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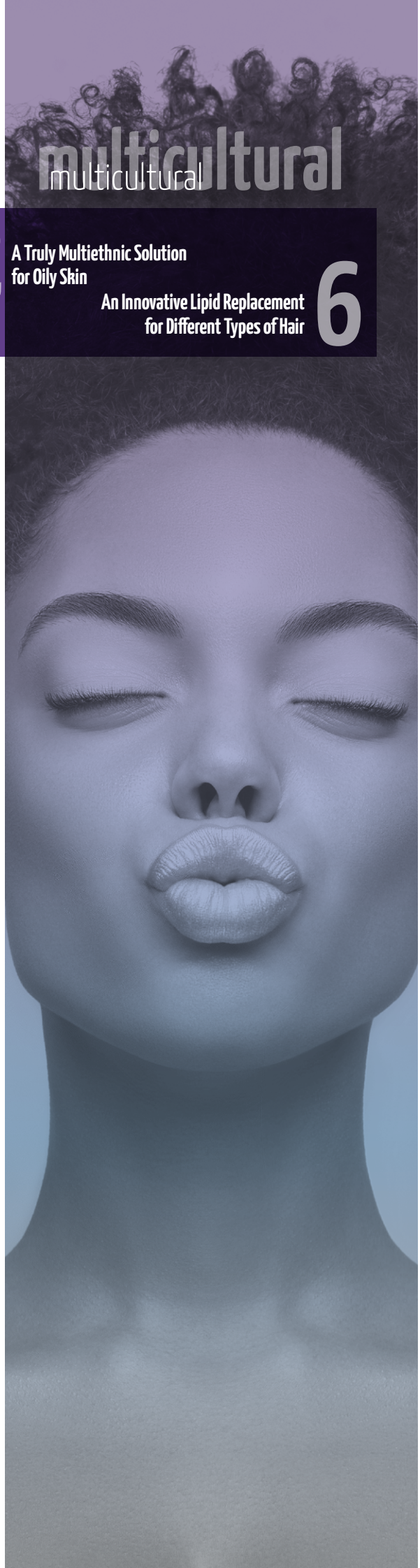

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A Truly Multiethnic Solution for Oily Skin

Bix'Activ® for decreased sebum production

S. Pain, C. Kalem, A. Courtois, V. André-Frei

Oily skin affects about 35 percent of people worldwide. However, solutions for this condition are often ineffective for many consumers because skin has a different composition of oil and lipids depending on ethnicity. This shows the urgent need for personal care products that are suitable for the requirements of all skin types – and a clinical study on people with African skin has now confirmed that BASF's plant-based active ingredient Bix'Activ® [1] is a truly multiethnic solution for oily skin.

Oily skin, known as *seborrhea*, occurs when the sebaceous glands produce excessive amounts of an oil-like substance called sebum that waterproofs and lubricates the skin to protect it from becoming dry. This can be triggered by hormonal changes, as well as by lifestyle factors like stress or a rich diet, or even by environmental factors like weather and air pollution. Oily skin often looks shiny and pores can become enlarged, which makes them more susceptible to getting clogged up. This can lead to inflammation and imperfections such as blemishes or acne. As a result, many people affected by *seborrhea* state that they suffer from a negative self-image and feel like their skin is dirty [2].

Up to 80 percent of people in their teens and early twenties are affected by oily skin [3], and it remains a concern for around 35 percent of people into their thirties and beyond – regardless of their location, gender or ethnicity. However, even though it is known that different ethnic groups have different structures of the epidermis and dermis, many of the topical skin care solutions available today are not effective on all skin types. This is a particular problem for African people, whose skin tends to produce more sebum – and there is a severe lack of customized solutions that respond to the unique needs of this target group.

Demand for these products in Africa is increasing rapidly, driven by other factors such as the growing middle class and increasing levels of disposable income among consumers in this region. In fact, Africa is expected to be home to some of the world's fastest-growing economies in the coming years, with growth rates far above the global average. It is the world's second most populous continent and is expected to command more than 20 percent of the global population by 2025. The market for beauty and personal care products in Africa grew by 14 percent in 2017, with consumers placing a particularly strong focus on brands that offer customized products [4]. Altogether, this means a huge number of people with African skin want an effective solution for oily skin – and are willing and able to pay for it.

A multi-ethnic solution for oily skin

BASF is committed to providing innovative solutions that respond to the unique needs of people around the world, across all genders and ethnicities. That's why its research teams have created the active ingredient Bix'Activ®. It targets the main pathways that trigger oily skin by reducing sebum overproduction in sebaceous glands, decreasing the size of pores and acting against *Cutibacterium acnes (C. acnes)*, a bacterium that colonizes the sebaceous glands and can lead to skin imperfections.

Bix'Activ is obtained through an environmentally compatible process that uses water as a solvent. It is extracted from seeds of the *Bixa orellana* plant, commonly known as the red lip tree, an evergreen shrub with white and pink flowers that produces inedible fruit and clusters of seed pods. Each pod contains many seeds that are covered with a thin layer of aril. At maturity, the pods dry out and harden before splitting open to expose the seeds. BASF extracts Bix'Activ from the grinded seeds of the *Bixa orellana*, and then standardizes and concentrates it to create a preservative-free powder with maltodextrin (30-50 percent *Bixa orellana* seed extract; 50-70 percent maltodextrin).

Initial *in vivo* study on Asian skin types

In 2018, a double-blind, randomized, split-face, placebo-controlled clinical study was performed on 35 Asian females. These participants were aged between 20 and 45, all showing a lipidic index of ≥ 120 µg/cm² on the face (measured with a Sebumeter) and presenting cheek sebaceous pores graded between 2 and 4 (*R. Bazin / F. Flament,* Skin Aging Atlas). Twice a day for 56 days, they applied a formulation containing 0.25 percent active ingredient on one half of the face and a placebo on the other half of the face. These *in vivo* tests

examined the plant extract's ability to reduce sebum production, pore size and skin imperfections.

Measurements were taken at Day Zero, Day 28 and Day 56. Sebum production was measured with a sebum-sensitive adhesive film called Sebutape and then image analysis was performed using binary images of sebum droplet distribution on this tape. The level of sebum and sebum density on each measuring day were calculated and then compared to the placebo formulation. After 28 days of treatment with Bix'Activ at 0.25%, the number of spots significantly decreased by 22% vs baseline and 14% vs placebo. After 56 days of treatment, it significantly decreased by 37% vs baseline ($p<0.001$) and 25% vs placebo ($p<0.001$) (**Fig. 1**).

The active ingredient was able to have this effect without dehydrating the skin, which is extremely important because sebum plays a key role in keeping the skin flexible and preventing water loss from the body.

This study also evaluated the size of the pores on the participants' cheeks. After 28 and 56 days, a qualified evaluator provided a visual clinical score for the sebaceous pores before and after the product was applied. This was scored using the scale described in the Skin Aging Atlas (Bazin) that rates pores on six grades, from zero (not visible) to six (very visible). After 28 days, the active ingredient (0.25 percent concentration) had visibly reduced the size of the sebaceous pores by 3% vs baseline, and it further decreased pore size for a total reduction of 9% vs baseline and 3% vs placebo by Day 56. On top of this, the participants also reported a reduction in pore size during self-assessment. They perceived their pores to have become smaller and less visible. The participants also stated that they felt their skin appeared healthier. And the *in vivo* tests showed that skin imperfections such as blemishes and pimples were significantly reduced by the active ingredient (0.25 percent concentration).

