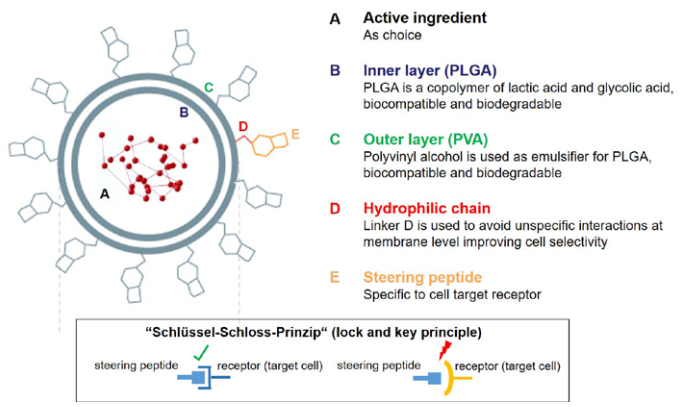

Fig. 1 Schematic description of the X50 capsule structure and function as well as the "Schlüssel-Schloss-Prinzip" (lock and key principle).

chosen for that they only match the receptors of the target cell intended for them (**Fig. 1**). This mechanism corresponds to the so-called "Schlüssel-Schloss-Prinzip" (lock and key principle), which was introduced in 1894 by the German chemist and Nobel laureate Emil Fischer to describe the substrate specificity of enzymes [1]. Through numerous research works in various scientific and medical fields, this pictorial analogy has been proven to be a basic model for the explanation of elementary life processes [2].

A biochemical reaction can only take place, if the key (substrate) fits into the lock provided for this (substrate-specific enzyme). The mechanism of the X50 capsules follows the same rule. Thus, the active ingredient contained in the capsules, for example to stimulate collagen synthesis, can develop its full potential exactly where it is needed: in fibroblasts as target cells. Therefore, the cosmetic efficacy of the corresponding active ingredient can be significantly increased.

The X50 capsule shell is made of two different layers. The inner layer consists of PLGA (poly(lactic-co-glycolic acid)), a copolymer of lactic and glycolic acid. The outer layer is made of PVA (polyvinyl alcohol). These two capsule materials are highly biocompatible and biodegradable. Therefore, they are not rejected as foreign substances in the skin, but decomposed into physiologically known substrates that are involved in various endogenous metabolic processes (e.g. in the citrate cycle). This means that they can also be available as a nutrient substrate for the target cell. The average particle diameter of the X50 capsules is 220 nm (size distribution above the declaration limit for nanomaterials).

The specific binding between the steering peptide and the receptor of the corresponding target cell activates intracellular signal transmissions. In the course of this, mechanisms related to the specific efficacy can already be stimulated, e.g. the activation of collagen and elastin synthesis (fibroblasts). Thus, there are synergistic effects between the steering peptides and the active ingredient inside the capsule. The uptake of the capsule into the cell is also initiated by the specific receptor binding. After enclosing the cell membrane and forming a lysosome, the X50 capsule is incorporated in its entirety into the cell interior (endocytosis). Due to the biocompatible properties of the capsule material, the capsule is released from the lysosome. This is followed by the enzymatic degradation of the capsule shell, which gradually releases the active ingredient from the inside of the capsule in a controlled manner, so that a long-term effect depot is created. This entire process is shown in **Fig. 2**.

Methods and results

Proven increase of efficacy through improved penetration and specific cell bindings

The penetration of an active ingredient after topical application is the first decisive step on the way to developing the desired efficacy. The skin barrier in the *stratum corneum*, which protects the skin against negative influences from the environment, but also against transepidermal water loss, has to be overcome [3, 4]. Skin penetration studies (*in vitro*/Franz cell, OECD 428 guideline, fluorescence analysis) show, that the X50 capsules penetrate much faster than corresponding capsules without steering peptides (**Fig. 3**).

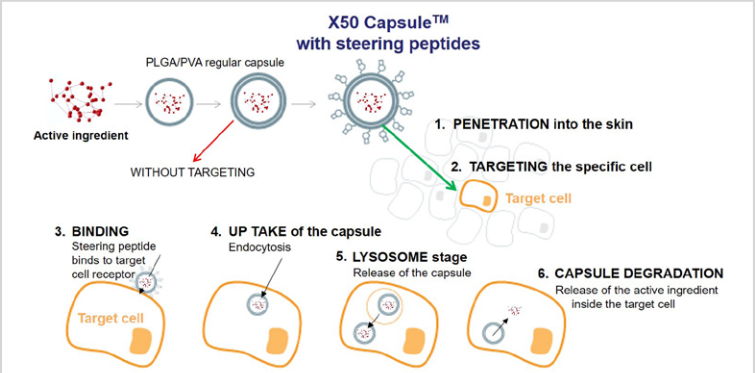

Fig. 2 Selective active delivery as far as the inside of the target cell.

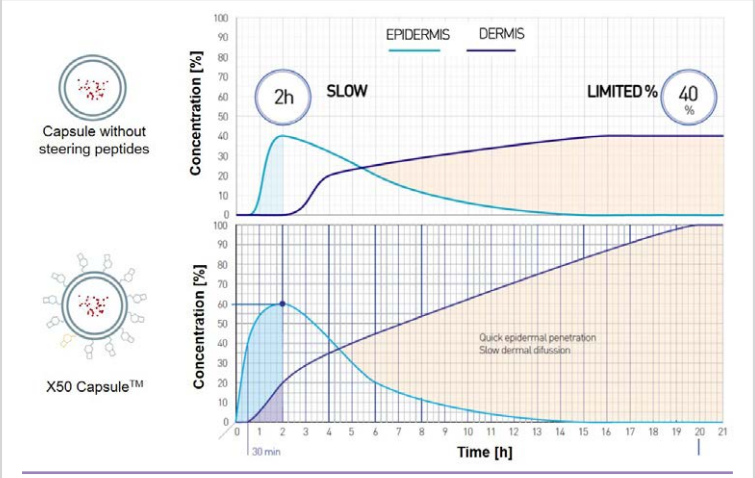

Fig. 3 *In vitro* skin penetration studies of X50 capsules with and without steering peptides (Franz cell, OECD 428 guideline, fluorescence analysis).

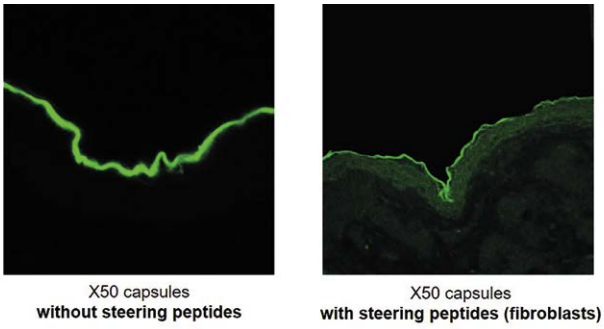

Fig. 4 Confocal microscope images of skin tissue cross-sections taken in the same time frame (*in vitro* skin penetration studies, Franz cell, fluorescent labelling of the X50 capsules). Left: X50 capsules without steering peptides. Right: X50 capsules with steering peptides (for fibroblasts).

After two hours, 60 % of the capsules with steering peptides penetrate into the epidermis. Regarding the corresponding capsules without steering peptides, only about 40 % penetrate in the same time period. Just 30 minutes after topical application, the capsules with steering peptides begin to diffuse into the dermis, which is completed quantitatively after 20 hours. Without steering peptides, the diffusion into the dermis is significantly more delayed and reaches a non-quantitative maximum value after a few hours, which does not increase over time.

Confocal microscope images of skin tissue cross-sections clearly show the different penetration and diffusion properties of the X50 capsules with and without steering peptides (**Fig. 4**, related to the penetration study described above/**Fig. 3**).

As described, the X50 capsules can bind specifically to the receptors of the corresponding target cell in the skin by means of the steering peptides. This enables a high level of cell selectivity, so that the respective active substance can be transported precisely to its site of action. **Fig. 5** shows this cell selectivity on the example of X50 capsules with steering peptides that specifically bind to the receptors of fibroblasts. Bindings to other cell types are non-selective with low incidence. In comparison, the binding of X50 capsules without steering peptides was also tested. It can be clearly seen, that these capsules bind non-selectively to all cell types considered in the experiment with an unspecific distribution.

The high cell selectivity of the X50 capsules with steering peptides not only enables the targeted delivery of active ingredients to increase their efficacy, but also prevents undesired side effects that could result from unspecific cell reactions. Therefore, the X50 capsules with steering peptides have a high safety profile.

The proven improved penetration/diffusion and the cell-specific binding of the X50 capsules with steering peptides compared to the corresponding capsules without steering peptides are fundamental requirements for increasing the efficacy of the active ingredients carried inside the capsules. The actual increase of efficacy is shown on the example of the stimulation of collagen synthesis (**Fig. 6**).

In this study, fibroblast cultures were treated with X50 capsules containing a peptide that stimulates the synthesis of collagen type I (X50 Antiaging; INCI (powder): Lactic Acid/Glycolic Acid Copolymer, Polyvinyl Alcohol, Heptapeptide-15 Palmitate, Copper Heptapeptide-14 Pantothenate). Both X50 capsules with and without steering peptides were evaluated and the collagen synthesis was measured over a period of six days via ELISA assay. In the case of the X50 capsules with steering peptides, a steadily increasing collagen concentration was determined during the analysis period. Looking at the capsules without steering peptides, the stimulation of collagen synthesis could be determined at a low level, but the incubation of the cell cultures over the analysis period (six days) did not result in a significant increase of collagen type I synthesis. Thus, the X50 capsules enable a significant increase of efficacy due to the contribution of the steering peptides.

As a consequence of the specific increase of efficacy related to the X50 capsules with steering peptides, the dosage can be reduced substantially. The recommended dosage is 0.001 % of X50 Capsules™ (powder), which corresponds to 1 % of 1 g of X50 capsules (powder) in 1 L of water. Due to this very advantageous combination of high cell selectivity and low dosage, the X50 capsules with steering peptides have an excellent safety profile.

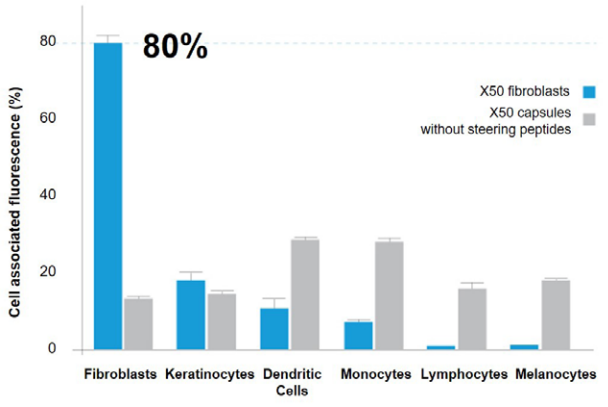

Fig. 5 Cell selectivity of the X50 capsules with steering peptides for fibroblasts (*in vitro* fluorescence labelling).

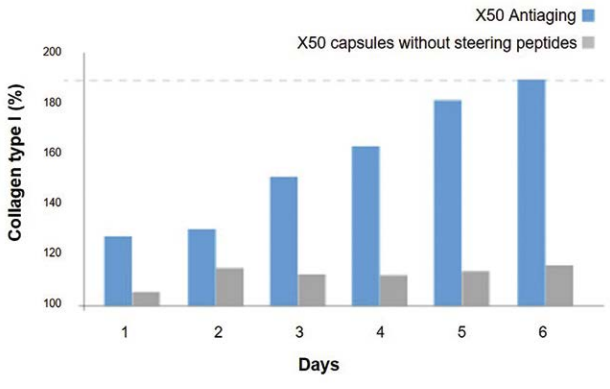

Fig. 6 Increased efficacy due to X50 capsules with steering peptides (fibroblast cultures; quantitative measurement of collagen type I synthesis via ELISA assay).

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The high efficacy of the X50 capsules loaded with active ingredients (hereinafter referred to as X50 actives) has been verified in various *in vivo* studies. The studies were designed in relation to the specific active ingredient function and focused, for example, on the reduction of wrinkle-determining parameters, the improvement of the radiance of the skin or the reduction of the intensity of age spots. One of these studies is described here as an example. It shows the reduction of expression lines by X50 Myocept (INCI (powder): Lactic Acid/Glycolic Acid Copolymer, Palmitoyl Hexapeptide-52, Polyvinyl Alcohol, Palmitoyl Heptapeptide-18), whose capsules bind selectively to the receptors of skin neurons.

The active ingredient contained in these capsules is a peptide that inhibits the formation of the SNARE protein complex from skin neurons to muscle cells. This interrupts the signal transmission for muscle contraction, which can reduce the intensity of expression lines. That process is similar to the one of the neurotoxin botulinum toxin (also known as botox), whereby the influence of botox results in a long-lasting blockade of the signal transmission for muscle contraction. The effect of X50 Myocept is temporary and briefly reversible as soon as the active is no longer applicated.

The mechanism of X50 Myocept clearly shows, that the function of cell-specific steering peptides does not only consist in the selective transport to certain target cells, but that the binding to the respective cell receptors already activates processes, which support the desired effect of the corresponding X50 active. The binding of the X50 Myocept capsule to the skin neuron already activates a physiological process that inhibits the uptake of Ca^{2+} ions into the interior of the skin neuron. As a result of the reduction of the Ca^{2+} ion concentration inside the skin neuron, fewer neurotransmitters for signal transmission are provided on the cell membrane of the neuron (here acetylcholine for triggering muscle contraction). The less acetylcholine is available on the inside of the neuron membrane, the weaker the signal transmission to the muscle cell and thus to muscle contraction. However, the signal transmission will only take place, if the so-called SNARE protein complex is formed between the skin neuron and the muscle cell. The peptide contained in the capsules additionally hinders the formation of this protein complex. This is done by steric hindrance in blocking the activity of the SNAP-25 protein, which is involved in the SNARE protein complex. The signal transmission for muscle contraction is counteracted in two parallel ways, so that the formation of expression lines can be effectively reduced. The desired efficacy is further increased by the synergistic effects between the steering peptides and the active ingredient inside the capsule.

The *in vivo* study to evaluate the reduction of expression lines was carried out with a panel consisting of 30 volunteers (male/female) aged 40-55 years. The formation of the expression lines on the outer eye contour (crow's feet) was determined with fringe projection (three-dimensional projection of the surface structure). The test product with 0.001 % of X50 Myocept powder (corresponds to 1 % of 1 g of X50 Myocept capsules (powder) in 1 L of water) was applied twice a day for a period of four weeks. Already after 14 days an average reduction of the expression lines by 12 % was determined, which could be increased to an average of 20 % (best result 27 %) after 28 days. **Fig. 7** shows two selected test results with the corresponding fringe projections.

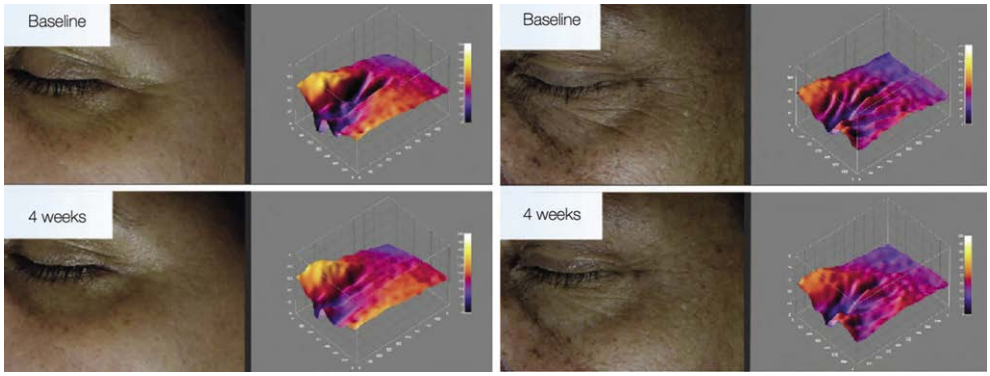

Fig. 7 Selected test results of the *in vivo* study on the reduction of expression lines (crow's feet).
Each on the left: before and after four weeks of application of the test product.
Each on the right: corresponding fringe projections.

One technology, many actives – X50 capsules as universal delivery system

With the help of X50 technology, numerous active ingredients can be encapsulated for various cosmetic applications. An existing selection is shown in **Tab. 1**. This technology is compatible with both hydro- and lipophilic active ingredients. Therefore, it can also be used as a platform for actives already incorporated in a product line to increase the potential of these active ingredients.

Outlook

The targeted active delivery to specific cells is, as described in this article, a modern and forward-looking approach to efficiently increase the efficacy of cosmetic actives. In a next step, a further distinction can be made inside the cell between individual cell organelles as specific sites of action. Mitochondria, for example, are the central powerhouses of cells [5] and therefore very interesting targets for some active ingredients. In the course of this, a new X50 active for mitochondria was developed, which will be available still in 2020.

Summary

The requirements for cosmetic active ingredients are as diverse as their respective mechanisms of action. However, they all have one thing in common: In order to develop their full potential, the active ingredient must be efficiently available in the skin at its specific site of action. This is a major challenge in the development of modern active based cosmetics. Dermal delivery systems offer very good properties to meet this challenge and are therefore very well established in this field.

The X50 capsules described in this article are a delivery system in which the respective active ingredient is encapsulated. In addition, these special delivery capsules have specific steering peptides on their surface that enable the active ingredient to be selectively transported as far as the inside of the specific target cells. Hence, the active ingredient can develop its full potential directly at the respective site of action. As the *in vitro* and *in vivo* studies show, the efficiency of cosmetic active ingredients can be significantly increased with the help of this forward-looking technology.