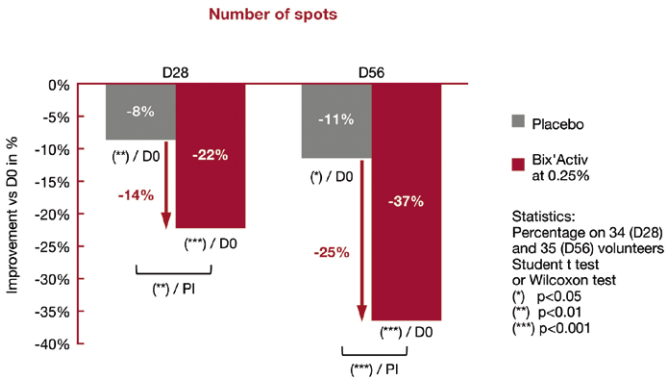

Fig. 1 Percentage of evolution of the number of spots on the forehead measured by image analysis on Sebutape

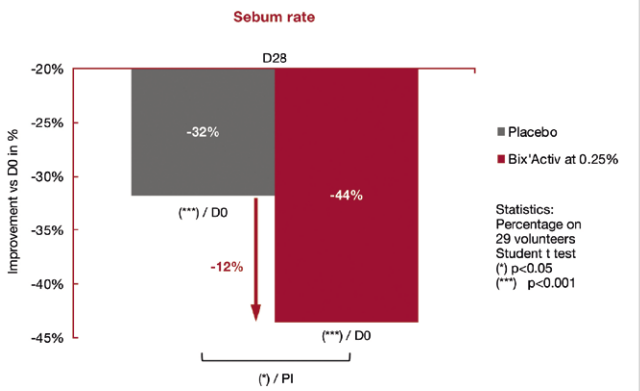

Fig. 2 Evolution of the percentage of the sebum rate (total mass of the lipids excreted by surface unit) on the forehead (Sebumeter).

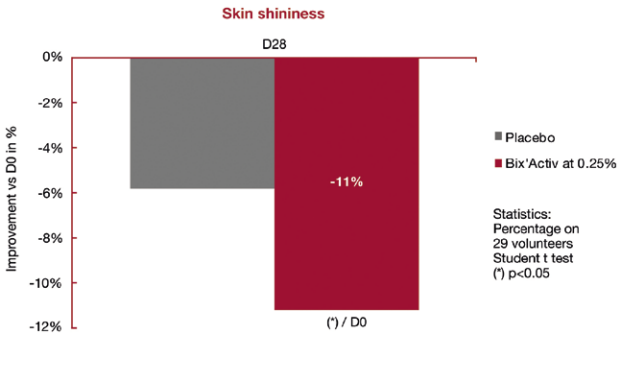

Fig. 3 Evolution of the percentage of the skin shininess (Glossymeter): mattifying effect of Bix'Activ®.

New *in vivo* tests on African skin types

As part of BASF's strong focus on responding to the unique needs of people worldwide, a second clinical study that directly examined the efficacy of Bix'Activ on oily skin for African skin types has now been completed. This double-blind, randomized, split-face, placebo-controlled study was performed on 29 black men and women (phototypes V and VI). The participants were aged from 19 to 40 years old. They all had oily skin (Lipidic index ≥ 100 µg/cm², measured with a Sebumeter), as well as shiny skin. Twice a day for 28 days, the participants applied Bix'Activ (0.25 percent concentration) to one half of their faces and a placebo formula to the other half. Measurements were taken on Day Zero and Day 28.

The Bix'Activ (0.25 percent concentration) formula was shown to decrease the quantity of sebum excreted on the skin surface by 44 percent compared to the baseline and by 12 percent compared to the placebo after 28 days (**Fig. 2**).

The study also showed a mattifying effect that reduced shininess by 11 percent compared to the first day of the study. This was measured using a glossymeter on the forehead to measure the fraction of light being reflected directly from the skin, as well as the scattered fraction of reflected light (**Fig. 3**). In addition, the study confirmed that Bix'Activ (0.25 percent concentration) preserves the hydration of the skin on the cheeks. Using a Corneometer, the study showed no significant difference in hydration levels between Day Zero and Day 28. This demonstrates that the active ingredient can be used to treat oily skin on African skin types without causing skin dryness.

In the self-assessment questionnaire, a significant majority of the participants also stated that Bix'Activ had improved the overall appearance of their skin. 93 percent perceived their skin to be less oily after 28 days, with 97 percent stating that they felt their skin was hydrated and not dry. And 90 percent of participants felt that their pores had tightened, while the same percentage said they felt that the active had reduced imperfections such as pimples or blemishes. Taken together with the results of the study, these self-assessments show that Bix'Activ (0.25 percent concentration) has a capacity to improve the appearance of oily skin, creating a mattified and healthy appearance on African skin types (**Fig. 4**).

Fig. 4 Illustrative pictures of skin shininess, before (D0) and after treatment with Bix'Activ® at 0.25% for 28 days.

Conclusion

Bix'Activ offers a multi-ethnic solution to the problem of oily skin, which affects 35 percent of people worldwide. The active ingredient from BASF, which is extracted from *Bixa orellana* seeds, is 100-percent from natural origin. Moreover, it is COSMOS and ECOCERT-approved, and is also suitable for use in NATRUE-certified formulations. *In viv*o tests on Asian and African skin types have demonstrated that Bix'Activ slows down sebum production, decreases the size of pores and reduces blemishes, while also reducing shininess and keeping the skin moisturized. It is proven to reduce the number and size of active sebaceous glands from Day 28 onwards, which has an overall effect that beautifies the skin.

In particular, Bix'Activ has now demonstrated its efficacy for African skin types. This addresses a significant gap in the personal care market, as many currently available topical skin care solutions for African skin are too harsh and further induce sebum production. The new data shows that this active ingredient is suitable for all ethnicities, with clinical tests and self-assessments both clearly indicating a positive impact on oily skin among study participants with African skin types.

Bix'Activ is one example of BASF's overall strategy of developing customer-oriented solutions that address the unique needs of people worldwide. With the market for beauty and personal care products in sub-Saharan Africa widely predicted to achieve highly attractive growth in the coming years, Bix'Activ has the potential to meet rising demand for customized solutions that are specifically targeted at consumers in this region. BASF will continue its research and development activities to make sure it meets the specific needs of consumers around the globe.

Formulations

Mattifying Cream (SC-FR-18-BC-50802-07) (see p. **38**)
Pore Refining Toner (SC-FR-18-BC-50848-01) (see p. **39**)

References

[1] The trademarks symbolized with a ® or ™ are either property of or licensed to BASF group and registered and/or applied for registration in relevant countries. Other product names and trademarks mentioned may belong to third parties.

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An Innovative Lipid Replacement for Different Types of Hair

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abstract

Since Brazil's early days, the country turned into a "melting pot" of Europeans, Indians and Africans, forming a diverse and multicultural society. This ethnic mix spawned the Mamelukes (Indians with Caucasian people), Caboclos (Africans with Indians) and Mulattos (Caucasians with Africans) who still compound the mosaic of the Brazilian population. The cultural diversity resulting from this process allows Brazil to position itself as a strong laboratory for hair care studies, stimulating huge possibilities of product development that can cover different markets all over the world. Under this scenario, Sensoveil Soft was created. It is a vegetal based product obtained via a proprietary technology which acts as a lipid replacement for different types of hair, by forming a biofilm on the hair fiber through intermolecular attraction forces. The benefits of this ingredient was proven by 3 protocols being two objectives and one subjective. The first one tested combability and cuticle evaluation; the second protocol was focused on frizz reduction and the third one demonstrated results of the salon test. Benefits: improvement of combability; frizz reduction; hair cuticles reparation; softness and shine. It is also silicone, lanolin and quat free; vegan claim; sustainable concept 100% biodegradable; China compliant.

Introduction

Brazil per se has a very interesting history when we look at diversity and multicultural society. Since its early days, this country turned into a "melting pot" of Europeans, Indians and Africans. Most of this is because Portuguese people had a tradition of miscegenation with local people and this has facilitated the integration of different cultures bringing the breath of a multicultural place.

The Multicultural Brazil begins with the composition of its ethnic groups, starting with the miscegenation that occurred since its colonization. This ethnic mix spawned the Mamelukes (Indians with Caucasians), Caboclos (Africans with Indians) and Mulattos (Caucasian People with Africans) who still compound the mosaic of the Brazilian population with Caucasian, Indians, Africans and Asians. The cultural diversity resulting from this process allows Brazil to position itself as a strong laboratory for hair care studies.

There has been a study on the composition of the Brazilian hair types that identifies four additional hair types to the three known standards: Caucasian, African and Asian. Although this has brought out extra complexity to the R&D and Innovation departments when developing hair care products for this market, on the other hand, companies have chosen Brazil as the place to settle their research centers because here one can test their products in all basic hair types plus the results of its mixture.

So from this multicultural and multi mix market it is possible to extract different development possibilities of products that can cover different markets all over the world.

Where a product can be tested and the preference for treating the hair rather than skin, makes Brazil one of the largest hair products market, influencing trends globally and leading this sector in Latin America, where it represents 57% of the Latin America market share which represents BRL 21.6 billion [1].

Evaluating all these possibilities and considering Brazil as a great hair care laboratory; Chemyunion has been capable of creating and developing ingredients that fit different hair types. All by delivering the customer with expected benefits and perceived value. Under this scenario, Sensoveil Soft was created. It is a vegetal based product which acts as a lipid replacement by forming a biofilm on the hair fiber through intermolecular attraction forces. This is possible because this product works on proprietary technology that makes the oil phase to be deposited onto the hair surface independently of its type. The oil phase was chosen with the best synergy between sunflower, crambe and avocado oils. The synergy is rich in Omega 6 and 9, Vitamins A, C, D, E and betacaroten which are delivered through the proprietary technology to attend different types of hair.

Sensoveil Soft is a quat free product designed to condition from its oils without leaving a grease feel. By working with different dosages and galenic formulas, this ingredient will offer a light conditioning to Caucasian hair type. If a more intense conditioning effect is needed, say for instance, an African type of hair, just increase the concentration and it will perform, for Asians just follow the customer need and adjust the desired effect. This leaves the formulator with a great maneuver area to be creative and efficacious when developing his finished product for the standard hair types or all the others.

This new ingredient follows the Fundamentals of Green Chemistry from the American Chemical Society without using organic solvents, with low energy consumption renewable feedstocks and efficient processes that minimize environmental impacts.
The development of this new ingredient has considered diversity, technology and innovation along the same centerline. A set of technical devices were combined with science to prove the effectiveness of delivering purposes and values in a solution designed for a multicultural and diverse global market, which demands attention, care and performance for different types of hair.

Materials & Methods

Hair tresses preparation

The tests were performed with standard tresses of dark brown hair, wavy type, provided by International Hair Importers – USA.
Before the tests began, all hair tresses were washed with anti-residue shampoo and dried with hot air. After pre-treatment, to combability and evaluation of the cuticle (First Protocol – Objective test), the hair tresses were submitted to a twice chemical bleaching process. The frizz reduction test (Second Protocol – Objective test), the hair tresses were submitted to a three chemical bleaching process. Both 2 protocols using 3 hair tresses per product evaluation.
The treatment process was repeated three times.
The hair tresses were maintained under controlled temperature and humidity. At 23°C – 73.4 °F and 50% relative humidity for 24 hours before testing began.

First Protocol – Objective test

Combability
The combability test (objetctive test) was carried out with the aid of a hair combing probe along with the TA.XT Plus equipment from Stable Micro Systems, UK.
Measurement principle: texture analyzer arm combs through the hair fibers and registers the strength necessary to detangle the hair. After combing, the arm returns to its initial position, in order to begin a new combing cycle. This process was repeated 10 times.
The results was performed by comparative evaluation (before and after treatment) of dry hair tresses. It is important to consider that increasing average strength values indicates greater difficulty in combing hair fibers, which may cause breakage of hair fibers due to increased strength applied while detangling hair.

Evaluation of the Cuticle Region by Scanning Electron Microscopy (SEM)
The evaluation of the morphological changes of cuticle regions after bleaching process were performed using Scanning Electron Microscope model 6460LV (JEOL), with magnification of 1.100x.

In order to carry out the evaluation, images of the hair fibers of the Control, Placebo, Benchmark and Sensoveil Soft were captured.

Second Protocol – Objective test

Frizz reduction

The tests were performed with standard tresses of dark brown hair, wavy type, provided by International Hair Importers – USA.

Before the beginning of the tests, all hair tresses were washed with anti-residue shampoo and dried with hot air from the hair dryer.

Each product (6 measurements per hair tresses) were submitted to measurements using the RUMBA evaluation system from Bossa Nova Technologies, USA. Measurements of hair fiber frizz were performed by quantifying the total number of pixels corresponding to each hair fiber. The increase or reduction in the number of pixels are correlated an increase or a reduction of frizz in the hair tresses, respectively.

Third Protocol

Subjective test – Salon test

Test with conditioner: To assess the benefits of Sensoveil Soft, a half-head salon test was performed on 10 volunteers with dyed or bleached hair. For this evaluation, a trained hairdresser washed the volunteer's hair with a standard shampoo (without conditioning agents). After this the hair was divided in two parts (half-head). The hairdresser applied a conditioner containing 2% Benchmark in one side of the head and a conditioner containing 2% Sensoveil Soft in the other side. After rinsing the hair, evaluations were carried out on wet and on dry hair.

Test with shampoo: To assess the benefits of Sensoveil Soft, a half-head salon test was performed on 4 volunteers with dyed hair. For this evaluation, a trained hairdresser wet the volunteer's hair with water. After this the hair was divided in two parts (half-head). The hairdresser applied a shampoo containing 0.3% Sensoveil Soft in one side of the head and a shampoo containing 0.3% Benchmark in the other side.

Results

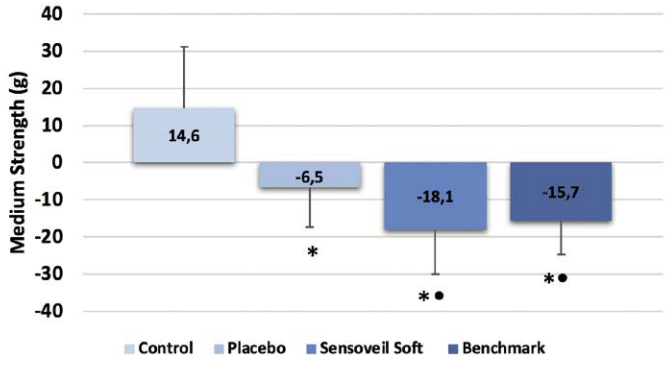
Combability

When evaluating the difference of the average strength values provided by the treatments as an object of this study compared to Control, it was possible to observe (**Fig. 1**) that hair tresses treated with Sensoveil Soft, Benchmark and Placebo have shown significant reduction (P <0.001) of the average combing force values, improving combability.

When compared to Placebo, the hair tresses treated with Sensoveil Soft and Benchmark demonstrated significant reduction (P <0.001) of the average combing force values, improving combability.

The hair tresses treated with Sensoveil Soft demonstrated average strength values similar to Benchmark with the advantage of being a vegetable based product.

Sensoveil Soft improves combability 2.8x better than Placebo.



Notes:
* Significant reduction when compared to the Control (P<0.001).
• Significant reduction when compared to the Placebo (P<0.001).

Fig. 1 Combability evaluation (average strength) of Control, Placebo, Sensoveil Soft and Benchmark.

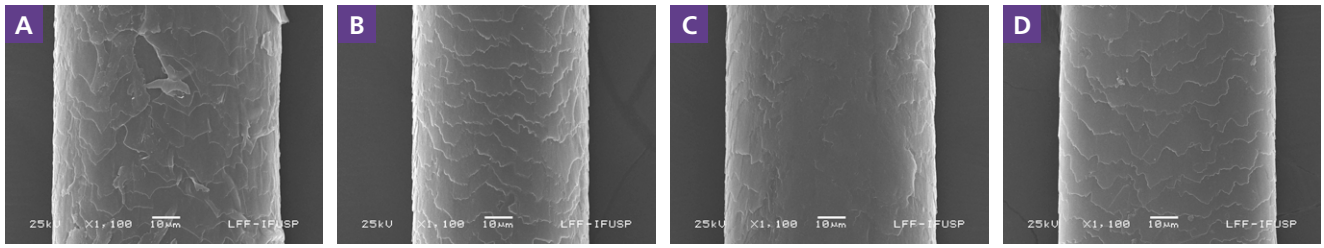


Fig. 2 Evaluation of the Cuticle Region by Scanning Electron Microscopy (SEM).