The target selectivity of the X50 capsules is achieved through the respective chemical structure of the corresponding

steering peptides, which bind specifically to receptors of the specific target cell. This mechanism corresponds to the so-called "Schlüssel-Schloss-Prinzip" (lock and key principle). The capsule is then incorporated in its entirety by endocytosis into the cell interior, where the active ingredient is gradually released in a controlled manner by enzymatic degradation of the biocompatible capsule material. The degradation products are substrates of the endogenous metabolic processes (e.g. citrate cycle) and can also be available as a nutrient substrate for the corresponding target cell. With the help of the X50 technology, various skin cells such as fibroblasts, melanocytes, skin neurons, adipocytes or keratinocytes can be steered very selectively by capsules loaded with active ingredients in order to stimulate collagen synthesis (capsules with anti-wrinkle active), to inhibit melanin production (capsules with whitening active) or to relax muscle contractions temporarily (capsules with anti-expression lines active).

The most important advantages of X50 Capsules™ technology compared to capsules without steering peptides or not encapsulated active ingredients are summarized below:

- Significant increase of efficacy through cell selectivity
- Synergistic effects between the steering peptides and the active ingredient inside the capsule
- Accelerated and quantitatively complete penetration/diffusion as far as into the dermis
- Continuous release of the active ingredient through enzymatic degradation of the biocompatible capsule material (controlled release, long-term effect depot)
- Stabilization of the active ingredient until its release in the cell
- Prevention of interactions between the active ingredient and the product formulation
- Low dosage possible with the same efficacy due to high efficiency
- Prevention of unspecific cell reactions and other side effects in combination with low dosage represents a high safety profile
- Easy handling in production process
- Highly cost-effective

The cell-specific X50 capsules are available or can be combined for different active ingredients and target cells and represent a particularly sustainable and modern approach to fully meet the high demands of today's active based cosmetics.

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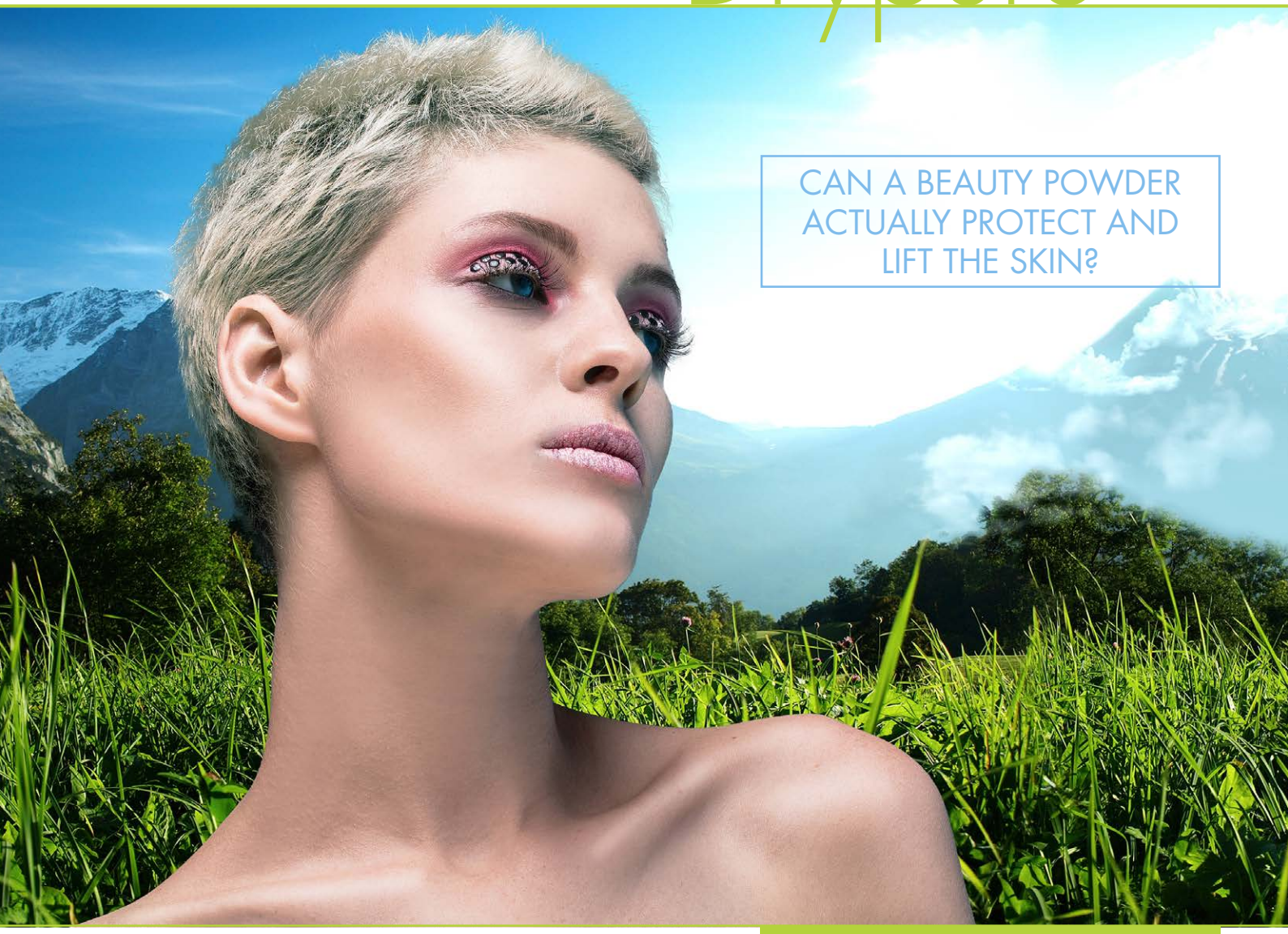

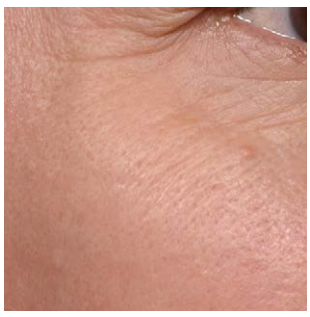

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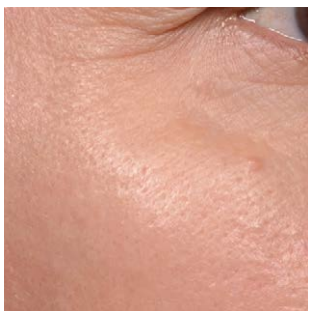

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Exclusive J-Beauty Ingredients for the European Skin Care Market

N. Subirats

abstract

Japanese Beauty appeared in the market as a strong defender of preventive rather than corrective solutions, with innovative developments and high-quality products with long-term reliability. This concept has had a big impact in our Western lifestyle, as it helps us to balance our stressful routines and brings us scientifically proven results. This article presents two ingredients developed by Kao Corporation for skincare. An emulsifier for W/O emulsions specially designed to avoid a sticky feel and easily spreadable, and an extremely moisturizing emollient with a skin biomimetic structure and non-greasy feel.

Beauty World

Today there are many global beauty trends in the market. The beauty industry across the world is developing brands inspired in each own culture for internal consumption while also exporting them globally. The demand for global beauty brands has grown due to globalisation and increased interest in foreign travel and culture, with the 'made in' stamp carrying more meaning than ever before. Beauty products from Japan were usually associated with efficacy, high-quality and benefit-led features. They are characterized by the simplicity and minimalism of Japanese rituals powered by extensive research and development.

The mission of Kao Chemicals Europe, as a part of the KAO Group, is to strive for the wholehearted satisfaction and enrichment of the lives of people globally and to contribute to the sustainability of society. Following our mission we would like to approach J-Beauty trend to Western lifestyle, providing preventive solutions with innovative developments and high-quality products with long-term reliability. This article presents two products developed by Kao Corporation for skincare: PENETOL GE-IS, a non-ionic emulsifier for W/O emulsions specially designed to avoid a sticky feel and easily spreadable, and EXCEPARL IS-CE-A, a cholesteryl ester with a skin biomimetic structure and a low melting point which is extremely poorly irritant to the skin. It shows characteristic emulsifying properties and excellent moisturizing performance.

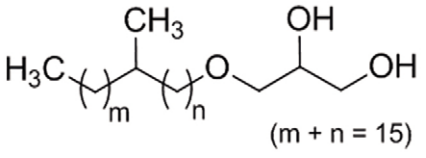

Fig. 1 Structure of Isostearyl Glyceryl Ether.

High Performance Water-in-Oil Emulsifier

An emulsion is the most common delivery form found on the skin care market. Emulsions are systems composed of two or more immiscible materials, in which one material (the discontinuous or internal phase) is suspended or dispersed throughout another material (the continuous or external phase) in separate droplets. The immiscible phases can be water, oil or silicone. Emulsifiers work by forming physical barriers that keep droplets from coalescing. When added to an oil-in-water (O/W) emulsion, emulsifiers surround the oil droplet with their non-polar tails extending into the oil, and their polar head groups facing the water. For a water-in-oil (W/O) emulsion, the emulsifier's orientation is reversed: non-polar tails extend outward into the oil phase, while polar head groups point into the water droplet.

W/O emulsions, with oil as the external phase, tend to feel more oily or greasy upon application and are perceived as a rich skin feel. This aesthetic property can be useful for some applications, such as sun care products, where the occlusive feel gives a greater sensation of protection. Innovation in W/O emulsifier technology offers the possibility to formulate W/O emulsions which have a more elegant skin feel, aesthetically pleasing for the consumer.

PENETOL GE-IS is an α-monoalkyl glyceryl ether, which has an isostearyl group as a hydrophobic portion and glycerine as a hydrophilic portion.

This emulsifier can stabilize W/O emulsions with high water content

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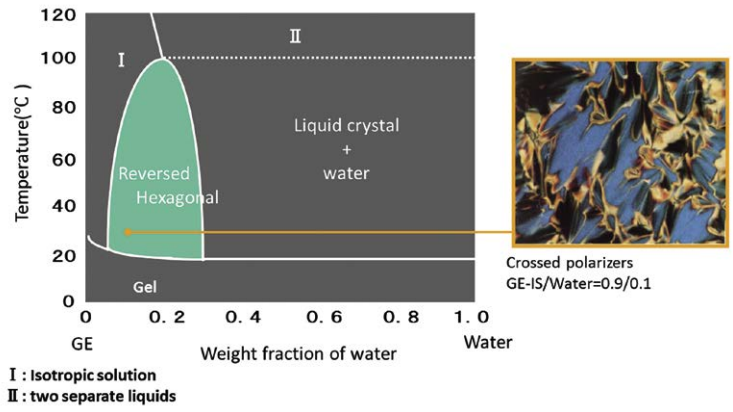

Fig. 2 Binary phase diagram of GE-IS /water system.

as a result of the formation of the liquid crystalline phase over the emulsion system. GE-IS forms the hydrophobic reversed hexagonal liquid crystal over a wide temperature and concentration range (**Fig. 2**). Angular texture was observed with a polarized microscope, so it is confirmed that this phase was a liquid crystal with hexagonal structure. This creates a sort of three-dimensional crystalline meshwork in the emulsion that actively contributes to the rheology and the stability of it. In turn, this would restrict the movement of water droplets keeping them apart to prevent coalescence. [1]

The formation of the liquid crystalline phase allows the formulator to create light, non-oily skin-feel W/O emulsions. Furthermore, the fluidity and dynamism of this meshwork contributes to the sensorial properties upon application on the skin.

PENETOL GE-IS can be used to create stable high internal phase W/O emulsions, known as HIPEs. Emulsions where the volume ratio of the dispersed phase is greater than or equal to 0.74 (which is the maximum packing density of monodisperse spheres) are called high internal phase emulsions. These emulsions have a high surface/volume ratio and viscoelastic rheological properties. Moreover, the well-defined hydrophobic and hydrophilic regions of the dispersed system allow the incorporation of molecules of different nature.

HIPE emulsions containing PENETOL GE-IS produce a light texture without the typical oiliness and stickiness of W/O emulsions, as well as the effect of maintaining skin moisture and flexibility (**Tab. 1**) [2]. The high amount of water trapped in the reversed hexagonal structures is immediately available when the emulsion is applied on the skin, leaving a fresh and light feel.

Biomimetic Cholesteryl Ester Compound

Cholesterol is widely distributed in nature, especially in the animal body where it is found in almost all systems, including brain cells, and it is believed to play an important role in physiological processes. Intercellular lipids in the *stratum corneum* help maintain the skin healthy by regulating its water-retaining capacity and barrier function [3]. **Fig. 3** shows the composition of lipids in the *stratum corneum*.

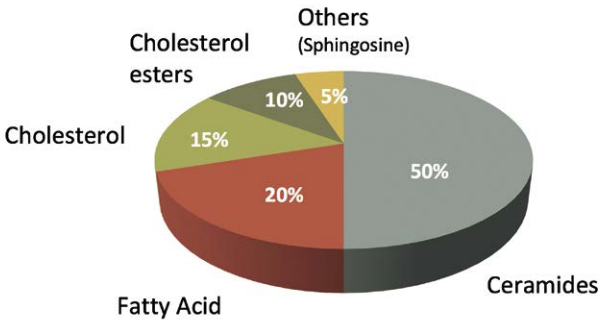

Fig. 3 Composition of intercellular lipids in the *stratum corneum*.

Emulsion type	Easy to spread	Moisture feel	Smooth feel	Water resistance	Emulsion stability
O/W	Good	Good	Good	Poor	Good
W/O	Medium	Excellent	Medium	Excellent	Medium
GE-IS model W/O (High water content)	Good	Excellent	Good	Excellent	Good

Tab. 1 Features of high-water content W/O emulsion.

Cholesterol can react with fatty acids to give the corresponding cholesteryl esters. Cholesterol ester is one of structural components of intercellular lipids, and plays a key role in keeping the skin moist. The use of these lipids as the oil component of cosmetic emulsions is of interest.

Most natural cholesteryl esters consist of straight alkyl chain fatty acids with a high melting point. EXCEPARL IS-CE-A is a biomimetic emollient that supplements the physiological function of the skin through the same mechanism as the intercellular lipids in the *stratum corneum*. EXCEPARL IS-CE-A is a methyl branched isostearic acid cholesteryl ester (**Fig. 4**) with a low melting point and is extremely poorly irritant to the skin.

It shows an excellent moisturizing performance and characteristic co-emulsification properties, allowing wide range of cosmetics applications such as skin care cosmetics and shampoo and hair conditioner products.

When EXCEPARL IS-CE-A is used as part of the emollient system in a multilamellar emulsion, the skin surface texture is improved and the water-holding capacity of the *stratum corneum* is recovered (**Tab. 2**). Here IS-CE-A stabilizes the lamellar association structure by intermolecular interaction, thus enhancing the content of bound water.

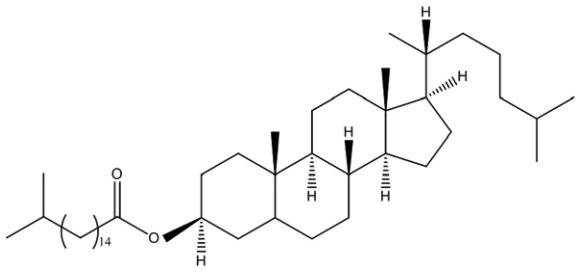

Fig. 4 Structure of Cholesteryl Isostearate.

Oil type	Material	Water hold %
Ester	EXCEPARL IS-CE-A Cholesteryl Isostearate	<300
	Isopropyl Myristate	14
	Octyldodecyl Myristate	53
Hydrocarbon	Liquid paraffin	13
	Squalane	14
Triglyceride	Triethylhexanoin	29
	Caprylic/Capric Triglyceride	32
Monoglyceride	Glyceryl Stearate	175

Tab.2 Water hold property is a measure of the total amount of water that can be absorbed per gram of emollient.

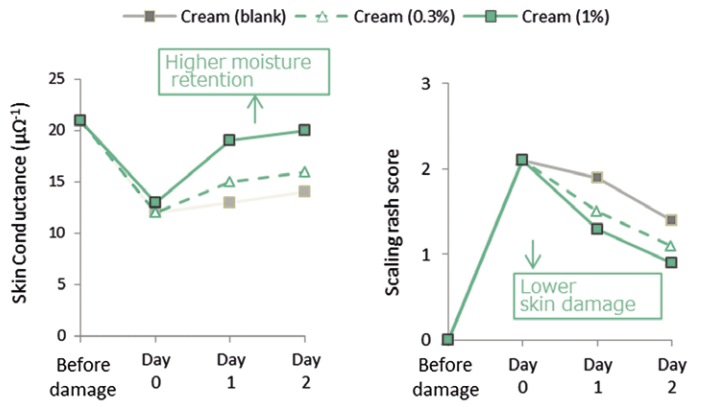

Fig. 5 Recovery of skin moisture and damage after artificial exposure using acetone-ether and application of W/O cream containing EXCEPARL IS-CE-A. W/O cream (blank): 2% PENETOL GE-IS, 3%petrolatum, 5% squalene and 10% octyl-dodecyl myristate.

The healthy skin surface is smooth and soft, because it is covered by a properly hydrated *stratum corneum*, an extremely thin and soft barrier membrane produced by the underlying normal epidermis. By contrast, skin surfaces covering pathological lesions exhibit dry and scaly changes and the *stratum corneum* shows poor barrier function. The water-retaining capacity of the *stratum corneum* is quantitatively evaluated by measuring skin conductance [4]. **Fig. 5** illustrates the moisturizing efficacy of EXCEPARL IS-CE-A at two concentration levels compared to a W/O emulsion (blank) without IS-CE-A, by applying the same amount to the respective skin areas and conducting the measurements at one and two days of application. The skin reaction, including scaling, was observed three days after acetone/ether treatment under the same conditions as conductance measurements. Scaling was assessed according to the following scale: no scaling=0, slight scaling=1, moderate scaling=2, marked scaling=3.

Topical applications of % EXCEPARL IS-CE-A in a W/O cream to acetone/ether induced dry skin showed a significant recovery of water-retaining properties associated with improvement in scaling vs that induced by the base cream.

Another property of EXCEPARL IS-CE-A is as a co-emulsifier suitable for O/W or W/O emulsions, obtaining extremely stable emulsions in combination with Cholesterol and Lecithin [5]. The combination of IS-CE-A and cholesterol could be used to obtain stable emulsions at a weight ratio from 90:10 to 10:90. For preparing the emulsion, lecithin is useful for stabilizing the emulsions (**Tab. 3**). The emulsion test was carried out as follows: 45 parts of olive oil, 2 parts of the emulsifier mixture tested and 53% parts of deionized water were heated to 70°C and stirred.

Skin Care Cream – High Water Content W/O

EXCEPARL IS-CE-A is used in amounts of 0.1 to 10wt% together with amounts of 0.5 to 25wt% of PENETOL GE-IS to obtain a cosmetic product of W/O type which can be used for protecting or treating dry skin [6]. Skin care Cream-high water content W/O illustrated in **Tab. 4** is a clear example of efficacy and high quality with benefit-led features that represent J-Beauty trend.

Emulsifier mixture composition (wt%)			Emulsion type	Stability (1 day at 25°C)
EXCEPARL IS-CE-A	Cholesterol	Lecithin		
5	5	90	O/W	stable
10	10	80	O/W	stable
20	20	60	O/W	stable
30	30	40	W/O	stable
40	40	20	W/O	stable
50	50	0	W/O	stable
Stearic acid cholesteryl ester	**Cholesterol**	**Lecithin**	**Emulsion type**	**Stability**
5	5	90	W/O	unstable
10	10	80	W/O	unstable

Tab. 3 Stability of O/W and W/O emulsion containing EXCEPARL IS-CE-A as emulsifier.

Skin Care Cream – High water content W/O

Ingredients	Wt%
EXCEPARL IS-CE-A *Cholesteryl Isostearate*	1.0
PENETOL GE-IS *Isostearyl Glyceryl Ether*	2.0
PEG-10 Hydrogenated Castor oil	0.2
Dimethicone	6.0
Squalane	4.0
Isopropyl Palmitate	3.0
Caprylic/capric Triglyceride	2.0
Glycerine	10.0
Magnesium Sulfate	0.7
Preservative	q.s
Fragrance	q.s
Water	balance

Tab. 4 Formulation guideline.

Conclusion

Beauty products from Japan tend to be associated with efficacy, high-quality and benefit-led features. PENETOL GE-IS and EXCEPARL IS-CE-A are two ingredients developed by Kao Corporation for Skin Care that bring the J-Beauty trend closer to Western lifestyle. PENETOL GE-IS is an emulsifier for W/O emulsions specially designed to avoid a sticky feel and easily spreadable. EXCEPARL IS-CE-A is an extremely moisturizing emollient with a skin biomimetic structure and non-greasy feel.

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Evaluation of Barrier Protection Properties of Jojoba Esters

T. Quinn, R. Harper

abstract

This research evaluates the ability of jojoba esters and hydrolyzed jojoba esters to protect the skin from insults consumers are exposed to everyday, such as pollution, sensitizers, and commonly used personal care ingredients. Jojoba esters and hydrolyzed jojoba esters are jojoba derived emollients that are commonly included in cosmetic and personal care products for their aesthetically pleasing properties and functionality, which include their ability to moisturize and protect the skin. Consumers encounter a variety of insults to the skin daily, including pollution, allergens, UV rays, as well as various ingredients included within personal care products, such as surfactants, alpha hydroxy acids, and fragrance. A series of *in vivo*, vehicle-controlled studies were carried out to determine if a combination of jojoba esters and hydrolyzed jojoba esters could protect the skin (i.e. reduce symptoms of irritation) from the following everyday insults: antiperspirant actives, pollution, and known sensitizers (i.e. allergens). The results show that jojoba esters and hydrolyzed jojoba esters provided statistically significant benefits for reducing perceived irritation / sensitivity, barrier disfunction (i.e. TEWL), and erythema.

Introduction

Hydrolyzed jojoba esters and jojoba esters are derived from jojoba oil (Simmondsia chinensis) and are commonly used in cosmetic and personal care products to impart multiple skin benefits such as hydration, barrier repair, and barrier protection [1,2], while also providing an aesthetically pleasing jojoba emollience to the skin. Since hydrolyzed jojoba esters and jojoba esters are derived from a wax ester (i.e. jojoba oil), they also allow for "oil-free" claims. Jojoba esters are naturally occlusive and are available with a range of melting points resulting in the ability to tailor the skin feel of a finished product using only one INCI name. Hydrolyzed jojoba esters are also occlusive and can provide water, wear, and transfer resistance to finished formulas. Hydrolyzed jojoba esters can also trap small molecules like glycerin and glycolic acid at the skin's surface, allowing these molecules to function longer [3]. The current research evaluates the skin protection properties provided by hydrolyzed jojoba esters and jojoba esters when they are included within antiperspirants, o/w emulsions, and ointment delivery systems (see **Tab. 1**).

Materials and Methods

All studies were IRB-approved, randomized, double-blind, vehicle-controlled, and carried out under controlled temperature and humidity conditions (20-22°C and <50% relative humidity).

Antiperspirant Sensitivity Reduction

A blend of hydrolyzed jojoba esters (1.0%) and jojoba esters (0.5%) were evaluated for their ability to reduce pain (i.e. discomfort due to stinging, burning, and itching), reduce sensitivity (i.e. irritation), and improve consumer perception after antiperspirant application. All evaluations were made compared to a vehicle formula (see **Tab. 1**) without the jojoba derivatives. Female subjects (n=14) underwent a three-day washout followed by once daily applications of each antiperspirant for one week (three swipes of the antiperspirant stick to the underarm). Subjects evaluated pain scores on a scale of 1 - 10 (where 10 was the most painful) immediately, 15 minutes, and 30 minutes after the first application of the antiperspirant and completed a consumer

Antiperspirant		Lotion		Ointment	
Ingredient	%wt./wt.	Ingredient	%wt./wt.	Ingredient	%wt./wt.
Cyclopentasiloxane	q.s.	Water	q.s.	Water	q.s.
Aluminum / Zirconium Tetrachlorohydrex-GLY	22.00	Glyceryl Stearate (and) PEG-100 Stearate	4.00	Stearic Acid	12.50
Stearyl Alcohol	17.40	Cetyl Alcohol	3.00	Propylene Glycol Monostearate	3.50
Hydrogenated Castor Oil	4.10	Glycerin	2.00	Butylene Glycol	2.00
Aluminum Starch Octenylsuccinate	3.00	Preservative	0.70	Glycerin	2.00
Ethyl Macadamiate	1.50	Xanthan Gum	0.20	Glycol Stearate (and) Stearamide AMP	1.00
C12-15 Alkyl Benzoate (and) Stearalkonium Hectorite (and) Propylene Carbonate	1.00	Disodium EDTA	0.03	Aloe Barbadensis Leaf Juice	1.00
Talc	0.50			Preservative	1.00
Fragrance	0.30			Triethanolamine	0.50
Lactic Acid	q.s.			Magnesium Aluminum Silicate	0.40
				Polyquaternium-10	0.30
				Tetrasodium EDTA	0.20
				Fragrance	0.20

Tab. 1 Vehicle Test Article Compositions (%wt./wt.).

perception survey 30 minutes after the first application of antiperspirant. Subjects also evaluated sensitivity on a scale of 0–3 (0 = none, 1 = mild, 2 = moderate, 3 = severe) daily for one week of at-home antiperspirant use.

Antipollution Properties

Hydrolyzed jojoba esters (2.0%) and jojoba esters (4.0%) were evaluated separately within a simple lotion (see **Tab. 1**), as compared to the vehicle lotion, for antipollution properties in two separate studies. For the first study [4], male and female subjects (n=22) received twice daily applications (AM and PM) of the lotions to their backs, for a total of five applications. Each test site was then exposed to pollution (i.e. tobacco smoke) for 20 minutes. Gas chromatography – mass spectrometry was used to determine the malondialdehyde (MDA) concentration pre- and post-pollution exposure. MDA was used as an indicator of skin lipid oxidation due to pollution.

For the second study, the same lotions were evaluated using Urban Dust (i.e. atmospheric particulate collected in an urban area) [5] as the pollutant. Once daily applications of each lotion were made to the volar forearms of male and female subjects (n=37) over three days. After each lotion application, the test sites were exposed to Urban Dust under occlusion for 24 hours using a 19 mm Hill Top® Chambers [6] with Webril®. Transepidermal water loss (TEWL) measurements were conducted using a Tewameter® TM 300 (in duplicate) [7] at baseline and after final patch removal.

Sensitizer Induced Erythema Reduction

A blend of hydrolyzed jojoba esters (5.0%) and jojoba esters (26.0%) were evaluated compared to a blend of known skin protectants, petrolatum (30.0%) and dimethicone (1.0%), within ointments for the mitigation of skin reactions due to

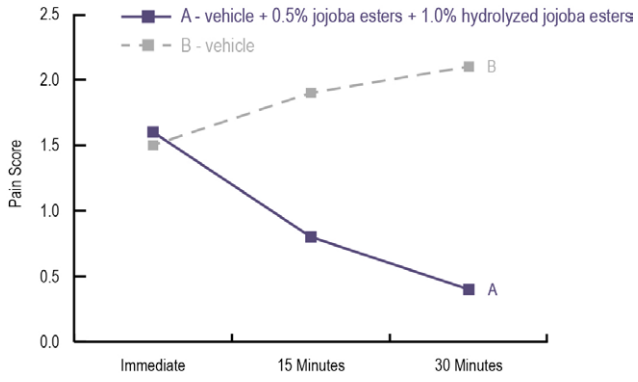

Fig. 1 Evaluation of perceived pain post antiperspirant application.

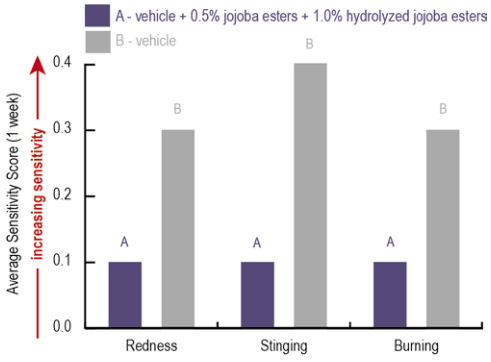

Fig. 2 Evaluation of subjective irritation after one week of antiperspirant use.

two known sensitizers [i.e. nickel (II) sulfate heptahydrate and urushiol] as compared to the vehicle (see **Tab. 1**). After confirmation of sensitivity (i.e. caused redness, stinging, burning, and/or itching) to nickel or urushiol (i.e. poison ivy), one application of each ointment was made to the forearms of male and female subjects (n=5 or n=9, respectively). Each test site was then exposed (under occlusion) to nickel or urushiol for 48 or 4 hours, respectively, using a Finn Chamber® [8]. Erythema was evaluated at baseline, and 30 minutes and 48 hours post-patch removal using the Mexameter MX 18 (in triplicate) [7] and visual grading [on a scale of 0 - 3 (0 = none, 1 = mild, 2 = moderate, 3 = severe)].

Results

The antiperspirant containing hydrolyzed jojoba esters and jojoba esters reduced subjective pain scores (i.e. discomfort due to stinging, burning, and itching) by 59% and 83% ($p<0.01$), 15 and 30 minutes after application, respectively, compared to the vehicle antiperspirant without the jojoba derivatives (**Fig. 1**). Additionally, after one week of use, hydrolyzed jojoba esters and jojoba esters reduced subjective irritation scores (i.e. redness, stinging, and burning) by up to 77% ($p<0.01$) as compared to the vehicle antiperspirant without the jojoba derivatives (**Fig. 2**). The consumer perception survey (data not shown) also revealed that of the consumers who indicated a preference, 86% ($p<0.05$) of them preferred the antiperspirant containing hydrolyzed jojoba esters and jojoba esters for less irritation, less stinging, burning, and itching, and best overall product performance. It is also important to note, that the inclusion of hydrolyzed jojoba esters and jojoba esters did not inhibit the efficacy of the antiperspirant active [3].

Hydrolyzed jojoba esters and jojoba esters demonstrated antipollution properties. The lotions containing hydrolyzed jojoba esters and jojoba esters reduced MDA concentrations up to 15% in skin that was exposed to tobacco smoke and produced up to 40% less of an increase in TEWL ($p<0.01$) in skin that was exposed to Urban Dust (**Fig. 3**).

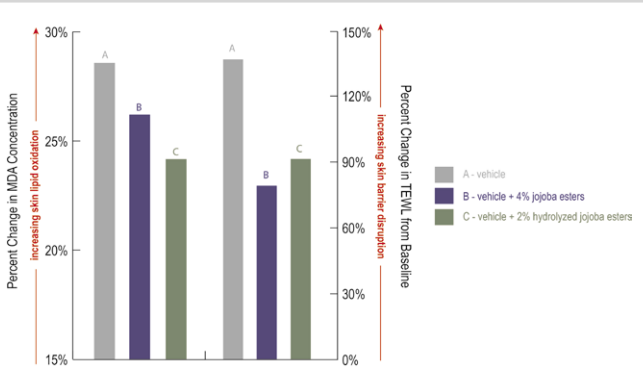

Fig. 3 Evaluation of antipollution properties post lotion application.

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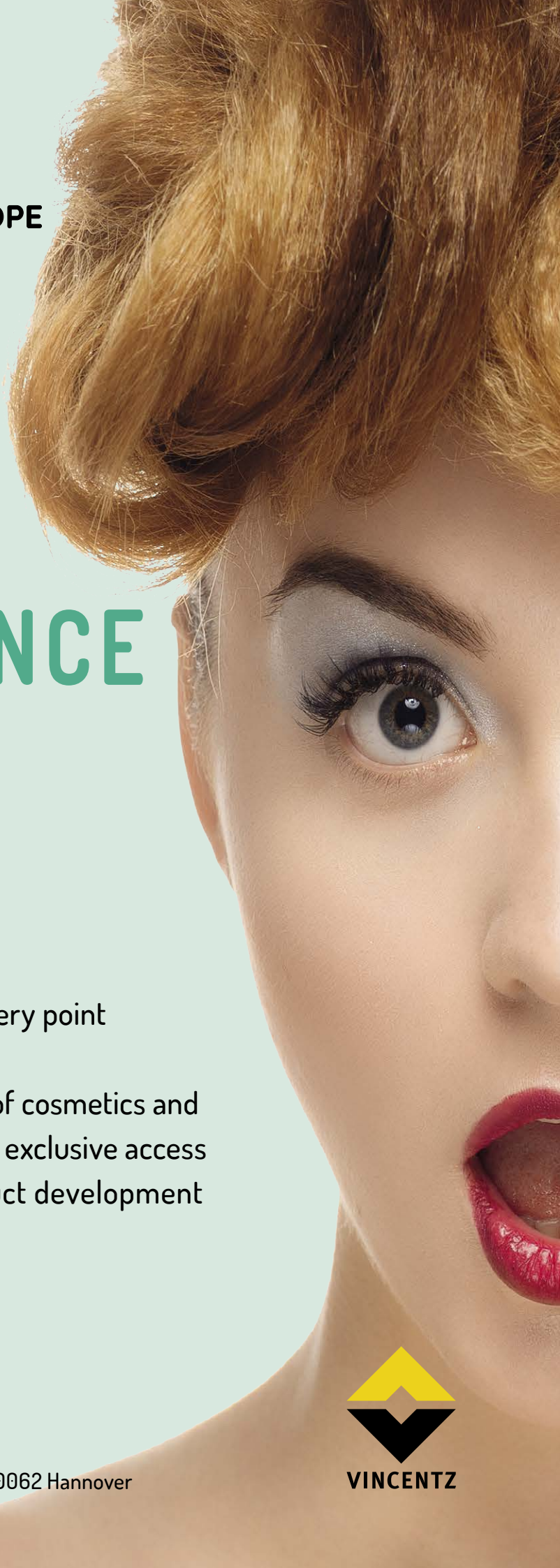

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The ointment containing hydrolyzed jojoba esters and jojoba esters provided protective qualities by reducing erythema (Mexameter) by up to 49% ($p<0.10$) compared to the ointment containing petrolatum and dimethicone, and also producing directionally significantly ($p<0.10$) less erythema (Mexameter) than the vehicle at both evaluation time points when applied prior to nickel exposure (**Fig. 4**). Similar results were seen for urushiol (**Fig. 5**), where the inclusion of hydrolyzed jojoba esters and jojoba esters reduced erythema (Mexameter) up to 78% compared to the vehicle ointment ($p<0.10$). The inclusion of jojoba derivatives also produced directionally significantly ($p<0.10$) less erythema (visual) than the vehicle ointment and the ointment containing petrolatum and dimethicone 30 minutes after patch removal. The inclusion of petrolatum and dimethicone also resulted in statistically significantly ($p<0.05$) less erythema (visual) than the vehicle 30 minutes after patch removal when applied prior to urushiol exposure.

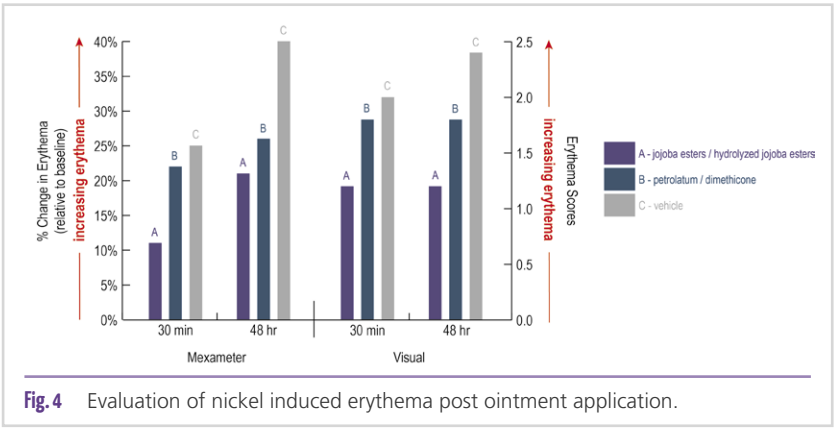

Fig. 4 Evaluation of nickel induced erythema post ointment application.