Evaluation of the Cuticle Region by Scanning Electron Microscopy (SEM)

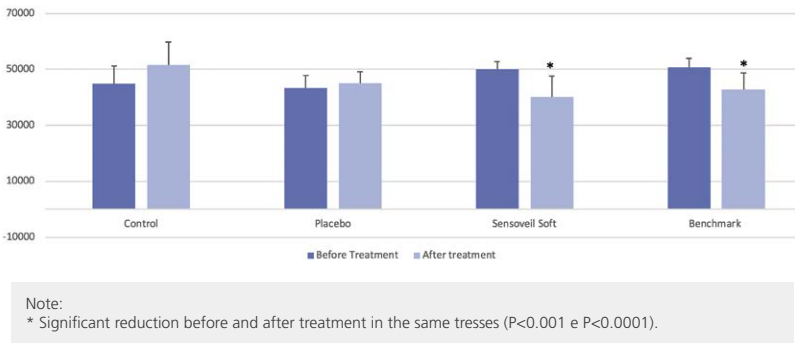
On the surface of the Control and Placebo it was demonstrated cuticles with larger opening angle and fragments on the surface of the fibers (**Figs. 2A** and **2B**).
Benchmark showed some regions with a build-up effect and a noticeable preservation of the cuticle region when compared to the Control and Placebo (**Fig. 2C**).
Sensoveil Soft revealed greater noticeable preservation of the hair surface with a uniform biofilm formation with no build-up effect, allowing aligned cuticles and repair after bleaching process compared to the Control, Placebo and Benchmark (**Fig. 2D**).

Frizz Reduction

According to **Fig. 3**, it was possible to observe that Sensoveil Soft showed a significant reduction in the value of frizz compared to the Control ($p < 0.05$) and Placebo ($p < 0.001$).
Sensoveil Soft promotes similar frizz reduction compared to the Benchmark with the advantage of being a vegetable based product.

Salon Test

On the test with conditioner, on wet hair, Sensoveil Soft has proven superior spreadability, detangling, combability, smoothness and conditioning results, comparing to Benchmark (**Fig. 4**). When the hairdresser evaluate on dry hair, Sensoveil Soft has proven similar performance of shine, detangling, combability, smoothness and conditioning, comparing to Benchmark, with the advantage of being a vegetal based product. According to these assessments, Sensoveil Soft can be used as a great alternative to silicones.
On the test with Shampoo on wet hair, Sensoveil Soft has proven superior performance of combability and similar performance of spreadability, amount of foam and creamy foam comparing to Benchmark (**Fig. 5**).



Note:
* Significant reduction before and after treatment in the same tresses ($P<0.001$ e $P<0.0001$).

Fig. 3 Evaluation of Frizz: Control, Placebo, Sensoveil Soft and Benchmark.

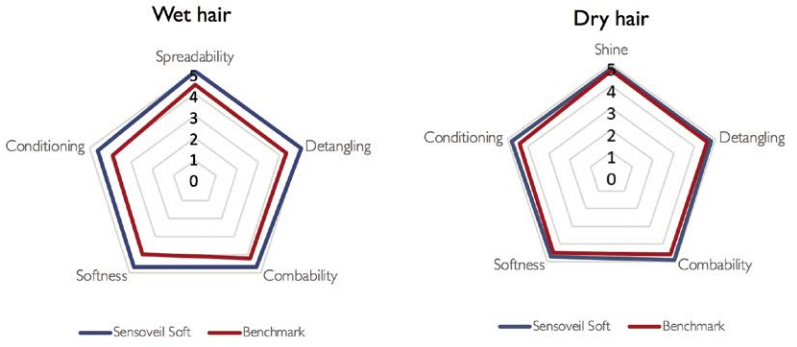


Fig. 4 Comparison of the sensorial parameters between Sensoveil Soft and Benchmark on wet and dry hair.

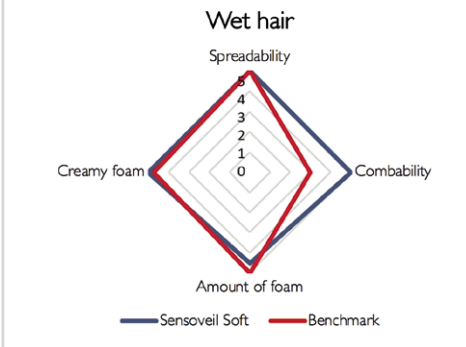


Fig. 5 Comparison of the sensorial parameters between Sensoveil Soft and Benchmark on wet hair.

Conclusions

In the experimental conditions, the results of the protocols performed have shown:

Sensoveil Soft demonstrated average strength values similar to Benchmark with the advantage of being a vegetable based product and improves combability 2.8x better than Placebo.

Sensoveil Soft revealed greater noticeable preservation of the hair surface with a uniform biofilm formation with no build-up effect, allowing aligned cuticles and repair after bleaching process compared to the Control, Placebo and Benchmark.

Sensoveil Soft showed a significant reduction in the value of frizz compared to the Control and Placebo and promotes similar frizz reduction compared to the Benchmark with the advantage of being a vegetable based product.

In salon test with conditioner, on wet hair, Sensoveil Soft has proven superior spreadability, detangling, combability, smoothness and conditioning results, comparing to Benchmark. On dry hair, Sensoveil Soft has proven similar performance of shine, detangling, combability, smoothness and conditioning, comparing to Benchmark, with the advantage of being a vegetal based product. According to these assessments, Sensoveil Soft can be used as a great alternative to silicones.

In salon test with shampoo, on wet hair, Sensoveil Soft has proven superior performance of combability and similar performance of spreadability, amount of foam and creamy foam comparing to Benchmark.

Sensoveil Soft mechanism of action uses intermolecular attraction forces to build a bridge between the amino acids on the hair surface and sunflower, crambe and avocado oils (knowned by their emmolient properties). This vegetable oils homogenously lay over the hair forming a biofilm, recovering shine, softness, combability and aligned cuticle as have proved in the tests performed.

This product provides noticeable conditioning in the first application, it is easy to apply and can be used in shampoos, conditioners, masks, pomades, water-less products, powders and bars. Because of its versatile properties, Sensoveil Soft suits different types of hair.

This ingredient provides the following benefits: improves combability, reduces frizz, repairs cuticles after bleaching processes, promotes softness and shine, claims such as silicone, lanolin and quat free, vegan claim, sustainable concept 100% biodegradable and is China compliant.

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[1] Euromonitor (2018).

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abstract

Darkenyl™ is a revolutionary and unique hair repigmenting active ingredient. It has been rationally designed to counteract the hair greying biological process, by combining two synergistic molecules: an optimised plant polyphenol (taxifolin glucoside), triggering the hair follicle stem cells to produce new melanocytes, while protecting hair follicles from free radicals (ROS); and a soluble precursor of melanin synthesis (N-acetyl-tyrosine), boosting melanogenesis.

Taxifolin glucoside is a unique stabilised polyphenol shown to reactivate hair bulge stem cells proliferation (+30%) and migration to help repopulating the hair matrix with new melanocytes. Its antioxidant properties enable to reduce free radical damages in hair follicles (-53%) and helps protecting existing melanocytes (+189%). Once the hair matrix has been repopulated with new melanocytes and that both new and existing melanocytes are protected from ROS, Darkenyl™ delivers its melanin synthesis precursor (N-acetyl-tyrosine) to reactivate melanogenesis (+364%).

Darkenyl™ therefore features a mode of action inspired from stem cells, and delivers powerful consumer benefits: 3.4 times less white hair in 4 months than a placebo (down to -56% white hair). It is also gender and hair-colour independent and it ensures a long-lasting efficacy.