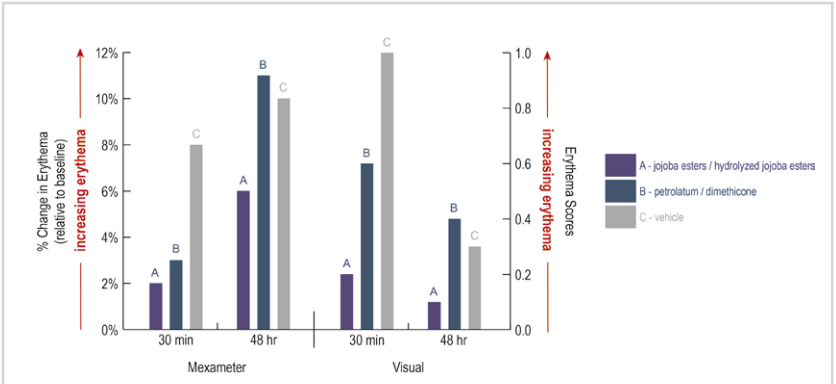

Fig. 5 Evaluation of urushiol induced erythema post ointment application.

Discussion

Jojoba esters and hydrolyzed jojoba esters are ideal for use in diaper rash creams, ointments, anti-itch treatments, and other personal care and OTC category products due to their skin barrier protection and skin barrier recovery capabilities. Previous research demonstrates how jojoba esters and hydrolyzed jojoba esters increase skin smoothness, improve skin barrier function, increase skin hydration, and improve consumer perception of finished products [1,2]. These studies demonstrate that these jojoba derived ingredients can also prevent symptoms of irritation such as burning, stinging, itching, redness, and barrier disfunction (increased TEWL) caused by irritants and sensitizers that consumers are exposed to everyday. Incorporating jojoba esters and hydrolyzed jojoba esters into everyday use consumer products not only provides the oxidative stability attributed to jojoba-derived ingredients, but also provides protective and restorative benefits to the skin.

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Ready for the Biotic Revolution

New active ingredients for next-generation skin and scalp care solutions

S. Leoty-Okombi, C. Boury, C. Kalem, A. Courtois, V. André-Frei, P. Moussou, D. Rival

abstract

Cosmetics that contain prebiotic and probiotic ingredients are rapidly gaining popularity around the world because consumers associate these materials with health, wellness and sustainability. BASF's innovative biotic ingredients Phytofirm® Biotic and Scalposine™ enable cosmetics manufacturers to develop next-generation skin and hair care solutions that respond to this growing trend – while preserving the youthful appearance of skin and making hair more beautiful.

Prebiotic, probiotic or postbiotic – when monitoring current trends and claims in the cosmetics market, there is virtually no way around these terms. New beauty rituals involving biotic skincare products are taking over the personal care market with claims related to moisturization, soothing properties and anti-aging, as well as skin and scalp protection. 28 percent of all skincare products launched in Europe and the US between December 2018 and November 2019 contained fermented ingredients, while 54 percent of these products claimed an anti-ageing effect [1]. Clearly, there is a new player in the game. Yet, technically speaking, biotics is no invention of the 21st century. In fact, scientists have been harnessing the properties of these materials for over a century.

In the 1900s, the Nobel Prize-winning zoologist and immunologist Ilya Ilitch Metchnikov discovered the mode of action of lactic ferments. The term probiotic was used for the first time in the 1950s, when scientists discovered substances in human milk that had a positive effect on bifidobacteria, which are most commonly found in the intestines and stomach. In the early 2000s, the first clear definitions of probiotic and prebiotic became widely used. Probiotic means "in favor of life" and is generally used to refer to microorganisms or their derived substances that produce a beneficial effect on the microbiome in the body. This might involve restoring the balance of bacteria in the digestive system or strengthening the body's immune system. Prebiotics refers to the substances that these bacteria eat. In this context, the International Scientific Association for Probiotics and Prebiotics (ISAPP) was founded in 2002. In 2014, ISAPP issued its official definition of probiotic: "Live microorganisms that, when administered in adequate amounts, confer a health benefit on the host." [2] Three years later, the association defined prebiotics as follows: "A substrate that is selectively utilized by host/commensal microorganisms conferring a health benefit."[3]

These health benefits have become increasingly attractive for consumers across markets – and particularly for skin and face care products in the cosmetics industry. Products with a biotic claim are associated with health, wellness and eco-friendliness. 47 percent of US women aged 18-44 who use beauty products already take oral probiotics for general wellbeing, and these consumers are now seeking cosmetic products that contain biotics. In fact, 16 percent of US women aged 18 or over are interested in buying skincare products that have fermented ingredients in them. [1]

At the same time, metagenomic studies are becoming more affordable. Researchers can now compare the microbiome of a healthy person to an unhealthy person. This leads to the discovery of next-generation biotics contributing to health – and to the creation of applications in cosmetic products.

A probiotic ferment for preserving youthfulness

BASF has developed Phytofirm® Biotic to support cosmetics manufacturers in creating probiotic anti-ageing skin products. *In vitro* and *in vivo* testing has proven that this innovative probiotic rejuvenates the youthful appearance of the skin from head to toe by contributing to an increase of the production of collagen I, collagen V and elastin. It is obtained by fermenting soybean extract from non-GMO, traceable Euro-

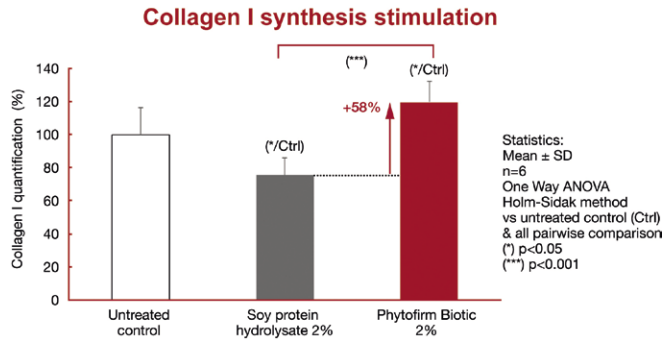

Fig. 1 *In vitro*: Comparison of performance between Phytofirm® Biotic and a soybean protein hydrolysate on collagen I synthesis by fibroblasts.

pean soybeans using the *Lactobacillus plantarum* strain. This generates an extract that is rich in peptides and lactic acid. It now offers manufacturers worldwide an effective alternative to soy protein hydrolysate when making probiotic skin care products. (**Fig. 1**)

Rejuvenating three key components of the skin

In vitro, Phytofirm Biotic (INCI: Lactobacillus/Soybean Ferment Extract, Pentylene Glycol, Caprylyl Glycol) increases the synthesis of three important extracellular matrix (ECM) components within fibroblasts: collagen I, collagen V and elastin. In this way, it addresses changes in the dermal matrix that make the skin less elastic, less dense and thinner [4]. These changes lead to the contours of the face becoming less defined, as well as skin sagging or becoming less smooth – which are all widely considered to give the skin an ageing appearance. Of course, these effects are related to individual characteristics, however, they are also accelerated by external factors like exposure to sunlight, cigarette smoking or pollution. At cellular level, the changes in the dermis are mainly the result of defects in the function of fibroblasts, which are the first contributors in synthesizing ECM components including collagen I and V, and elastin.

Collagen I is the most abundant ECM molecule. It is produced by fibroblasts and is known to provide a structural scaffold for cell attachment, which has an impact on tissue organization and tissue homeostasis by affecting cell growth, motility, viability and differentiation [5]. Collagen V is less abundant than collagen I, but is necessary for the development of a functional skin matrix [6] because it acts as a regulator for fibril-forming collagen. *In vitro* quantified respectively by radiolabeling and immunoassay, collagen I was shown to increase by 59 percent in dermal fibroblasts as a result of Phytofirm Biotic, while collagen V was shown to increase by 51 percent (data not shown). On top of this, the active ingredient also induced a network of longer and more entangled collagen I and V fibers compared to untreated control. This leads to better ECM organization, and improved dermis and skin densification – which contributes to increased skin thickness (**Fig. 2**).

Elastin is responsible for the elasticity and resilience of the skin. Its overall quantitative and qualitative decline during ageing includes the loss of structural integrity due to proteolytic enzymatic activity [7]. *In vitro*, elastin synthesis quantified by colorimetric method increased by 34 percent as a result of Phytofirm Biotic (**Fig. 3**). The active ingredient also slowed down elastin degradation by 48 percent by inhibiting elastase activity ($p<0.05$. data not shown).

A randomized, double-blind study was conducted with 42 female volunteers aged from 55-63 years old who considered themselves to have lost skin elasticity and firmness, especially in the lower face area. The study aimed to assess the efficacy of Phytofirm Biotic on skin elasticity and skin thickness

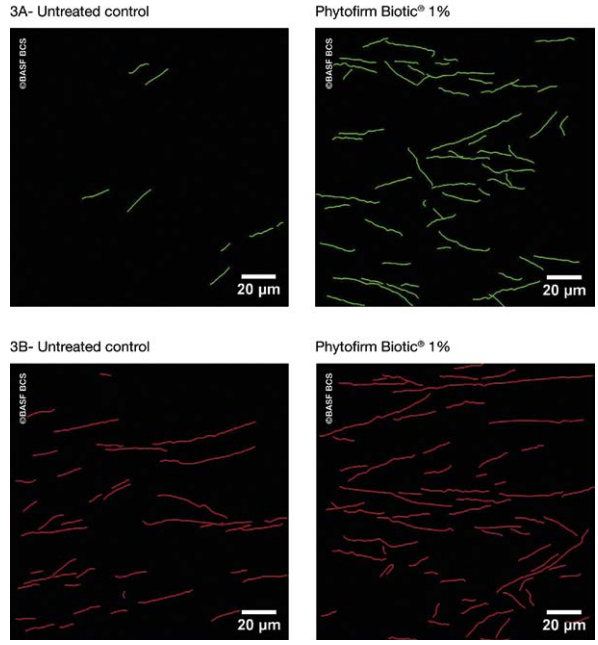

Fig. 2 *In vitro*: Orientation of (A) collagen I and (B) collagen V fibers in fibroblasts monolayer culture Phytofirm Biotic vs untreated control.

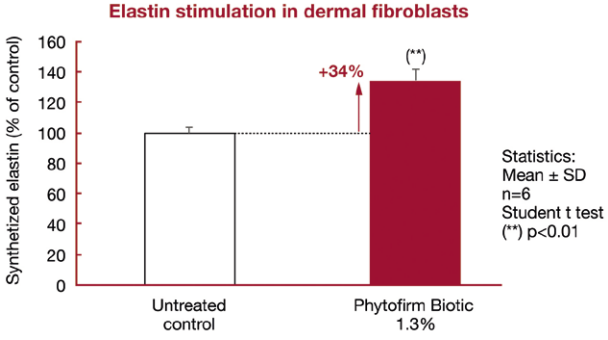

Fig. 3 *In vitro*: Stimulation of elastin synthesis in fibroblasts.

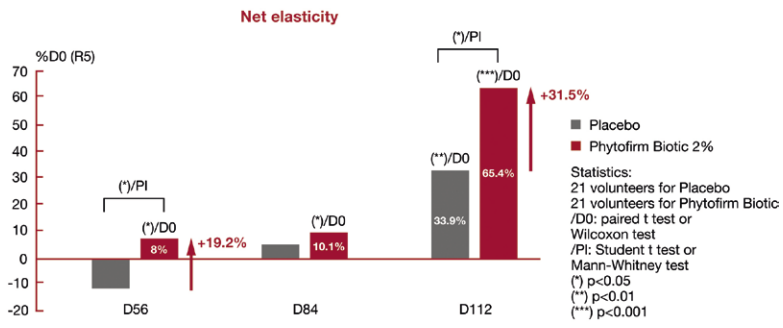

Fig. 4 Net elasticity of skin in the jaw area after Phytofirm® Biotic and placebo treatments.

in the jaw area compared to the baseline and to a placebo formula. The active ingredient was formulated at 2 percent in an emulsion and applied to the entire face twice a day for 112 days. Skin elasticity was evaluated using a Cutometer through different parameters: net elasticity (R5), immediate recovery (R7), global elasticity (R2) and elastic recovery (Q2). Skin thickness was measured using Dub Skin Scanner TPM Ultrasound with a 22MHz Long Probe. Measurements were made at baseline (D0), as well as after two months (D56), three months (D84) and four months (D112) of applying the product.

Overall skin elasticity was improved after treatment with Phytofirm Biotic. Compared to baseline, the active ingredient showed an 8-percent, 10.1-percent and 65.4-percent increase in the net elasticity parameter R5 at D56, D84 and D112. Compared to the placebo, the active ingredient exhibited a 19.2-percent and 31.5-percent improvement in R5 at D56 and D112, respectively (**Fig. 4**). These results were consistent with the improvement of the other measured skin elasticity parameters, R2 and R7 (data not shown).

Phytofirm Biotic also showed an 8-percent and 14-percent increase in the elastic recovery parameter Q2 at D56 and D112, respectively. Compared to the placebo, the active ingredient offered a 16.5-percent improvement in parameter Q2 at D56 and a 13.6-percent improvement at D112 (**Fig. 5**).

And alongside the improvements in skin elasticity and elastic recovery, Phytofirm Biotic also led to an increase in skin thickness as measured with the DUB Skin Scanner. The skin thickness increased by 9.8 percent compared to the baseline and by 6.5 percent compared to the placebo at D112 (**Fig. 6**).

Restoring the balance of the scalp microbiota

Scalposine™ (INCI: Glycerin, Water, Sarcosine) is another new active ingredient from BASF. It is proven to soothe and purify the scalp by decreasing the production of oily substances and replenishing beneficial microbiota. Scalposine tackles the impact that modern lifestyles can have on the scalp and its microbes. First, stress can cause the sebaceous glands in the hair follicles to produce too much sebum, which makes hair greasy or oily. And second, urban living can cause dust

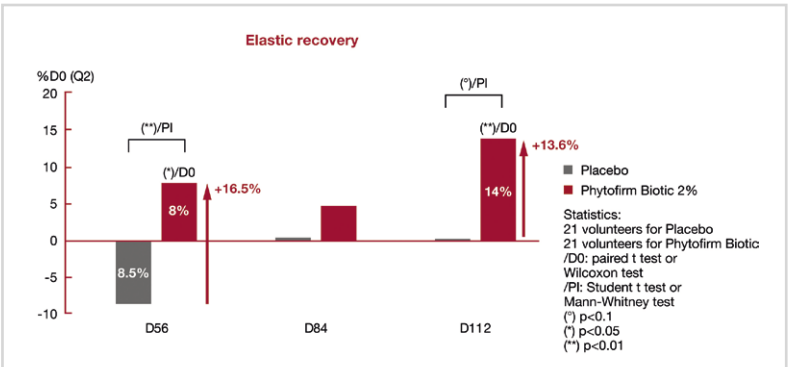

Fig. 5 Elastic recovery of skin in the jaw area after Phytofirm® Biotic and placebo treatments.

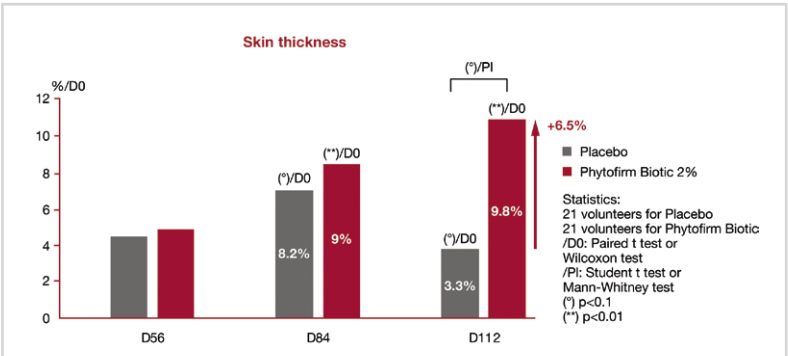

Fig. 6 Skin thickness after Phytofirm® Biotic and placebo treatments.

or pollution to form deposits on the scalp and hair fibers. The combination of these two factors changes the physiological parameters of the scalp – and disrupts the fragile balance of the microbiota. Scalposine contributes to the removal of grease and impurities while offering a prebiotic effect that replenishes beneficial strains of microbes in the scalp. It contains the active ingredient Sarcosine, a precursor of glycine, which is an amino acid that is essential for building major skin macromolecules such as elastin and collagen.

A proven prebiotic effect on the scalp

On top of its impact on decreasing sebum overproduction, Scalposine has also been proven in *in vivo* tests to reset and rebalance the microbiota ecosystem of the scalp. BASF recently conducted a metagenomic study to explore the difference between the microbiota of a normal scalp and that of an oily scalp. 40 volunteers with an oily scalp and 28 volunteers with a normal scalp participated in the study. Scientific studies in the past had already shown that skin microbiota diversity decreases in particularly oily areas of the skin such as the forehead [8]. However, BASF's new analysis has now demonstrated that oily scalps have less diversity in some species of microbiota than normal scalps.

In addition, researchers from BASF identified six strains of bacteria that have a significant presence in normal scalps and make a major contribution to overall scalp health. Based on this, further metagenomic analysis was conducted to compare the effect of a mask formula containing Scalposine against a placebo. The results confirmed that the new solution increased the number of species present on the scalp by 36 percent after one month of application vs placebo (**Fig. 7**). Beyond this, Scalposine also supports the recolonization of the scalp by the abovementioned six beneficial strains of bacteria. This indicates a prebiotic effect because the active ingredient was shown to stimulate the growth of advantageous scalp bacteria.

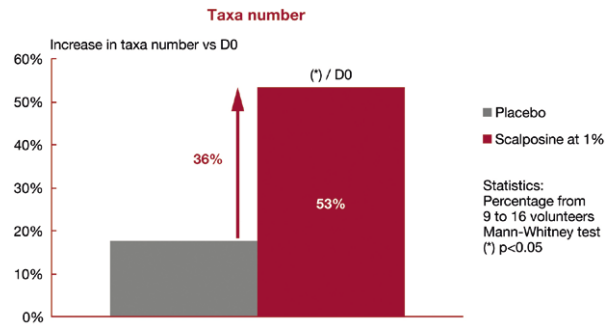

Fig. 7 Increase in diversity after Scalposine™ and placebo treatments.

Conclusion

Two new active ingredients from BASF – Phytofirm Biotic and Scalposine – open up exciting opportunities for companies to respond to the increasing demand for biotic cosmetics.

Phytofirm Biotic is a nature-based ingredient for anti-ageing skincare products. It is proven by *in vivo* and *in vitro* testing to improve the synthesis of three extracellular matrix (ECM) components that play a key role in the appearance of the skin. In this way, it can be used to make probiotic products that give consumers more youthful-looking skin.

Scalposine can be used to make haircare products with prebiotic properties that restore and replenish the balance of the microbiome in the scalp. *In vivo* testing has shown that it increases the diversity of the microbiome of the scalp while stimulating the growth of beneficial scalp bacteria – making people more comfortable and making hair more beautiful.

Formulations (see p. **46–49**)

Body Milk Mist (SC-ES-17-1610-21)
Night Recovery cream (SC-FR-16-011-F014)
Biome Balance Mask (HB-FR-19-BC-50845-02)
Advanced Scalp Detox Shampoo (HB-FR-19-BC-50777-03)

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Simple Analytical Method for the Quantification of Aroma Molecules in Aqueous Media

R. Kudla, D. Rusch, J. S. Gutmann, L. Tsarkova

abstract

Aroma molecules (fragrances) are indispensable components of many cosmetic and wellness products. This work demonstrates the possibility of quantitative determination of aroma molecules in carrier salts (flavored salts for bath-wellness and as components of detergent compositions) based on the surface activity of aroma molecules. The aqueous solutions of three differently coloured carrier salts with different loaded fragrance composition have been studied using dynamic tensiometry (maximum bubble pressure). The fraction of the carrier (coarse/fine) and the amount of the dissolved flavoured salts have been varied. Also, the effect of the artificial aging on the amount of the loaded aroma molecules has been revealed. The demonstrated approach can be used for the optimizations of compositions and of the manufacturing processes of fragrances-containing products, as well as for the assessment of the release/evaporation of fragrances from the products.

Further development of the proposed approach will make it possible to evaluate the molecular interactions of aroma substances with other components of detergents and of cosmetic formulations, such as surfactants, polymers, salts and pigments.

Introduction

Fragrances provide a superior quality to the products in cosmetic, textile, wellness or home-care branches, and are therefore often used as consumer triggers in marketing strategy. The fragrance industry intensively supports R&D activities to gain know-how in the field of synthesis, characterization and application of fragrances, including the understanding of their olfactory function. In industrial praxis, odour assessment is usually performed by human sensory analysis, by chemo-sensors, or by gas chromatography, including electronic sensing devices.

One of the most common problems is the aging of cosmetic and personal care products, which leads to the changes or considerable loss of odour during storage, transport or application. Furthermore, often non-trivial effects occur when fragrance compositions are added to multi-component systems, as a result of different solubility in water, volatility as well as of specific interactions of aroma molecules with other formulation components.

Manufacturers and suppliers of perfume ingredients can not always provide recommendations on the optimal application of particular aroma molecules or fragrance compositions in various products. Moreover, in most cases such knowledge, although quite desirable, is not available for the user in view of the multi-component nature of the compositions of the products.

The aim of the present research is to develop a simple analytical method to quantify fragrances in multi-component liquid formulations (e.g. in creams, perfumes, oils, liquid soaps, etc.) as well as in solid carrier products (e.g. in salts, fats, capsules, scented wipes, etc.).

The scientific principle of this method is based on the recently disclosed high dynamic surface activity (in the millisecond range) of aroma molecules, what clearly differentiate them from other conventional components in formulations (surfactants, polymers, fats) and thus represents a unique characteristic of a fragrance compound (composition) [1]. This simple analytical method implicates the measurement of the dynamic surface tension of aqueous solutions (or water extracts) of the products.

Here we present the results of the characterization of the aqueous solutions of three flavoured salts using the method of dynamic maximum bubble pressure tensiometry under variation of the carrier grain size and concentration, as well as under artificial ageing.

Materials & Methods

Aroma molecules citral, geraniol, citronellal, citronell oil and linalool (NHU Europe GmbH), flavoured salts with pink, blue and green colours (CIPA S.p.a) have been used as received.

The surface tension σ was measured using maximum bubble pressure tensiometry, which allows determination of dynamic surface tension at the air-water interface as a function of the age of a newly formed surface. In this dynamic method air pressure is set up in a capillary, which is immersed in a testing solution. An air bubble is formed at the end of the capillary, and its internal pressure changes continuously as the radius

grows (see in **Fig. 1** the stages (**a**), (**b**), (**c**)). The surface tension is calculated from the difference between the maximum and minimum pressures in each air-bubble formation process. This allows the bubble lifetime (i.e. the lifetime of the formed surface and thus the adsorption time) to be varied with great accuracy from a few tenths of a millisecond to hundreds of seconds. We note that commonly used characteristic of surfactant solutions is a static surface tension, which corresponds to equilibrium adsorption conditions (infinite surface age).

Measurements have been performed using "Sita pro line t100" tensiometer (SITA GmbH) with a capillary made of polyether ether ketone (PEEK) at a temperature of 25 ± 0.5 °C. Solutions have been prepared using Milli-Q purified water.

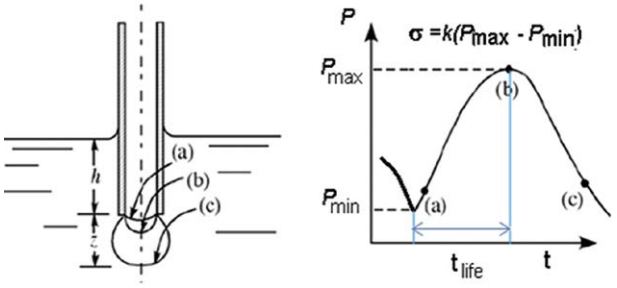


Fig. 1 Schematic representation of the measuring principle of the maximum bubble pressure tensiometry for the determination of the dynamic surface tension of aqueous solutions .The surface tension is calculated from the measurement of the pressure difference (P_{max}-P_{min}) in the bubble in a capillary with a known radius r, as indicated.

Results

Earlier it was shown that studied aroma molecules, e.g. poorly soluble in water monoterpene alcohols, are able to rapidly reduce the surface tension of the water as a result of their fast adsorption at water-air interface [2].

Fig. 2 shows time dependencies of the surface tension of saturated solutions of different fragrances (**Tab. 1**). As clearly seen, all studied solutions exhibit already in the millisecond range a significantly reduced surface tension as compared to pure water. The surface activity of geraniol (5) is higher than that of fragrance compounds with an aldehyde group (Figure 2, curves (2) and (4) for citronellal and citral, correspondingly).

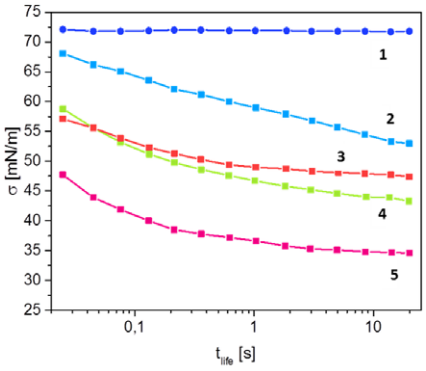
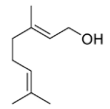
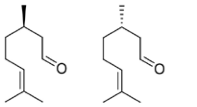
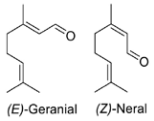
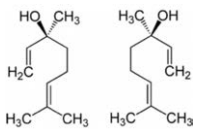


Fig. 2 Dynamic curves of the surface tension of water (1) and of solutions saturated with citronellal (2), citronell oil (3), citral (4) and geraniol (5) as a function of the bubble lifetime t_{life}.

Aroma molecule	Purity (GC) [%]	Structural formula	Molecular weight [g/mol]	Solubility in water at 20 °C [g/L]	Density [g/cm³]	logP at 20 °C	Boiling point [°C]
Geraniol	98.7	 Geraniol	154.25	0.686	0.878	3.28	229-230
Citronellal	98.8	 (*R*)-Citronellal (*S*)-Citronellal	154.25	0.07	0.849	3.530	208
Citral	97.8	 (*E*)-Geranial (*Z*)-Neral	152.23	0.42	0.886	2.330	225
Citronell oil	Geraniol (25-45 %) & Citronellal (25-54 %). Citral. Eugenol & Vanillin		154.25	–	0.849-0.878	–	208-230
Linalool	98.9	 (S)-(+)-linalool (left) and (R)-(–)-linalool (right)	154.25	1.589	0.858	2.44	198-200

Tab. 1 Physicochemical properties of studied aroma molecules.

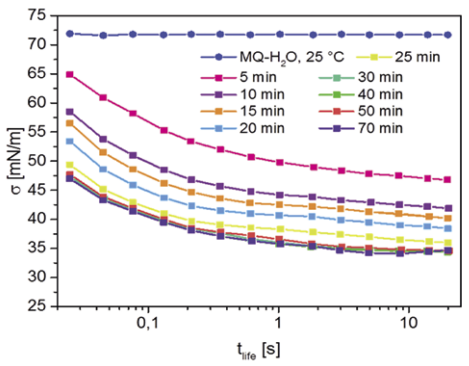


Fig. 3 Dynamic curves of the surface tension of geraniol solution as a function of the bubble lifetime t_{life}, each measured after indicated saturation time.

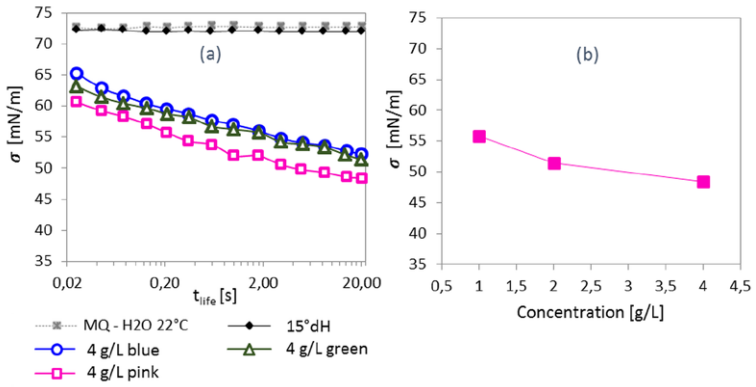


Fig. 4 (a) Dynamic surface tension of water (grey symbols), synthetic water with a water hardness of 15 °dH (black symbols) and of solutions of flavoured salts with a concentration of 4 g/L (pink, green and blue symbols). (b) Surface tension (at 20 s surface age time) of pink salt solutions versus the concentration of the product in the solution.

This effect cannot be entirely attributed to the higher solubility of geraniol (5) as compared to the investigated aldehydes (**Tab. 1**). In reference [2] it has been shown that the saturated solutions of the monoterpenes nerol and linalool show a similar kinetic dependence of the surface tension to that of geraniol, despite large differences in solubilities (1.45 g/L for linalool and practically insoluble for nerol). The saturated solution of citronell oil, which is a natural multicomponent mixture of geraniol, citronellal and citral (**Tab. 1**), is also characterized by a reduced surface tension already in the millisecond range, although in the literature citronell oil is referred to as an insoluble in water fragrance. The scientific question related to the "structure-property relationship" of such aroma molecules with regards to their molecular structure, volatility and interfacial activity is currently under further investigation.

Saturated solutions of the studied aroma molecules have been prepared by adding an excess of the organic phase to water and continuous stirring for at least two hours to achieve saturation with molecularly dissolved aroma molecules. During this process the concentration of the molecularly dissolved species increases, which has a measurable effect on the surface tension of water. As exemplarily shown in Figure 3 for geraniol solution, the measured surface tension decreases over the entire period of the bubble-lifetime with increasing the stirring time of the oil phase in water. The decrease of the surface tension is due to the growth of the molecular concentration in solution, which simultaneously leads to a higher adsorption at the air-water interface. Before each measurement, the solutions were filtered through a polyether sulfone filter (with a pore size of 500 µm) to remove excess oil droplets from the solution. This step was found to be necessary to achieve a good reproducibility of the surface tension measurements.

Fig. 3 clearly shows that the tensiometric measurements have a high sensitivity with regards to the concentration of aroma molecules in aqueous solutions, so that a calibration curve (isotherm) can be generated and used to determine unknown concentration in test solutions.

It should be noted that, the concentration of molecularly dissolved perfumes in the solution can be assesed by measuring the dynamic surface tension with maximum bubble pressure method and compared with the solubility data, which is available in literature. The concentration at which the minimum value of the surface tension is achieved according to the calibration curve (isotherm) corresponds to the limit of the molecular solubility of the investigated substance. The discrepancy observed in our studies (e.g. for citronell oil and nerol [2]) can be explained by the existence of so-called "meso-solubility" of organic liquids in water, which results in the formation on meso-droplets of oil with sizes of few hundred nanometers [3].

Demonstrated surface activity of aroma molecules was used to analyse flavored salt products, which apparently differ in colour and in composition of loaded fragrances. **Fig. 4a** shows kinetic curves of the solutions of pink, green and blue salts, as well as the surface tension of water with a hardness of 15 °dH. Also the examined salts were fractionated and divided into coarse and fine (less than 1 mm) fractions.

Fig. 5 shows the surface tension of solutions of pink and green salts as a function of the salt concentration in the solution and its fraction. From the measurements it can be seen that the fragrances are loaded onto the surface of the salts

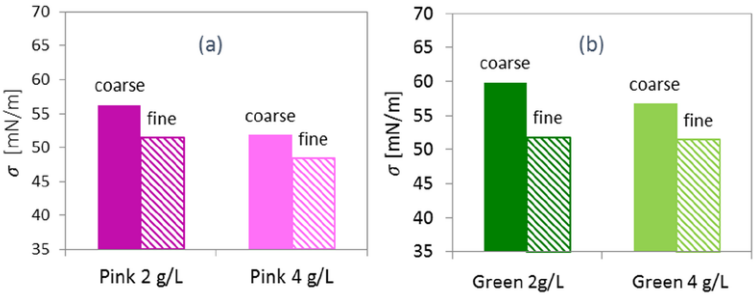


Fig. 5 Surface tension (at 20 s surface age time) of the solutions of coarse and fine fractions of pink (a) and green (b) salts with concentrations of 2 g/L and 4 g/L.

grains. A finer salt fraction has a larger surface area than a coarse fraction of the same mass. Accordingly, when the fine grains are dissolved, a larger amount of fragrance is released in the solution, resulting in a lower surface tension as compared to that of the coarse fraction.

As shown in **Fig. 6**, dissolving a larger amount of the fine fraction of the green salt (4 g/L) does not lead to a further decrease in the surface tension as compared to the solution with 2g/L salt. Presumably, the amount of the loaded fragrance exceeds the solubility limit in water, so that the excess of fragrances in solutions with a concentration of 4 g/l is likely dissolved in a form of mesoscale oil droplets.

This simple and quick method can also be used to evaluate the ageing of products containing aroma molecules. To demonstrate this, the pink salt was artificially aged by storing under exhaust snorkel with a defined exhaust air rate of 1 m^3/h for 24 hours. **Fig. 7** shows the surface tension of the solutions of the original and of the artificially aged pink salt.

By performing similar tests and tensiometry measurements it is possible to evaluate quantitative information regarding the concentration decrease of a fragrance (and respective loss of the product quality) and accordingly to develop recommendations on the optimal storage of a product.

Summary

The possibility of quantitative assessment of the content of aroma molecules in carriers (flavoured salts for wellness and as components of detergent compositions) using maximum bubble pressure tensiometry is demonstrated. Further, the evaluation of the stability and shelf-life of the products was performed. The demonstrated approach can be used for the optimization of compositions and manufacturing processes of products containing aroma compounds, as well as for quantitative evaluation of the release/evaporation of fragrances from capsules, carriers or products.

Another important aspect of the developed method is the possibility to evaluate the actual molecular solubility of aroma molecules, which are typically poorly soluble in water. A comparison of the measured values with the available in literature data shows that the latter rather refers to the so-called mesoscale solubility of organic liquids in aqueous media.

Further on-going development of the proposed approach will allow evaluation of the molecular interactions of fragrance molecules with other components of cleaning and cosmetic formulations, such as surfactants, polymers, salts and pigments.

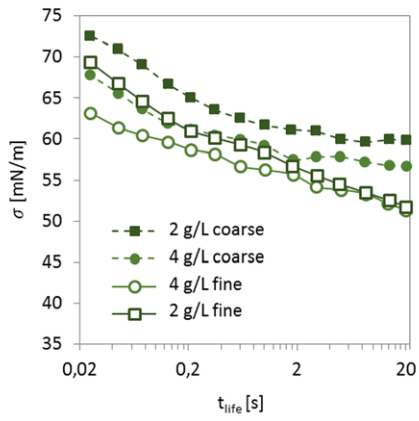


Fig. 6 Dynamic surface tension of solutions of green salts with a concentration of 2 g/L and 4 g/L for coarse and fine fractions.

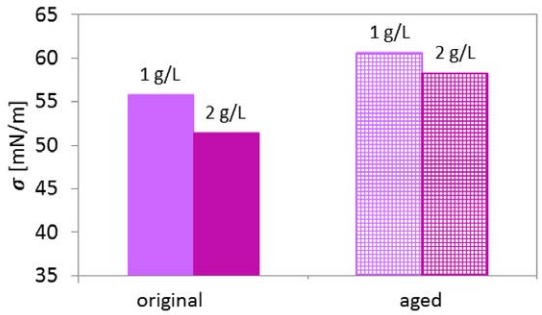


Fig. 7 Surface tension (at 20 s surface age time) of pink salt solutions with a concentration of 1 and 2 g/L before and after artificial ageing.