Stress, pollution and emotions are making our hair suffer. And whatever the source of problems, people are looking for solutions from the beauty industry, the easiest and most efficient way to get fast results. Consumers perceive the "premature ageing" of hair at two levels, physical and psychological. Actually, over 60% [1] of people in the world are currently bothered by hair color loss, especially people aged between 30 and 44. After this age (45 to 65 years old), 74% [2] of the worldwide population is affected by greying hair. Let's see how Darkenyl™ brings a safe and efficient answer to consumers' haircare need.

If genetics can play a large role in hair whitening, it is now well-known that free radicals are directly inducing the premature greying of hair for both men and women. Most of the existing hair pigmentation solutions are based on hair colorants, artificially repigmenting the hair shaft but not addressing the origins of hair whitening. Two other interacting factors are also part of the progressive loss of hair colour, the diminution of melanocytes number in the hair matrix and the decrease of melanin production by these melanocytes.

A human hair shaft is formed by three different layers: the cuticle (external shell), the cortex (internal part, containing melanin granules, responsible for hair colour), and the medulla (soft core only present in mature white hair). Melanin production in the hair is controlled by melanocytes located in the hair bulb matrix [3]. Their activity is regulated by the normal hair cycle. During the growing phase, the melanin produced by active melanocytes is transferred into cortical keratinocytes resulting in pigmentation of the entire hair shaft. During the catagen phase, the melanocytes will enter in apoptosis, and then disappear during telogen phase [4]. In order to produce a pigmented hair during the new growing phase a new pool of melanocytes will migrate and differentiate from the hair follicle stem cells reservoir to the hair bulb to naturally pigment the new hair [5].

Why do we lose hair colour?

The hair greying is explained by age related functional changes in the stimulation and migration of the stem cells from the bulge, but also by environmental factors. Indeed, the accumulation of reactive oxygen species (ROS) into melanocytes upon ageing will lead to mutations, decrease of antioxidant protection system, inflammation, hair falling and greying [6] through two main actions, decrease of the melanogenesis (lower melanin production by melanocytes) and decrease of the melanocytes number (less melanocytes to produce melanin).

How to act on stem cells to repigment the hair shaft?

Givaudan's experts have designed Darkenyl™ to counteract the hair whitening biological process, by combining two synergistic molecules, the taxifolin glucoside and N-acetyl-tyrosine. The first one is a unique stabilised polyphenol shown to reactivate hair bulge stem cells proliferation (+30%) and migration to help repopulating the hair matrix with new melanocytes. Its antioxidant properties enable to reduce free radical damages in hair follicles (-53%) and helps protecting existing melanocytes

(+189%). Once the hair matrix has been repopulated with new melanocytes and that both new and existing melanocytes are protected from ROS, Darkenyl™ delivers its melanin synthesis precursor (N-acetyl-tyrosine) to reactivate melanogenesis (+364%). In 4 months, it has been demonstrated that Darkenyl™ significantly reduces the proportion and density of white hair (down to -56%), 3.4 times better than a placebo.

Stimulation of hair follicle stem cells and melanogenesis

In vitro tests have been performed to study the stimulation of stem cells. One of them, a transcriptomic analysis, related to genes, has seen the hair follicle stem cells (ORSc) treated with 50µM of taxifolin glucoside (one of the 2 main components of Darkenyl™). The expressions of proliferation genes, hair follicle morphogenesis genes and stem cell maintenance genes were evaluated by RT-qPCR. Results show that taxifolin glucoside significantly increases the expression of these genes. A second test has seen the hair follicle stem cells (ORSc) treated with increasing concentration of taxifolin glucoside. The proliferation of ORSc was evaluated by measuring the incorporation of Bromodeoxyuridine (BrdU) into DNA of proliferating cells. Results show taxifolin glucoside significantly increases the proliferation of the hair follicle stem cells, up to +30% versus positive control (EGF). (**Fig. 1**)

To mimic the natural interaction of keratinocytes and melanocytes in the hair matrix, a co-culture of normal human keratinocytes (NHK) and normal human melanocytes (NHM) were treated with Darkenyl™ at 0.01% or Rapamycin (positive control), or left untreated for 72 hours. The melanin content in the cells supernatant was evaluated by colorimetric assay (405nm). It appears that Darkenyl™ significantly increases the melanogenesis, by +364%. (**Fig. 2**)

Activation of hair follicles defences and pigmentation

The antioxidant and pigmentation related genes activation was conducted *ex vivo* on face lift skin explants from three donors with the average age of 63. A mix of 9 mg of hypoxanthin + 10 units of xantin oxidase have been applied during one hour per day for three days, in order to mimic the oxida-

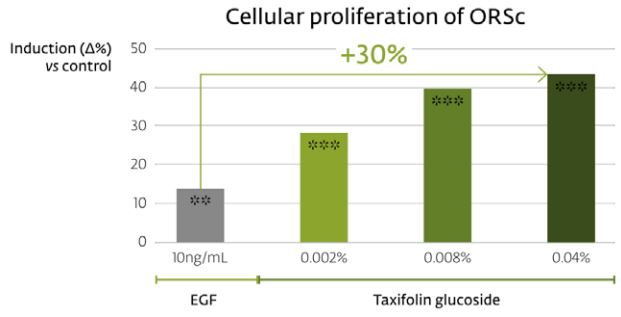

Fig. 1 Cellular proliferation.

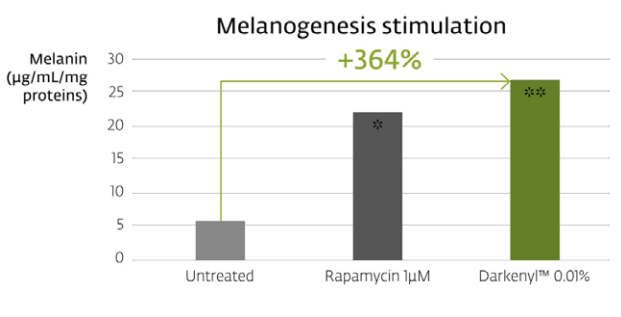

Fig. 2 Melanogenesis stimulation.

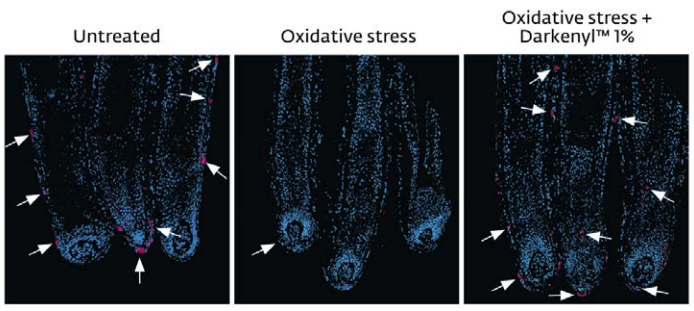

Fig. 3 Melanocytes protection.

tive stress occurring in ageing hair follicle. Then a treatment was done for 48 hours with 1% of Darkenyl™. The expression of genes involved in hair pigmentation, hair renewal and antioxidant defences were measured by RT-qPCR. It appears that under oxidative stress, Darkenyl™ significantly stimulates the expression of these genes.

On the other side, human hair follicles from a female donor (56 years old) were treated with 1% of Darkenyl™ or left untreated. The hair follicles are then exposed to an oxidative stimulus (cumene hydroperoxide – 50µM) for one hour. The ROS accumulation into the hair follicle was evaluated using a green fluorescent probe. Darkenyl™ demonstrates that under oxidative stress, it can significantly decrease by -53% the ROS accumulation into the hair follicle.