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Microbiological Requirements for Cosmetic Products – the ISO 17516 and the Interpretation of Test Results

B. Fellenberg

1. Introduction

Cosmetic products must be safe and harmless to health from the time they are placed on the market until they are used by the customer. The European Cosmetics Regulation (EC) 1223/2009 sets the legal framework for this.
This health safety also includes the microbiological quality of a product. The ISO 17516 as the state of the art specifies limit values for this.
This article should help you to interpret microbiological test results of cosmetic products and to be able to react accordingly in case of a positive result.

2. Contents and requirements

The ISO 17516 contains microbiological limit values for cosmetics. Even though this standard is not directly linked to EU cosmetics legislation, it has largely established itself as the central standard for the interpretation of microbiological test results of cosmetics. This standard is also used by the authorities. The standard distinguishes between two product groups:

- Cosmetics intended for children under three years of age, the eye area and mucous membranes.
- All other cosmetics

Tab. 1 shows the requirements from ISO 17516.

3. Interpretation of the limit values

Insofar as the limit values of ISO 17516 (see **Tab. 1**) are not exceeded for the respective product categories, the microbiological quality according to ISO 17516 is not objectionable and the requirements of the standard are considered to be fulfilled.
Regarding the quantitative limit values for the total number of aerobic mesophilic microorganisms (bacteria, yeasts and moulds), the footnotes in the table provide further informations for interpretation when limit values are exceeded. Due to unavoidable measurement uncertainties of the examination method, higher values are accepted than those listed in **Tab. 1**, as given in the European Pharmacopoeia (Chapter 2.6.12) and in the American Pharmacopoeia (Chapter 61).
This means that a quantitative limit value (total number of aerobic mesophilic micro-organisms) is fulfilled when values do not exceed more than 200 CFU/g or ml or 2,000 CFU/g or ml (see also footnote of **Tab. 1**).

	Cosmetics intended for children under three years of age, the eye area and mucous membranes	Other cosmetics
Total number of aerobic mesophilic micro-organisms (bacteria + yeasts + moulds)	≤ 100 CFU*/g or mla	≤ 1,000 CFU*/g or mlb
Escherichia coli	Absence in 1g or 1ml	Absence in 1g or 1ml
Pseudomonas aeruginosa	Absence in 1g or 1ml	Absence in 1g or 1ml
Straphylococcus aureus	Absence in 1g or 1ml	Absence in 1g or 1ml
Candida albicans	Absence in 1g or 1ml	Absence in 1g or 1ml

*CFU = Colony forming units

Due to unavoidable measurement uncertainties of the investigation methods, the results exceed the limit values as also found in the European Pharmacopoeia (Chapter 2.6.12) or American Pharmacopoeia (Chapter 61), if

[a] > 200 CFU/g or ml, [b] > 2,000 CFU/g or ml

Tab. 1 Microbiological limit values for cosmetics according to ISO 17516.

4. Procedure in case of positive findings

The term 'positive finding' here means any growth of microorganisms on the culture media used in testing a product (irrespective of the number and type of microorganisms).
Fig. 1 provides an overview of the extent to which positive findings during testing of a product lead to compliance or non-compliance with the requirements of the standard.
On the basis of the above scheme, the extent to which the product can or cannot be released must be checked individually for each positive finding.

4.1 Detection of microorganisms – Findings not in compliance with ISO 17516

Bacterial counts in products greater than the values of 200 CFU/g or 2,000 CFU/g specified in the standard and/or the presence of specified microorganisms (*Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Candida albicans*) in 1g of product usually result in the corresponding products not being placed on the market. Nevertheless, higher values may be acceptable in individual cases if it can be shown that

- the germ counts in the product remain stable or are reduced over the entire life cycle
- the nature of the microorganism is safe (in the context of the application)
- there is no adverse effect on the product and the health of consumers

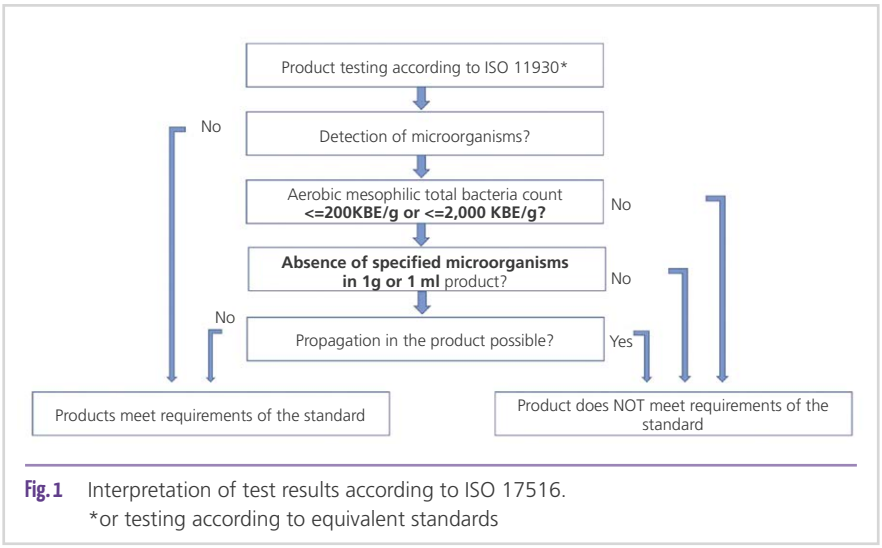

Fig. 1 Interpretation of test results according to ISO 17516.
*or testing according to equivalent standards

The extent to which these above-mentioned points can be proven beyond doubt in practice must be checked (never "0% risk"). The presence of a specified microorganism according to ISO 17516 usually results in a product that cannot be marketed. In the individual case consideration (risk assessment) of findings above the limit value (> 200 CFU/g or > 2,000 CFU/g), the type of product (rinse-off or leave-on) and the intended use (e.g. use in children under three years of age) also plays a major role.
As many of the microorganisms in most cosmetic products find good growth conditions and thus multiply, the number of these cases (release despite findings greater than limit value) should be kept to a minimum.
An example of a possible release despite the presence of microorganisms in a product is the presence of *Bacillus spp.* These microorganisms usually represent only a low product risk.

4.2 Detection of microorganisms – Findings conforming to ISO 17516

If microorganisms are detected in smaller quantities below the limit value (e.g. 20 or 100 CFU/g for a product for use around the eyes or 100 or 500 CFU/g for a product for general use), a decision must be made on a case-by-case basis (risk assessment). This also applies to the qualitative detection of a non-specified microorganism in 1g product (in case of a quantitative finding <10 CFU/g).
The following questions play an important role in this assessment:

- what kind of product is it?
- which microorganism or microorganisms have been detected (identification)?
- does reproduction take place over time? (retesting)
- is the contamination to be limited to a single batch, production period etc.? (larger sample numbers)

Retesting of the conspicuous sample (e.g. after one and two weeks) as well as testing of further samples of the same batch (distributed as representatively as possible over the batch) is necessary in order to be able to decide whether the goods can be released or not. Only then a decision can be made – with appropriate technical expertise and associated documentation – whether a product with a microbial finding can be sold or not.
A release based solely on the fact that the product meets the formal requirements of ISO 17516 (bacterial counts lower than the limit and/or absence of specified germs in 1g) is not legitimate.
Likewise, a passed preservation challenge test (e.g. according to ISO 11930) in the context of development and product release (criterion A or B achieved) cannot answer the question of whether or not microorganisms can multiply (e.g. after entry by application).
The source of the contamination should always be clarified – as far as possible – in order to avoid such findings in the future (raw materials, hygiene, insufficient cleaning & disinfection etc.). It should also be considered to what extent certain microorganisms, which are detected more often in products, should be included in the preservation challenge test in addition to the standard germs.

4.3 Germ identification

It is strongly recommended that any positive findings be looked at more closely. This also applies to very low bacterial counts in a product (e.g. 20 CFU/g) or the qualitative detection of a non-specified microorganism (e.g. *Pseudomonas putida* positive in 1g product at a bacterial count < 10 CFU/g). Only with the knowledge of which germs are involved, it is possible to make an assessment as to whether or not they represent a risk for the product and thus for the health of the consumer.
Furthermore, the nature of the microorganism may provide valuable information on the possible source of introduction (see above). Possible accumulations of certain microorganisms over a certain period of time provide indications of weaknesses in microbiological quality management.

5. A practical example

Shower gel with the following findings:

- Total number of aerobic mesophilic microorganisms: 50 CFU/g
- Specified microorganisms: Not detectable in 1g product
- Result identification: Pluralibacter gergoviae (formerly: Enterobacter gergoviae)

The present result formally complies with the requirements of ISO 17516 (number of microorganisms < 2,000 CFU/g, specified microorganisms not detectable). Nevertheless, an individual risk assessment must be carried out here, taking the above-mentioned questions into account:

- Nature of the product
- Nature of the microorganism
- Ability to reproduce over time

In the present case, the germ *Pluralibacter gergoviae* was identified in the product, a retesting after the initial findings were available showed a significantly higher total germ count (> 2,000 CFU/g). Further batches also showed findings.
In this case, the product cannot be released due to the nature of the microorganism (germ is known to be problematic in the cosmetic environment and also shows the so-called "phoenix effect") as well as the fact that growth over time is possible. Rather, the growth of germs in this example leads to a product that cannot be marketed.
This is against the background that after an initial finding (without an identification having been carried out) and without a retest, the product formally complies with the requirements of ISO 17516.
This example is intended to show that an individual risk assessment as well as an identification of the microorganisms is always necessary.

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Disinfecting Agent with Virucidal and Antiseptic Properties Based on Alcohol and Phosphonate

K. Henning

A fast-acting, residue-free evaporating disinfectant and/or antiseptic which is particularly effective against naked viruses such as poliovirus type 1, consists of 45 to 65% by weight of alcohol, 0.05 to 0.5% by weight of a phosphonate compound and an amphiphilic surfactant. The pH value of the disinfectant is adjusted between pH 4 and 9.

Viral infections

Viral infections are one of the most devastating and most feared biological health hazards of mankind. Some types of viruses envelop themselves by modification of their cell membranes by surrounding them with the outer membrane of an infected host cell, internal membranes such as the nuclear membrane or the endoplasmic reticulum, thereby forming an outer lipid bilayer, also known as the viral envelope. This strategy is known for the influenza virus and HIV. The infectivity of most of these so-called enveloped viruses is dependent on this envelope.

Other types of viruses that do not have such an envelope, but a nucleocapsid, contain the genetic virus as a protein capsid. These viruses are known as naked viruses. This group includes parvoviruses, papovaviruses, adeviruses, polioviruses and reoviruses.

In order to keep viral infections low, disinfectants and antiseptics are used on non-living and living objects to destroy the micro-organisms present on these objects.

Alcohols such as ethanol and isopropanol are a common component of these products, which are used in particular to disinfect hands and other parts of the skin, but also for surfaces and surgical instruments.

The great advantage of alcohol as the main disinfectant is its direct activity against microorganisms, so that surfaces treated with an alcohol disinfectant can be used again after a short time.

A further advantage of disinfectants containing alcohol is the residue-free evaporation of the active ingredient, which minimizes any subsequent contact with potentially harmful residues on the treated surface and requires no subsequent rinsing with water.

In the patent literature, there is a series of disinfectants and antiseptics containing alcohol as the main component. These usually contain a very high alcohol content of between 50 and 80 % by weight and partly additives of glycerine, Lewis acids, phosphorus compounds or polyalkylene glycols.

The disinfectants available on the market, which contain an alcohol content of 60% by weight or less, do not have a virucidal effect against naked viruses such as polioviruses. On the other

hand, a correspondingly required high alcohol content in the disinfectant results in high evaporation as well as undesirable effects on objects and hands, and they are also highly flammable.

Fast Acting and Residue-free Disinfectant

A fast acting, residue-free evaporating disinfectant and/or antiseptic with an alcohol content of about 60% by weight has the following composition:

- 45 to 65 % by weight of at least one alcohol
- 0.05 to 0.5 weight-% of at least one phosphonate compound
- at least one amphiphilic surfactant.

The pH value of the disinfectant is adjusted between pH 4 and 9. The disinfectant can be present in an aqueous solution or in the form of a gel.
The alcohol is selected from the monofunctional low molecular weight alcohols, preferably from the alkanols with one to four carbon atoms, preferably methanol, ethanol, isopropanol or butanol or combinations thereof. The most preferred alcohol is ethanol.
Suitable phosphonates are dimethylme-thylphosphonate (DMMP), 1-hydroxyethane-1,1-diphosphonic acid (HEDP), aminotris-(methylenephosphonic acid) (ATMP), ethylene-diaminetetra(methylenephosphonic acid) (EDTMP), Tetramethylenediaminetetra(methylenephosphonic acid) (TDTMP), Hexamethylenedia-mintetra(methylenephosphonic acid) (HDTMP), Diethylenetriaminepenta(methylenephosphonic acid) (DTPMP), Phosphonobutanetricarboxylic acid (PBTC), N-(phosphonomethyl)imino-monoacetic acid (PMIDA), 2-carboxyethylphosphonic acid (CEPA), 2-hydroxyphosphonocarboxylic acid (HPAA), aminotris(methylenephosphonic acid (AMP), and N,N-to(phosphono-methyl)glycine (BPMG) or combinations thereof.
The preferred option is 1-hydroxyethane-1,1-diphos-phonic acid (HEDP).
Furthermore, 0.1 to 3.0% by weight of an ethanolamine, preferably monoethanolamine, and 0.05 to 2.0% by weight of at least one amphiphilic surfactant may be present. The amphiphilic surfactant is preferably selected from the group of alkyl polyglucosides. Combinations of different amphiphilic surfactants are also possible.
A preferred amphiphilic surfactant is alkyl polyglucoside Glucopon 215 UP (BASF). The proportion of amphiphilic surfactant depends on the desired surface tension of the disinfectant and is often between 0.05 and 2.0 wt.%.
The virucidal disinfectant is used to disinfect living or non-living objects. The objects can be contaminated with one or more viruses, fungi and/or bacteria, whereby objects contaminated with poliovirus are preferred, especially those contaminated with poliovirus type 1.
The application is carried out by spraying and/or scrubbing disinfection or by dipping the surfaces. The surface can also be a living surface. Preferred is the skin of a mammal, preferably human skin.

In another form of application, the disinfectant is impregnated with a woven or non-woven material of viscose, polyester and polypropylene or with a paper towel or crepe paper. After application, the disinfectant must act for a period of time sufficient to kill or destroy viruses, bacteria and/or fungi.

Solution	1	2	3	4
Ethanol (wt.-%)	45.0	65.0	45.0	65.0
Proven effective against poliovirus type 1 after application in min.	2	1	2	1

Tab. 2 Influence of the proportion of ethanol on the effectiveness.

Humectants

Alcohol has a tendency to dry out the human skin. The application of a disinfectant containing alcohol can lead to the drying out of the human skin and, if applied repeatedly within a certain period of time, cracks can also form. These can provide protection for the microorganisms and in the worst case can serve as an access into the body, which leads to an infection.

Suitable humectants are long-chain linear and branched mono- or polyhydric fatty alcohols such as octyldodecanol. Other suitable humectants for example are glycerol trioleate, glycerol dioleates and glycerol monooleate, glycerol caprylate, glycerol caprate and polyglycerol 2-caprate, isopropyl myristate and cetearyl octanoate. The amount of the humectant is not limited. A proportion of 0.01 to 5.0 wt.% is preferred. The preferred proportion is 0.1-2% by weight and 0.15% by weight is particularly favored.

Thickening Agents

Aqueous solutions are particularly suitable for spray application. On the other hand, a gel filled in tubes can also be used without any problems for application on the road.

A gel can also be removed from a dispenser.

The viscosity of the disinfectant can be selected according to the individual requirements and can be adjusted by adding thickening agents such as agar-agar, guar gum, alginates, xanthan, dextran, cellulose derivatives or the like.

Examples

The reference or disinfectant solutions listed in **Tab. 1** were tested against poliovirus type 1 using the standard procedure according to EN 14476 (Chemical disinfectants and antiseptics - Quantitative suspension test Virucidity for chemical disinfectants in human medicine). The results obtained here show that the 0.3 wt.% HEDP (60%) content reduces the required exposure time to 1 minute.

The influence of the proportion of ethanol in the disinfectant solution on the exposure time is shown in **Tab. 2**. The disinfectant solutions 3 and 4 from **Tab.1** were tested for their efficacy at an ethanol content of 45 % by weight and 65 % by weight respectively. It is shown that the effectiveness deteriorates by reduction to 45 % by weight of ethanol. The required reaction time increases from 1 min. to 2 min..

Reference

First publication (German): *K. Henning*, „Desinfektionsmittel mit viruzider und antiseptischer Wirkung auf Alkohol- und Phosphonat-Basis“, Jahrbuch für den Praktiker, 2016, p. 339–342

„Alcohol-based disinfectant“; Patent-No.: EP 2 898 775, Publication: 29.07.2015, Applicant: Dr. Schumacher GmbH 34323 Malsfeld-Beiseförth

Ingredients	Disinfectant solutions Parts (wt.-%)			
	1 (Comparison)	2 (Comparison)	3	4
Ethanol	60.0	60.0	60.0	60.0
Glucopon 215 UP[1] (alkyl polyglucoside, 65 %)	0.1	0.1	0.1	0.4
Phosphoric acid (85 %)	-	0.5	-	-
HEDP[2] (60 %)	-	-	0.3	0.3
Monoethanolamine (85 %)	-	-	-	0.16
Water, distilled	39.9	39.4	39.6	39.14
pH value[3]	3.99	3.96	4.04	4.01
Proven effective against poliovirus type 1 after application in min.	no	5	1	1

[1] BASF; [2] 1-Hydroxyethane-1,1-diphosphonic acid; [3] pH- Value setting with 45% NaOH, except with solution 4

Tab. 1 Testing the effectiveness against poliovirus type 1 with different test solutions.