Protection of melanocytes during an oxidative stress

Human hair follicles from a female donor (56 years old) were exposed to an oxidative stimulus (cumene hydroperoxide – 50µM) for one hour during an *ex vivo* test. The hair follicles were then treated with 1% of Darkenyl™ or left untreated. The pigmenting cells (melanocytes and melanoblasts) quantification was obtained following NKI/beteb-DAPI double immunostaining. Darkenyl™ significantly protects the melanocytes and melanoblasts into the hair follicle under oxidative stress, by +189%. (**Fig. 3**)

Reaction of pigmentation in white hair

Stimulation of melanin production in greying hair was also tested during an *ex vivo* test. Human hair follicles in anagen phase (growing) from 2 donors (35 and 53 years old) were treated with 1% of Darkenyl™ for 72 hours or left untreated. The melanin content into the hair follicles was evaluated using melanin quantification with Fontana Masson staining and image analysis. Darkenyl™ significantly increases by +15% the production of melanin into the greying hair follicles in 3 days. (**Fig. 4**)

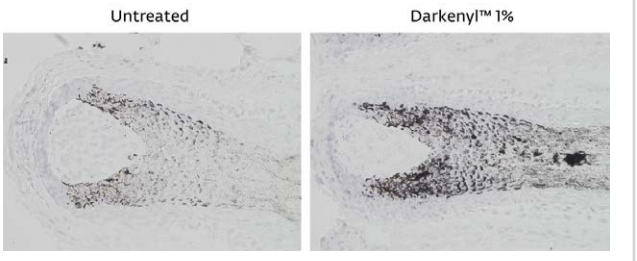

Fig. 4 Melanin production.

Darkenyl™ reduces white hair in 4 months

The efficacy of Darkenyl™ at 1% was evaluated in a double blind clinical test versus placebo. Forty four Caucasian male volunteers (18 year old and more) with white hair were involved in this evaluation. The panel was split into two groups of twenty two volunteers each, one was testing the placebo and the other one was testing the hair lotion containing 1% of Darkenyl™. The treatment was applied in leave-on by massage on the scalp, once a day for four months. Clinical tests have shown amazing results such as the reduction of the white hair proportion. Pictures of the scalp were taken using a NIKON D7100 in combination with the Canfield Epiflash® system, on the first day of the test and after four months of daily application of the product. The hair parting area was defined according to the white hair localisation. A blind scoring was performed to evaluate the proportion of white hair in the picture versus total number of hair. After four months of treatment, Darkenyl™ significantly decreases the proportion of white hair by an average of -17% versus D0 (from 59% of white hair at D0 down to 49%), 2.1 times better than the placebo. The proportion of white hair is visibly reduced, with a reduction down to -56% for the best respondent (from 90% of white hair at D0 down to only 40% after 4 months). No white roots effect was observed during hair growth. (**Fig. 5**)

To evaluate the efficacy of Darkenyl™ independently from the scalp density, an absolute quantification of the white hair number was also performed. At the beginning of the test, an area of 1 cm^2 was shaved on each panellist's scalp. Two days after shaving, a

Fig. 5 Scalp density.

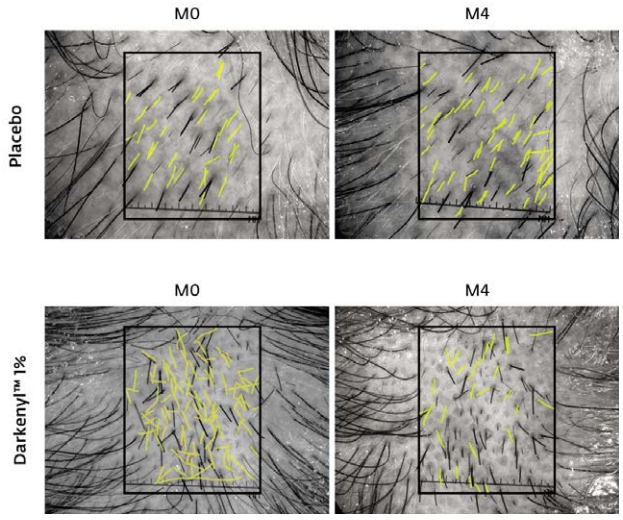

Fig. 6 Hair density.

picture was taken of the area using a NIKON D7100 in combination with the Canfield Epiflash® system. The density of white hair (number/cm²) was evaluated with a specific Photoshop® tool, on a 0.7 cm² test area (1 x 0.7 cm) defined on the image. All white hair whose root was in the analysis zone were counted. After four months of treatment, Darkenyl™ significantly decreases the number of white hair per cm² by -6.8, 3.4 times more efficiently than the placebo. The density of white hair is visibly reduced, with up to -55.7 white hair per cm² for the best respondent after four months, equivalent to a reduction of -33,420 white hair (the average scalp surface being 600 cm²). (**Fig. 6**)

Darkenyl™, the perfect innovation to answer a global consumers' need

Most of the existing hair pigmentation solutions are based on hair colorants, artificially repigmenting the hair shaft but not addressing the origins of hair greying – sometimes even generating additional free radicals during their usage. These dyes usually end up with non-natural results (a point of concern for men), and lead to the well-known "white hair roots" effect when hair grow back. Darkenyl™ is rationally inspired from the analysis of biological causes of the hair greying. Its unique mode of action is gender independent and can be used on any hair type or colour. It shows progressive and long-lasting results with no white roots effects. Darkenyl™ is the first active ingredient with clinical evidence versus placebo to reactivate the overall hair pigmentation in a significant way, helping consumers look younger upon time, in a natural way, with their own hair colour. Water soluble and worldwide compliant, this active ingredient is easy to formulate in any haircare formula. By reboosting the native production of hair pigment, Darkenyl™ enables brands and formulators to design new generations of "well-ageing" hair care products while crafting a new sensory beauty gesture answering consumers' expectations number one: "I want to look and feel younger with natural solutions".

To inspire the beauty industry

Our experts of formulation crafted S3D® Colourback, a repigmenting and conditioning serum to beautify and rejuvenate the hair. Featuring Darkenyl™ and ResistHyal®, which is the ultimate hair beauty enhancer (optimised mix of hyaluronic acids), this product quickly penetrates into the scalp and spreads on the hair while activating the repigmentation process and protecting the hair follicles. With its innovative comb, S3D® Colourback enables a precise and effective application, directly on the roots.

An active awarded several time

Since its launch, Darkenyl™ won some impressive awards. It began in 2018, when the active ingredient won the Spotlight On Formulation Award – Haircare Actives Winner during in-cosmetics Asia. 2019 was also a successful year since it won 3 awards, two awards during in-cosmetics global 2019 in Paris, the first one for the Innovation Zone Best ingredient Award 2019 – Bronze and the second one for the Best hair care ingredient awards at the Beauty Industry Awards, but also the 1st prize as Innovation Award 2019 during SEPAWA® Congress.

Leave-in option, the sustainable choice

Reducing the amount of water is also part of our main concern for the sustainability in the beauty industry. This is why Givaudan Active Beauty makes sure that active ingredient such as Darkenyl™ can be used in leave-in formula such as hair colour recovery spray for example.

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Androgenetic Alopecia: Microbiota Landscape and Role of *Lindera strychnifolia* Roots Extract as a Natural Solution for Hair Loss

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Abstract

The human scalp harbors a vast community of microbiotal mutualists. Androgenetic alopecia (AGA), a most common form of hair loss in males, is a multifactorial condition involving genetic predisposition and hormonal changes. The role of microflora during hair loss remains to be understood. Here, we investigated bacterial communities in 12 healthy and 12 AGA subjects at baseline and after 84 days of treatment by *Lindera strychnifolia* roots extract (LsR). Using a phototrichogram, we also compared hair density and total hair counts in 17 subjects receiving LsR treatment at baseline and after 83 days of treatment.

The analysis of bacterial distribution at the genus level showed no modifications between healthy and AGA groups. Higher *C. acnes/S. epidermidis* ratio in AGA subjects compared to control ones was noted. Concerning the mycobiota environment, lower abundance of Basidiomycota and higher proportion of Ascomycota, associated with lower proportion of *Malassezia genus* and increase of other *fungal genus* (*Wallemia, Eurotium*), implicated in the hair loss process, were observed in AGA scalp. Finally, lower proportion of *M. globosa* and *M. restricta* were observed. Therefore, data from sequencing profiling of the scalp microbiota strongly support a different microbial composition between normal and AGA affected the scalp. 84 days treatment with LsR extract rebalances bacteriota and mycobiota for a healthy scalp. A significant increase in hair number that reach +6.9% compared to Day 0 (p=0.002) was observed in the 17 subjects. At this time point, 71% of men had an improvement of hair density.