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A key element in the perception of cleanliness is a pleasant smell. With MULSIFAN RT 203/80, we offer the ultimate solution for formulating all kinds of household cleaning products enriched with fragrances or essential oils. These might also provide additional cleaning or bacteriostatic effects. Our solubiliser has no colour, is odourless and leaves no residues on any surfaces.

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Body Milk Mist | SC-FR-20-BC-50901-02

Phase	Ingredients	INCI	% by weight	Function
A	Water, demin.	Aqua	73.75	
	Edeta® BD	Disodium EDTA	0.05	Complexing agent
	Preservative		q.s.	Preservative
	Glycerin	Glycerin	2.00	Humectant
	Sorbitol Solution 70% USP *(Escuder)*	Sorbitol	2.00	Humectant
	Cosmedia® SP	Sodium Polyacrylate	0.50	Rheology modifier
	Tinovis® GTC UP	Acrylates/Beheneth-25 Methacrylate Copolymer	0.70	Rheology modifier
	Sodium Hydroxide (25% solution)	Sodium Hydroxide	q.s.	pH Adjustment
B	Plantapon® LGC SORB	Sodium Lauryl Glucose Carboxylate (and) Lauryl Glucoside	1.50	Emulsifier (O/W)
C	Dehymuls® PGPH	Polyglyceryl-2 Dipolyhydroxystearate	2.00	Emulsifier (W/O)
	Lanette® 22	Behenyl Alcohol	0.50	Consistency agent
	Xiameter PMX-200 Silicone Fluid 100CS *(Dow Corning)*	Dimethicone	1.00	Emollient
	Myritol® 331	Cocoglycerides	2.00	Emollient
	Cetiol® RLF	Caprylyl Caprylate/ Caprate	4.00	Emollient
	Cetiol® C 5	Coco-Caprylate	3.00	Emollient
D	Phytofirm™ Biotic BC10138	Lactobacillus/Soybean Ferment Extract, Pentylene Glycol, Caprylyl Glycol	2.00	Active ingredient
E	Syniorage™ PW LS 9847	Mannitol, Acetyl Tetrapeptide-11	1.00	Active ingredient
	Water, demin.	Aqua	4.00	
F	Perfume	Parfum	q.s.	Fragrance

Specifications
pH value (20°C): 6.65
Viscosity (Brookfield; RVT; spindle 5; 10 rpm; 20°C): 5000 mPa s

Performance
Additional performance has not been evaluated

Manufacturing Process
Prepare Phase A by adding the EDTA, moisturizers and preservative into the water. Add the Cosmedia SP and disperse until having a homogeneous gel. Add the Tinovis GTC UP and adjust the pH value to approx. 6.0 with sodium hydroxide.
Add Phase B into Phase A and heat to 75-80°C.
Prepare Phase C and heat to 75-80°C. Add Phace C into Phase A+B under high stirring (around 500 rpm) and T=75-80°C. Maintain stirring and temperature for 5 minutes and then start cooling. At 65°C homgenize with Turrax (1 minute, 11,000 rpm).
Continue cooling under moderate stirring (around 300 rpm). At 30°C add Phase D and E (previously solubilize Syniorage in hot water 50°C). Finally add the perfume and adjust pH to around 6.6.

Filling
Bag in Valve System:
Aluminium Can (volumen 110ml)
Valve-Bag: NKWBU470.847/R-V14.45/110 (COSTER) Difusor + Cup: V04.1808 + V20.87TR (COSTER)
In bag: liquid as is (60g)
Outside bag: Compresed air (10.5 Bar)

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Night Recovery Cream | SC-FR-20-BC-50902-02

Phase	Ingredients	INCI	% by weight	Function
A	Water, demin.	Aqua	58.50	
	Glycerin	Glycerin	5.00	Humectant
	Preservative		qs	Preservative
B	Cosmedia® SP	Sodium Polyacrylate	1.00	Rheology modifier
C	Eumulgin® VL 75	Lauryl Glucoside, Polyglyceryl-2 Dipolyhydroxystearate, Glycerin	3.00	Emulsifier (O/W)
	Eumulgin® SG	Sodium Stearoyl Glutamate	0.50	Emulsifier (O/W)
	Cutina® HVG	Hydrogenated Vegetable Glycerides	2.00	Consistency agent
	Cutina® PES	Pentaerythrityl Distearate	2.00	Consistency agent
	Cetiol® SB 45	Butyrospermum Parkii Butter	5.00	Emollient
	Cegesoft® PS 6	Olus Oil [EU], Vegetable Oil [CTFA]	8.00	Emollient
	Myritol® 331	Cocoglycerides	6.00	Emollient
	Cetiol® C 5	Coco-Caprylate	4.00	Emollient
D	Cetiol® Ultimate	Undecane, Tridecane	3.00	Emollient
E	Phytofirm™ Biotic BC10138	Lactobacillus/Soybean Ferment Extract, Pentylene Glycol, Caprylyl Glycol	2.00	Active ingredient
F	Perfume	Parfum	qs	Fragrance

Specifications
pH value (20°C): 6.3-6.5
Viscosity (Brookfield; DV-I+; spindle TD, Helipath; 10 rpm; 20°C): 70 000 - 90 000 mPa s

Performance
Additional performance has not been evaluated

Manufacturing Process
Hot Process:
Heat phases A and C at 75-80°C.
Then add phase B in phase A with high stirring for 5 minutes. Add phase C in phase A+B and stir during 10 minutes.
Cool down to 60°C and add phase D with stirring for 5 minutes.
Cool down at room temperature and add phases E and F with stirring for 5 minutes.

For more information visit us at www.personal-care.basf.com or www.carecreations.basf.com

Biome Balance Mask | HB-FR-19-BC-50845-02

Phase	Ingredients	INCI	% by weight	Function
A	Dehyquart® F 75 T	Distearoylethyl Hydroxyethylmonium Methosulfate, Cetearyl Alcohol	2.00	Emulsifier (O/W)
	Emulgade® Sucro	Sucrose Polystearate, Hydrogenated Polyisobutene	2.00	Emulsifier (O/W)
	Lanette® O	Cetearyl Alcohol	4.00	Consistency agent
	Cetiol® CC	Dicaprylyl Carbonate	2.00	Emollient
	Cetiol® SB 45	Butyrospermum Parkii Butter	0.50	Emollient
B	Water, demin.	Aqua	84.50	
	Cosmedia® Triple C	Polyquaternium-37, Dicaprylyl Carbonate, Lauryl Glucoside	1.00	Rheology modifier
C	Dehyquart® A-CA	Cetrimonium Chloride	2.00	Conditioning agent
D	Scalposine™ BC10101	Glycerin, Aqua, Sarcosine	1.00	Active ingredient
	Perfume	Parfum	q.s.	Fragrance
	Euxyl PE 9010 (Schülke)	Phenoxyethanol, Ethylhexylglycerin	1.00	Preservative

Specifications
pH value (23°C): 3.9
Viscosity (Brookfield; RVT; spindle TD, Helipath; 5 rpm; 23°C): 100 000 mPa s

Performance
Additional performance has not been evaluated

Manufacturing Process
1. Heat phases A and B at 75°C.
2. Add phase A into phase B while stirring. 3- Add Phase C at 60°C under stirring.
4. Allow to cool to room temperature.
5. At 30°C, add Phase D under stirring.

Additional information
Perfume: Aqua d'Eau RS68717 (Technicoflor)

Stability Tests
Conform 3 months at 4°C, RT, 40, 45°C

For more information visit us at www.personal-care.basf.com or www.carecreations.basf.com

Advanced Scalp Detox Shampoo | HB-FR-19-BC-50777-03

Phase	Ingredients	INCI	% by weight	Function
A	Water, demin.	Aqua	58.30	
	Rheocare® XGN	Xanthan Gum	1.20	Rheology modifier
B	Plantacare® 2000 UP	Decyl Glucoside	14.00	Surfactant
	Plantasil® Micro	Dicaprylyl Ether, Decyl Glucoside, Glyceryl Oleate	5.00	Conditioning agent
	Plantapon® ACG HC	Sodium Cocoyl Glutamate	12.00	Surfactant
	Lamesoft® PO 65	Coco-Glucoside, Glyceryl Oleate	2.00	Conditioning agent
	Glycerin	Glycerin	3.00	Humectant
	Sodium Benzoate	Sodium Benzoate	0.50	Preservative
C	Perfume	Parfum	q.s.	Fragrance
	Scalposine™ BC10101	Glycerin, Aqua, Sarcosine	1.00	Active ingredient
D	Citric Acid (50% solution)	Citric Acid	3.00	pH Adjustment

Specifications
pH value (23°C): 5.0
Viscosity (Brookfield; RVT; spindle 5; 50 rpm; 23°C): 2 600 mPa s

Performance
Additional performance has not been evaluated

Manufacturing Process
Phase A : At room temperature, disperse Rheocare® XGN in water until the gel is homogeneous. Add one by one the components of Phase B.
Add components of Phase C.
Adjust pH to 4.8 - 5.2 with Phase D.

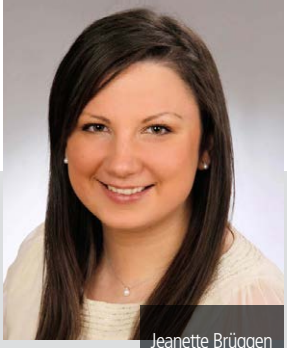
External Suppliers
Perfume: Aqua d'eau RS68717 (Technicoflor)

Stability Tests
Conform 3 months at 4°C, RT and 45°C.

For more information visit us at www.personal-care.basf.com or www.carecreations.basf.com

Cellulose Fibres as Trendsetters in Solid Cosmetics without Microplastics and Packaging Waste

Interview with Jeanette Brüggen, Project Manager Cosmetics, CFF GmbH & Co. KG



Jeanette Brüggen

In your opinion, what are the latest trends in the cosmetics industry?

Trends in the cosmetics industry change very quickly and the industry is constantly moving towards new trends. If we consider the activities during the last 20 years, we can clearly see that the topics of naturalness and sustainability have developed from a niche trend to the „trend of the future". Nature-friendly cosmetics are becoming increasingly important in our society. Even manufacturers of conventional cosmetics cannot ignore this trend and start to avoid environmentally harmful raw materials and to specifically use vegan and above all animal-free raw materials. Of course, it is not only the legal adjustments that play a driving role in this development, but also the changing consciousness of consumers. The younger generations in particular are very strongly committed to the environment. This development naturally influences the cosmetics industry, which is increasingly focusing on natural packaging and innovative presentation forms such as solid cosmetics.

What exactly are solid cosmetics and why is it the "trend of the future"?

Solid cosmetics stand for sustainability and environmental compatibility, because it is not just a question of using nature-friendly raw materials, but a question of avoiding plastics, especially in the form of packaging, and of avoiding water as far as possible. There are numerous studies on plastic waste in the oceans. Because of the enormously high pollution, it is high time to do something about it. Solid cosmetics applications can reduce some of the plastic requirements, as solid cosmetics often do not require individual packaging and can be easily stored in reusable glass containers. Solid products can also be easily dosed when purchased.

Another advantage of solid cosmetics is the reduced amount of water. Some products can even manage completely without water. This helps to conserve what is probably our most precious raw material, because many cosmetic products contain large amounts of water.

Solid cosmetics are very versatile. How can SENSOCEL® serve all applications?

That is correct. We find solid cosmetics in skin care and skin cleansing, in hair care, in dental care, but also in colour cosmetics, really in every conceivable field. The product variety of SENSOCEL® our natural cellulose fibers, is as diverse as all cosmetic applications. SENSOCEL® is available in different particle shapes and lengths, which bring individual characteristics with them. For example, within our particularly developed solid toothpaste formulation SENSOCEL® dental can be used as a mild and effective cleansing agent. White and colourful SENSOCEL® scrubs, based on natural raw materials, are ideal for the use in solid skin and hair peelings. As environmentally friendly and sustainable exfoliants, they perfectly complement the solid trend.

Of particular interest are the developments of solid creams in which SENSOCEL® significantly improves the skin feel and contributes to the stability of the formulation. In short, SENSOCEL® are natural all-rounders and multifunctional for the use in numerous cosmetic products - whether solid or liquid.

CFF GmbH & Co. KG is active in many areas, especially with SENSOCEL® several new developments have been made in the last years. Which are these?

The production of natural cellulose fibres is our passion. This raw material accompanies us through so many areas of everyday life without us noticing it.

We constantly try to exploit our possibilities and look for new applications.

Especially in the cosmetics sector, the demand must be met quickly. When starting in the cosmetic field about 5 years ago, our focus was on natural cellulose, which conjures a luxurious skin feeling in a natural way. We developed dental cleansing bodies and peeling particles, which were evaluated during a research project as an alternative to microplastics and silica in terms of abrasion and cleansing performance. The results are outstanding: besides a considerably lower abrasion but comparable cleansing performance, SENSOCEL® is also up to 100 % biodegradable under freshwater conditions within 1-2 months.

Our product portfolio is complemented by natural stabilising systems which replace microplastics and at the same time improve sensory performance. In addition to the development of raw materials to stabilise Pickering emulsions, our development work also focuses on alternatives to microplastic powders like nylon or PMMA. Our latest developments are black and coloured granules and fibres based on 100 % natural raw materials.

What can we expect from SENSOCEL® in the future?

We always try to cover current needs and expand our portfolio. Solid cosmetics is only one trend among many others that is perfectly suitable for the use of cellulose fibres.. For example one of our new targets is to develop a natural absorber and/or filler for baby products.

And of course we are curious about the future trends. For sure, it will not get boring.

www.cff.de

CLARIANT

Clariant Launches New Ecolabel Guidance Tool for Industrial Cleaning & Home Care Customers

Muttenz/Switzerland | May 25, 2020. Ecolabel clarity at your fingertips. Clariant offers the Industrial & Home Care segment fast and free online access to the ecolabel compatibility and sustainability features of its extensive formulation ingredients via its new Ecolabel Guidance Tool launched today.

With rising consumer interest in more environmentally-friendly products in categories like dishwashing, laundry and hard surface cleaning, brands are keen to display relevant ecolabels on their products and offer ingredient transparency to provide greater guidance to their customers. However, the proliferation in ethical labelling schemes can lead to added complexity when it comes to ingredient choice for reformulating or creating new eco-friendly products.

"To ease some of the confusion that surrounds ecolabels, Clariant now offers formulators in Home Care and Industrial Cleaning a quick and convenient web-based tool for determining the specific label or labels each listed product complies with. This is backed by clear information on other important aspects such as Renewable Carbon Index, plant origin etc. Having this information readily available, just a click away, should make it simpler to both select ingredients and create the transparency customers seek," comments *Ralf Zerrer*, Head of Strategic Marketing & Innovation at Clariant.

Currently, Clariant features 100 ingredients in the tool, each one linked to relevant labels as well as indepth technical and sustainability-related data. Background information on the individual ecolabels is also provided, such as their field of application and criteria.

Users can filter searches by product function, by ecolabel, and by RCI and EWG score in order to identify the most relevant ingredients for particular requirements. For example, laundry detergent manufacturers looking for a Nordic Swan compatible soil release polymer will be directed to the market's first bio-based option, new TexCare® SRN 260 Life. The ingredient offers best in class fiber protection against dirt as well as outstanding sustainability benefits.

The new Industrial & Home Care Ecolabel Guidance Tool will be updated regularly to support customers with accurate, up-to-date information on new products and ecolabel developments – access it: https://www.clariant.com/en/Business-Units/Industrial-and-Consumer-Specialties/Industrial-and-Home-Care/Ecolabel-Guidance-Tool?utm_source=media-release&utm_medium=ecolable-tool&utm_campaign=HomeCare.

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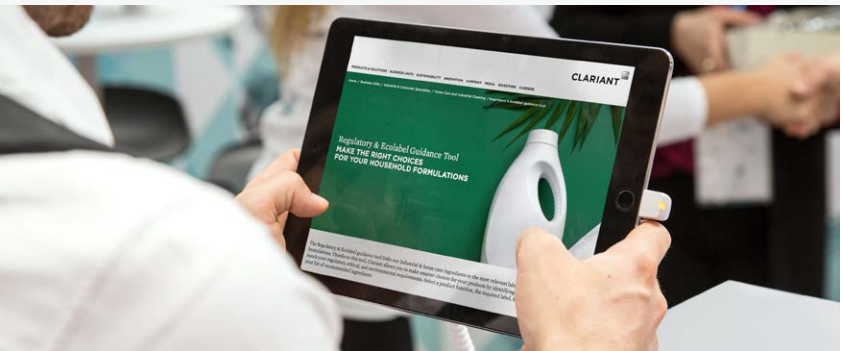


Clariant to Increase mild Surfactants Capacity in Europe and USA

Muttenz/Switzerland | May 26, 2020. Clariant is expanding production capacity for its isethionates derivatives - Hostapon SCI - mild surfactants to support the increasing shift by personal care formulators and brands towards using mild surfactants to differentiate applications. It also supports the growing consumer trend for hygiene products. The investment at facilities in Europe and the USA will bring additional capacity on stream during Q1 2021.

"As one of the leading company for specialty chemicals in personal care, Clariant continues to invest and support the latest trends in the sector. Mild surfactants are a growing sector driven by consumers seeking new mildness claims, invaluable in helping formulators to answer needs for mild cleansing hygiene, sensitive skin solutions, solid formats and more natural ingredients," comments Christian Vang, Global Head of Business Unit Industrial & Consumer Specialties.

Clariant's Hostapon SCI grades are natural, anionic mild surfactants. Plant-based, they are non-irritant, ultra-mild and compliant with a number of industry-recognized ecolabels, and create formulations with creamy, stable foams. They form part of Clariant's broad portfolio of mild surfactants, the most comprehensive in the industry, for skin cleansing, hair care and baby care applications. Each one brings high level cleaning performance and specific foam types or thickening behavior to products, supported by different formulation benefits and consumer features.

As a global expansion, the investment targets capacity increase and general modernization of current facilities at the Mount Holly (USA) and Tarragona (Spain) manufacturing sites. The general asset modernization will optimize energy consumption and also aggregate options for new SI grades (different Carbon-chains).

"We are pleased to announce this long-term strategic investment. Together with our introduction in recent years of Glucamides sugar surfactant technology, it further positions Clariant as one of the innovative leaders for the future of mild surfactants, as they become increasingly popular among our personal care customers in their development of milder and healthier solutions," adds *Ralf Zerrer*, Global Head of Strategic Marketing and Innovation Business Unit Industrial & Consumer Specialties.

www.clariant.com

Symrise Introduces Next-generation Anti-dandruff Active Derived from 100 % Natural Raw Materials

Holzminden/Germany | May 11, 2020. Symrise will present Crinipan® PMC green, its novel anti-dandruff active, with an online webinar on 27 May 2020. The new molecule's efficacy is based on an innovative mode of action, and it shows comparable results to established anti-dandruff actives. Symrise Cosmetic Ingredients are in a pioneer position to combine such effectiveness with an entirely bio-based solution.

Consumers have increasingly high expectations regarding their cosmetics: Products should reflect the trend to be more natural, sustainable, and at the same time, be as effective as conventional solutions. With **Crinipan® PMC green**, Symrise fulfills this desire for an anti-dandruff active. The new ingredient has clinically proven effectiveness and targets the cause of dandruff with an innovative mode of action: The ingredient´s anti-dandruff effect is activated by the dandruff-causing yeast Malassezia itself.

Until now, producers of anti-dandruff products mainly had to rely on three established anti-dandruff actives: zinc pyrithione, climbazole and piroctone olamine. Aside from some multifunctional ingredients, no major anti-dandruff active has been released onto the market for decades.

By launching **Crinipan® PMC green**, Symrise opens up completely new perspectives for cosmetic manufacturers and their dandruff control strategies. They will be able to achieve benchmark efficacy by using a 100 % bio-based, environmentally friendly anti-dandruff active. This is particularly relevant for serving the naturalness trend in personal care.

"More than 45 years of expertise in the area of Micro Protection enable us to launch **Crinipan® PMC green**. We also thank Professor Dr. Peter Mayser, a renowned dermatologist and dedicated expert in Malassezia research for his constant support during our joint research project with the University of Giessen on dandruff", explains *Dr. Christin Koch*, Head of Microbiology Research at the Global Innovation Cosmetic Ingredients Division of Symrise. "Our first active ingredient, climbazole, dates back to the year 1975. Crinipan® AD (climbazole) has for years been a proven and established ingredient on the cosmetics market. After many years of extensive research and development we are now launching the next generation active, which particularly stands out with its innovative mode of action."

"Developing green products like **Crinipan® PMC green** is in line with the Symrise corporate sustainability strategy," says *Dr. Florian Genrich*, Senior Global Product Manager Skin Protection at Symrise. "In future we are going to continue our path of developing more and more natural ingredients to serve our customer´s and consumer´s needs."

As the most innovative active ingredient in the category scalp/skin barrier/redness, **Crinipan® PMC green** recently won the prestigious first place in the BSB Awards 2020. Symrise will present the product in an online webinar on 27 May 2020 via in-cosmetics organizer Reed Exhibitions Ltd.

www.symrise.com

Vytrus Biotech Launches DEOBIOME, the First Biological Deodorant of the Market

Barcelona/Spain | May 19, 2020. Vytrus Biotech, the company specialised in plant stem cell culture for the cosmetic sector, has just launched a new biological deodorant ingredient that efficiently reduces body odour, **DEOBIOME NONI**. It consists of the first deodorant treatment that allows the axilla to perspire while avoiding the bad odour generation, while respecting the skin microbiota and the ecosystem.

This cosmetic ingredient covers different applications within the cosmetic industry: underarm deodorants (roll-on, creams, gels), feet treatment deodorants (gels, serums, creams), scalp treatments and body care (deodorizing body lotions, body odour modulation).

The flourishing clean movement, consumers who search and choose products with more natural and sustainable ingredients, is among the new growing trends. In the field of fighting body odour, there is a need for alternatives to conventional products but respectful with an important physiological function as sweat production, as well as respectful with the skin microbiota.

The daily battle against body odour is still dominated by two classical strategies: deodorants that often eliminate bacteria by applying alcohol bases or bactericidal actives and cover malodour by using perfume; and traditional antiperspirants whose strategy is based on clogging the pores with derivates of aluminium salts, thereby depriving the bacteria in the axilla of malodour precursors. Therefore, Vytrus Biotech has broadened the scope of axillary care by designing a biological deodorant treatment that efficiently eliminates the bad odour. This strategy consists of an innovative combination that addresses the care of the skin through a prebiotic technology, and the microbiota re-balancing, thus challenging the fight against body odour.

Òscar Expósito, CEO, CSO and co-founder of Vytrus Biotech, says: "the launch of **DEOBIOME** is a great achievement for our company, and it also implies a great scientific advance for body odour treatment as our ingredient is the first biological deodorant of the market. Furthermore, it respects the skin microbiota thanks to the innovative mechanism of action of the active".

DEOBIOME NONI, made from Morinda citrifolia plant stem cells, is presented to the market as an alternative to conventional products, respectful with the skin and the environment, being a solution against body odour. It represents a big scientific step forward in body odour treatment.

www.vytrus.com

PRODUCT LAUNCH

SILAB Launches AGREYNIST®

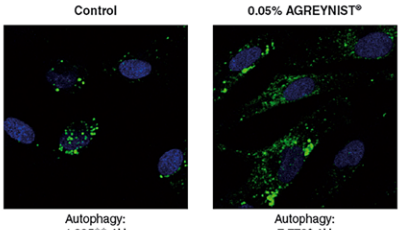
Saint-Viance/France | May 5, 2020. AGREYNIST® is an anti-free radical and pro-pigmenting active ingredient of plant origin, enabling greying hair to return to its natural color without the need of dyeing it.

AN UNPRECEDENTED ANTI-GREYING APPROACH

Double innovation: autophagy and structural quality of hair

Greying of hair is an unavoidable phenomenon, however, there is a strong consumer expectation to avoid it with natural solutions. Faced with this observation, SILAB developed **AGREYNIST®**, a natural active ingredient capable of regulating the biological pathways leading to greying, in particular:

- it restores the oxidative balance of hair, a necessary factor of any anti-greying strategy, not only by reducing the formation of free radicals, but also by activating cell detoxification induced by autophagy;
- it favors repigmentation of the hair fiber by stimulating the synthesis of melanin with its cytoprotective effect;
- it re-establishes the structural quality of hair (result from an original modeling study*).



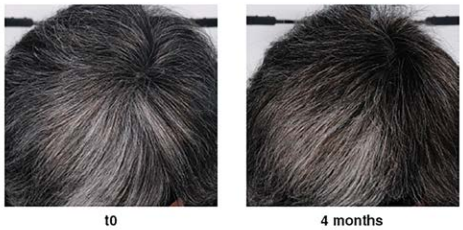
°*: significant result according to Student's t test/normal melanocytes control (P < 0.01)
*: significant result according to Student's t test/stressed melanocytes control (P < 0.05)

Capacity of AGREYNIST® to activate autophagy by human melanocytes subjected to an oxidative stress.

A REPIGMENTING EFFECT

Visible reduction of the stage of greying

The repigmenting effect of **AGREYNIST®** was demonstrated on Caucasian and Asian, male and female volunteers. Indeed, a visual scoring by experts on photos highlighted that after 4 months of daily application, **AGREYNIST®** formulated at 2.5% in a lotion significantly decreases the stage of greying by 20% ($P < 0.001$) on Caucasian volunteers, corresponding to an average decrease of one stage of greying (result visible in 91% of volunteers).



Repigmenting effect of AGREYNIST® on Caucasian volunteers after 4 months of daily application.

A subjective evaluation confirmed these data, as after 6 months of use, 91% of the volunteers reported that they have fewer grey hairs and 88% of them considered that it is an anti-grey hair product.

TWO PLANTS WITH COMPLEMENTARY EFFICACIES

Detoxifying and pro-pigmenting actions

In order to address effectively the issue of hair greying, SILAB implemented a screening of natural raw materials targeting the indispensable anti-free radical and pro-pigmenting effects.
This work led to the identification of two raw materials: black oat seeds (anti-oxidant and detoxifying) and spiny restharrow roots (pro-pigmenting). The use of green solvents combined with enzymatic bioengineering enabled the optimized extraction of molecules of interest. SILAB thus concentrated and stabilized in **AGREYNIST®** the complementary efficacies of these two raw materials obtained from a controlled supply chain.


Spiny restharrow (Ononis spinosa) and black oat (Avena strigosa)

With its protective, detoxifying and repigmenting action, **AGREYNIST®** (INCI name: Butylene Glycol & Water & Ononis spinosa Root Extract & Avena strigosa Seed Extract) offers a natural solution for grey hair care. Composed of biopeptides and polyphenols, this patented active is available in aqueous solution (recommended amount: 0.5 to 2.5%) and compliant with international cosmetic regulations (Europe, United States, Japan, China, etc.).

www.silab.fr

*Using Raman microspectroscopy, SILAB conducted a more detailed analysis of the course of greying and, in a novel way, has shown that there are changes in molecular markers related to biomechanical properties (conformation of proteins) and to the barrier function (organization of lipids) in grey hair.

Launch of New Product WeylCare® CetylP

Frankfurt/Germany | May 5, 2020. High-end emulsifying with a velvety feel: **WeylCare® CetylP** is a flexible to use anionic PEG-free oil/water emulsifier with a HLB of 9.6. It is suitable to emulsify high amounts of oils and give excellent stability for difficult to emulsify emulsions like sun care formulations. **WeylCare® CetylP** is derived natural according to ISO 16128, EO & halogen-free and can be used in almost all application areas including sensitive skin care, baby products and natural cosmetics.

www.weylchem.com

PRODUCT LAUNCH

Vantage Personal Care™ to Introduce New CLEAR BEAUTY Concepts at in-cosmetics Global 2020

Warren/NJ/USA | May 6, 2020. Vantage™ anticipates that the need for traceability, clean ingredients, positive and sustainable economic and ecological impact will continue to grow rapidly over the coming years. The need for increased traceability, largely influenced by the food industry, also resonates with the overall natural transformation that the beauty industry has faced over the past decade. In 2020, consumers are using a large set of data to balance ingredient safety, environmental concerns and societal impact when picking a new brand.

To address these needs, Vantage™ (booth G40) will be introducing its new CLEAR BEAUTY concept at in-cosmetics Global, a combination of highly traceable, sustainable and deeply impactful ingredients, selected for their clear traceability, clear efficacy and clear impact.

New Product Launches

Pollution, dry weather and stress are amongst many factors contributing to a disrupted skin barrier, which in turn increases skin sensitivity. Several studies have described "skin sensitivity" as a major concern for consumers around the world. Additionally, premature skin aging due to inflammation, also known as "inflammaging" has become a growing issue for health-conscious beauty users.

Vantage™ has created **Bio-Signal™ Lipid 10 MB**, a patented, skin-mimetic technology comprising of phosphotidylglycerol, a unique naturally-occurring phospholipid. In in-vitro studies, **Bio-Signal™ Lipid 10 MB** stimulated the expression of several epidermal proteins known to strengthen the skin barrier, hydrate the skin and reduce the inflammatory signaling pathways. In clinical studies, it not only demonstrated benefits for skin moisturization, tightening and radiance but was also found to work synergistically with irritating actives (AHAs) to decrease their irritation potential in sensitive skin. Bio-Signal™ Lipid 10 MB is a breakthrough active technology for consumers with sensitive skin and formulations with clear skin benefits.

www.vantagegrp.com

Natural Treatment of Dentin Hypersensitivity

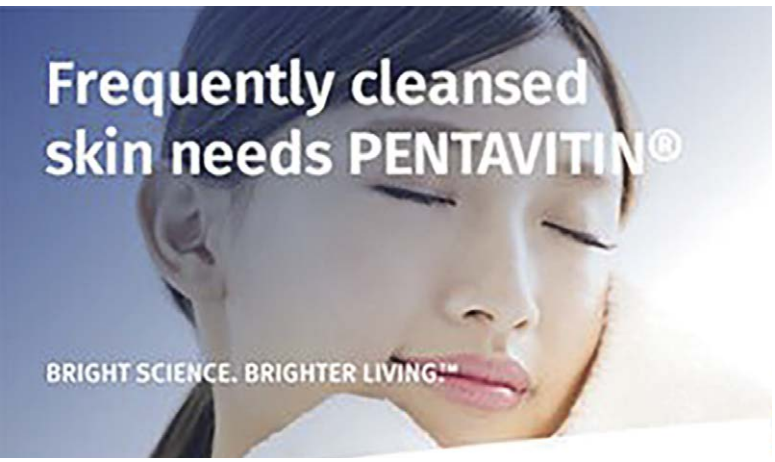
©Picture Credits: mimagephotography/Shutterstock.com

Oftringen/Switzerland | May 19, 2020. Omya, the expert in advanced mineral ingredients, has developed Omyadent®200 – OG, a new grade of particles that are highly efficient for desensitizing toothpaste applications. The co-processed mineral has an outer shell of hydroxyapatite,the main constituent of enamel and dentin, and can therefore interact with the tooth surface to make it more resistant to painful stimuli.

Produced using Omya proprietary technology, in which the mineral is modified so that new surface features develop and particles become porous, **Omyadent®200 – OG** has been specifically developed to addressdentin hypersensitivity (DH). This discomfort is as a result of exposed tubules within dentin, most commonly due to receding gums or enamel wear. Symptoms are characterized by a reaction to certain triggers, such as hot, cold, sweet or sour foods and beverages. This can induce the movement of fluid within the tubules, aggravating nerves in the pulp and causing short, sharp pain. As a result, those affected start to avoid certain products, which negatively impacts their quality of life. Dentin hypersensitivity can be treated by blocking dentin tubules, therefore preventing stimuli and dentinal fluid movement. Thanks to its tailored small particles, **Omyadent®200 – OG** penetrates the tubules and effectively occludes them, while the hydroxyapatite shell makes it resistant to acid attack.

www.omya.com

DSM: Make Skin Dryness after Cleansing a Thing of the Past



Kaiseraugst/Switzerland | May 19, 2020. Cleansing products that don't leave the skin feeling dry have long featured prominently on consumers' wish lists. With "wash, rinse, repeat" now a key part of our everyday routines, our sustainable and 100% natural moisture magnet **PENTAVITIN®** can make all the difference. **PENTAVITIN®** mimics skin's natural ability to lock in moisture, even when washing and showering.

Did you know that consumers are more likely to buy shower gels and body washes that can also smooth and moisturize their skin?* Findings from our new studies prove that common skin cleansing formulations containing **PENTAVITIN®** help reinforce the skin's barrier and immediately boost skin hydration for 24 hours, meaning an end to skin dryness after washing or showering.

Powered by our hero ingredient **PENTAVITIN®**, our new, ready-to use formulations gently cleanse skin and support its protective barrier – delivering immediate and long-lasting comfort, even with frequent washing. Our on-trend, cleansing micellar water –that outperformed market benchmark products in make-up removal – is just one of the big highlights we have ready for you.

Internet searches for hand sanitizers have increased in recent months, and so have the numbers of people asking why the skin on their hands has become so dry. New tests show that adding **PENTAVITIN®** to hand sanitizers with an alcohol content of up to 70% can increase skin hydration by up to 9% within just one hour of use. Even better, there's a 14% hydration boost after 3 hours. For the next blockbuster in hand sanitizers, get formulating now.

www.dsm.com

BASF Introduces Luviset® 360: a New Styling Polymer for Exceptional Textures and Very Strong but Flexible Hold

Monheim am Rhein/Germany | 05. Mai 2020. BASF launches its new styling polymer **Luviset® 360** providing an efficient styling performance in six dimensions: The innovative product offers strong, flexible and long-lasting hold as well as low flaking. It supports anti-pollution claims and allows for new textures. **Luviset® 360** is perfectly suited for producing high viscous styling products with no or low movement inside the package. It has been designed for a wide range of final hair styling products such as gels, creams and waxes.

Thanks to its self-thickening properties in concentrations above 4 percent, **Luviset® 360** ensures a pleasant consistency in styling gels. Hair care manufacturers using Luviset 360 need less carbomer thickener to achieve target viscosity.

"Consumers are increasingly looking for styling products that offer flexible, but strong hold and are less likely to flake. **Luviset® 360** is the perfect solution to develop styling gels for this very demanding market," says Hans-Martin Haake, Head of Market Development Hair, Body, Oral at BASF Personal Care Europe.

Proven efficacy

Performance tests have shown that **Luviset® 360** provides a high degree of bending stiffness and curl retention even in formulations with low concentrations and shows excellent hold, especially under conditions of high humidity. BASF experts use standardized methods to measure the flexural stiffness of hair strands in climate chambers. In sensory tests for **Luviset® 360**, this flexibility in hold is perceived as a more natural bending without breakage of the film. The innovative styling polymer also showed significantly lower flaking with a smaller and less visible size of the flakes.

Sensory tests have shown that formulations with **Luviset® 360** provide better peaking and cushion effects during the application on hair strands. **Luviset® 360** is also suitable for styling products with additional claims related to anti-pollution: BASF experts carried out tests in a pollution chamber that showed that less pollution remained on hair strands treated with**Luviset® 360** than on those treated with a placebo formulation. Its compatibility with numerous actives also makes **Luviset® 360** perfectly suitable for styling products with claims for caring effects such as moisturizing or hair strengthening.

Luviset® 360 can be used alone or in combination with other BASF polymers such as Luvigel® FIT UP, Luviskol® K 90 or Tinovis® GTC UP, providing excellent synergies for strong claims and creative textures.

www.basf.com

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silicone-experts.cht.com