Based on these results, we conclude that the LsR extract is a promising remedy for preventing hair loss and promoting hair growth.

Introduction

Androgenetic alopecia (AGA) or simply baldness is the most common form of permanent hair loss in both men and women with an increasing prevalence with age. It is a hereditary pattern affecting 80% of Caucasian men and 40% of women throughout a life time [1]. Although there is racial variation in the incidence of androgenetic alopecia, it affects at least 50% of men by the age of 50 years and up to 80% of them in later life [2]. Prevalence in women has wide variation ranging from 6% in women aged under 50 years to 30-40% of women over 70 years [2]. The occurrence of AGA has been considered to have a great negative impact on the patient's psychology and the quality of life [3].

AGA is characterized by a progressive loss of hair diameter, length, and pigmentation. Shortening of the hair growth phase (anagen phase) and a slow progressing miniaturization of the hair follicle occurs over time, hair growth cycle comprising of anagen, catagen, and telogen phases. During the transition between these phases, a group of specialized fibroblasts known as dermal papillae cells (DPCs) present in the hair follicle bulb plays an essential role in the regulation of the hair growth cycle, and factors affecting the functions of DPCs are of great importance for the development of therapy for the treatment and/or prevention of hair loss [4]. These factors include, but not limited to, multiple signaling molecules, such as Wnts, Sonic hedgehog (Shh), and transforming growth factor-beta (TGF-β), which contribute to the anagen initiation of multipotent epithelial stem cells [5]. Targeting these biochemical signaling pathways of hair growth regulation would be a rational approach for the treatment of alopecia.

The genetic inheritance of AGA is well known. However, its ethology is multifactorial including micronutrients, stress, alterations of hormonal secretion [6]. Infiltration of mononuclear cells and lymphocytes is also detected in about skin samples of AGA. This micro-inflammation takes place in the upper third of the hair follicle, where a great number of microorganisms are harbored. Besides these factors, strongest evidence supporting correlations with microorganisms colonizing the scalp has been found in seborrheic dermatitis and in dandruff [7]. The most abundant bacteria found in scalp swabs of healthy individuals are *Cutibacterium spp.* (with the vast majority of *C. acnes*) and *Staphylococcus spp.* (with the predominance of *S. epidermidis*), comprising approximately 90% of the total gene sequences.

Corynebacterium spp., *Streptococcus spp.*, *Acinetobacter spp.*, and *Prevotella spp.* are listed among other significantly less numerous species [8]. Among fungi, *Malassezia spp.* largely predominate on the scalp, *Malassezia globosa* (*M. globosa*) and *M. restricta* being the most abundant species.

Ascomycota (*Acremonium spp.*, *Didymella bryoniae*), other Basidiomycota (*Cryptococcus liquefaciens* and *C. diffluens*),

Coniochaeta spp., Rhodotorula spp., were also identified on healthy scalp. It appears that fungal invasion and prevalence of *Cutibacterium* acnes result in an increased hair shedding [9]. Nevertheless, the data are scare.

Management of alopecia is an essential aspect of clinical dermatology given the prevalence of hair loss and its significant impact on patients' quality of life. Over the centuries, a wide range of remedies has been suggested for androgenetic alopecia and current treatments include surgery, hormone action modifiers and non-hormonal therapy. Pharmacological therapies are based on the understanding of androgen action mechanisms in hair follicle. Use of natural products has been quite common in hair care industry and the search for natural products is being continuously promoted [10]. It seems that polyphenols and terpenes have positive effects on hair growth cellular pathways. Indeed, polyphenols have been shown to enhance proliferation of human dermal papilla cells, to increase growth factors concentrations such as IGF-1 and VEGF and to reduce oxidative stress, resulting in an improved hair growth [11]. Lignans were also shown to exert hair growth-promoting effects by increasing Wnt/β-catenin signaling pathway in human dermal papilla cells [12]. Terpenes such as linderane were also able to inhibit the cAMP/PKA/CREB pathway [13] whereas agents increasing cAMP levels were identified as potent inhibitors of human hair follicle growth. These molecules can be found in some plants such as *Lindera strychnifolia* roots (LsR) [14]. The plant, is distributed in several Asian countries and is considered as a drug promoting longevity and as an elixir of life. Extracts of roots are used as traditional medicine and recent studies reported antioxidant and anti-inflammatory effects [15].

The aim of this investigation was to evaluate the effect of LsR extract versus placebo on the bacterial and fungal scalp microflora using a panel of 12 volunteers presenting a hair loss / chronic alopecia. The strategy used was based on high throughput DNA sequencing targeting the encoding 16S ribosomal RNA for bacteria and ITS1 (Internal Transcribed Spacer 1) ribosomal DNA for fungi. Finally, the efficiency of LsR extract in preventing hair loss was assessed using phototrichogram analysis during 84 days in 17 subjects.

Material and Methods

Preparation of Extract

Dried roots of *Lindera strychnifolia* were firstly washed by alkaline water, and then extracted by 70% alcohol at 65°C during 12 hours. After 10 µm clarification, the extracted solution was concentrated, under vacuum at 55°C, up to 6% of dry matter in propan-1,3-diol (less than 10% of residual water). The decontamination is realized by filtration under 2 µm.

Lindera strychnifolia roots extract (LsR) contains polyphenols (29.4% per dry matter), linderane (1.2% per dry matter) and linderalactone (1.8% per dry matter). The polyphenols content is mainly constituted by tannins (24% per dry matter) and catechin derivatives (5% per dry matter).

Subjects recruitment

Twelve males AGA subjects (40–65 years old) were recruited. They had chronic alopecia of androgenetic origin with a stage of III to IV according to the Norwood Hamilton classification.
All enrolled subjects had to meet the following criteria: 1) no antibiotics in the 30 days leading up to the sampling 2) no probiotics in the last 15 days 3) the last shampoo was performed 48h before sampling 4) not suffering from other dermatological diseases 5) no anti-tumor, immunosuppressant or radiation therapy in the last 3 months 6) no topical or hormonal therapy on the scalp in the last 3 months 7) Any local or general treatment that may affect hair growth or hair loss in the last few months prior to the investigation 8) no subject with hair loss treatment or who has used this type of treatment (application of Minoxidil or taking of Finasteride within six months before the start of the study or taking another product for oral or topical hair loss treatment during the 3 months prior to the selection visit 9) No inflammatory skin disease or progressive skin lesion on the scalp (psoriasis, seborrheic dermatitis, severe erythema, severe excoriation, severe sunburn, etc.)
The control group included the following criteria: (1) the age and sex of healthy volunteers were basically matched with those who participated in the hair loss group; (2) perms and hair dyes were not used 2 months prior the treatment. Anti-hair loss shampoo was also not used; (3) oral or topical antifungal preparations were not given within 1 month prior the treatment; (4) no scalp-related diseases such as scalp folliculitis, head lice, and alopecia areata were observed in the individuals.

Treatment

Applications of a lotion with LsR extract at 1% and a placebo lotion were performed twice daily during 84 days on a randomised half-head (one product per half-head).

Swab sample collection
The scalp surface has been sampled by means of swab procedure.

DNA extraction
Genomic DNA was extracted with the "DNeasy PowerSoil kit" following supplier's recommendations. Genomic DNA samples were stored at -80°C and were then sent to an external firm for next generation sequencing.

Amplification and sequencing of 16S RNA gene
Microbiota composition analysis of samples was performed by amplifying the hypervariable regions V1-V3 of the 16S RNA gene. Sequences were processed using Mothur (version 1.36.1) according to MiSeq SOP pipeline (Schloss, 2009).

Amplification and sequencing of ITS1 RNA gene
Fungal composition analysis of samples was performed by amplifying the ITS1 regions of the RNA gene. This amplification was done using universal primers ITS5 (GGAAGTAAAAGTCGTAACAAGG) and 5.8S-1R (GTTCAAAGAYTCGATGATTCAC) which target the conserved regions of this gene common to all fungi. The products of this amplification were sequenced by MiSeq Illumina technology. Sequences were processed using Mothur (version 1.36.1) according to pipeline developed by our provider.

Phototrichogram test
For this evaluation at D0 and D84, we focused on type III alopecia (n= 17 men, mean age: 51 years old). Type III androgenetic alopecia (according to Norwood Hamilton scale) represents the minimal extent of hair loss sufficient to be considered as baldness. The treatment was the same as the first study.
The phototrichogram is a non-invasive technic that allows studying the hair growth cycle by the determination of the proportion of growing and resting hair. Analyses of the photographs allow the determination of hair number of in growing (Anagen) and resting/shedding (Telogen) stages.

Self-assessment questionnaire
At the end of the study, all subjects completed a self-evaluation questionnaire to evaluate their overall opinion and their attitude towards the effectiveness of the lotion being tested.

Statistical analysis
Results are presented as mean ± SEM.
Statistical analysis of variations over time and analysis comparing LsR extract and Placebo were performed using paired t-test (if the normality of the distributions was confirmed using the Shapiro-Wilk) or with the Wilcoxon test (if the normality of the distributions was rejected). The level of significance was set at 5%.
Concerning the scalp microbiome, alpha diversity (Shannon diversity index) was evaluated. It is a measure of the biodiversity of samples and is characterized by the observation of the taxonomic richness and distribution of OTUs.

Results

Identification of bacteria communities

Alpha-diversity did not differ between the groups studied, whatever the period of investigation.
At D0, samples corresponding to healthy scalps were mostly composed of 3 major phyla: *Actinobacteria, Firmicutes* and *Proteobacteria* that account for 98% of total sequencing

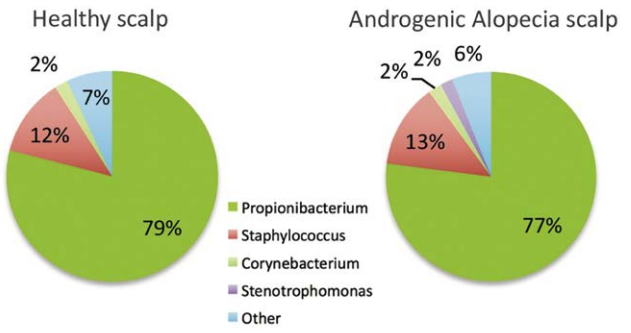

Fig. 1 Distribution of the bacterial genus present in the samples corresponding to healthy and hair loss/chronic alopecia subjects.

reads in all samples. The bacterial landscape corresponding to AGA scalps showed no modifications as compared to healthy group.

At the genus level, *Propionibacterium* (79%) and *Staphylococcus* (12%) account for about 90% of the total scalp microflora for healthy volunteers, data in agreement with the literature (Polak-Witka, 2019) (**Fig. 1**). For the AGA volunteers, *Propionibacterium* (76.5%) and *Staphylococcus* (14%) account also for about 90% of the total scalp microflora.

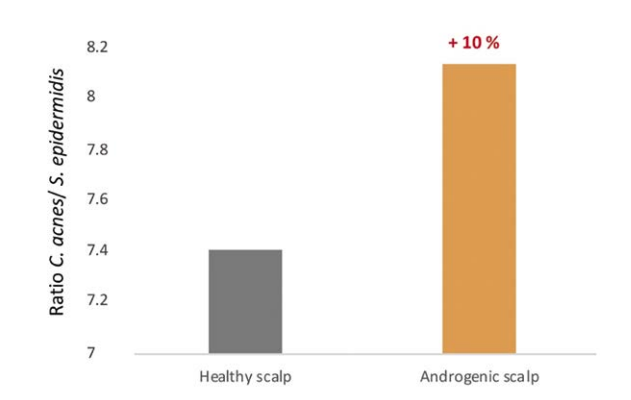

Fig. 2 Ratio *C. acnes/S. epidermidis* at D0 in healthy and hair loss scalp.

At the species level, mean reads of *Stenotrophomonas geniculata* and *Staphylococcus epidermidis* were different between healthy and AGA group, with higher mean reads of *Stenotrophomonas geniculate* noted in the AGA population. At the same time, the ratio *C. acnes/S. epidermidis* was higher in AGA subjects (mean ratio = 8.1) compared to control subjects (mean ratio = 7.45) **Fig. 2**).

Identification of fungal communities

It was observed that the alpha-diversity (Shannon diversity index) for the fungal population was not significantly different in the healthy scalp compared to the AGA scalp, whatever the period of investigation.

Taxonomic fungal composition of healthy and hair loss scalp at the beginning of the study (D0) are presented in **Fig. 3**.

Healthy scalp is mostly composed of one major phyla: Basidiomycota, predominant fungus being *Malassezia*. The bacterial landscape corresponding to pathogenic scalps differed from that of healthy scalps by a lower abundance of *Basidiomycota* (91%-89% vs 99% for AGA scalp and healthy scalp, respectively) and a higher proportion of *Ascomycota* (8%-10% vs 1% for AGA scalp and healthy scalp, respectively).

A lower proportion of *Malassezia genus* in samples corresponding to AGA scalps and an increase of other bacterial genera (*Wallemia, Eurotium*) were noted (**Fig. 3**).

At the species level, results showed that the samples were mainly composed of fungi belonging to the *Malassezia genus*. The major component in the healthy scalp of fungal microbiome was represented by *M. restricta* and *M. globosa*.

A lower proportion of *M. globosa* and *M. restricta* were observed for the AGA group (-56% and -52%) as compared to the control group.

Effect of LsR extract treatment on microbiome

At the phylum and genus level, LsR extract maintains the biodiversity of bacteria.

Results showed a significant decrease in the abundance of Cutibacterium acnes (-15%) following the treatment with

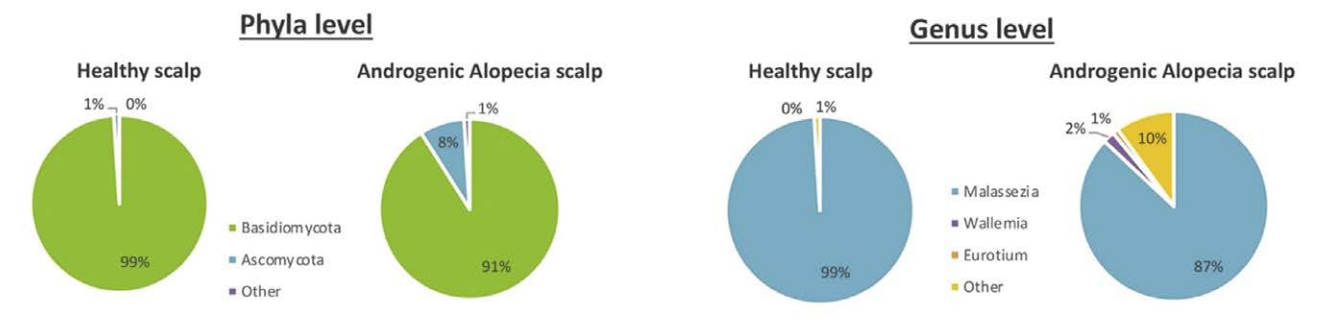

Fig. 3 Distribution of the fungal phyla and genus present in the samples corresponding to healthy and hair loss/chronic alopecia subjects.

LsR extract ($p < 0.05$). *Staphylococcus epidermidis* increased significantly ($p < 0.05$) by 33% between D0 and D83 with LsR treatment. Thus, the ratio *C. acnes*/S. epidermidis decreased by 37.8% as compared to the ratio noted at D0 (**Fig. 4**).

At the phylum level, LsR extract tended to restore the "normal" fungal landscape for the Basidiomycota phylum and the three fungal genera studied. In fact, LsR extract allowed an increase in the abundance of *Malassezia* (+3%). A decrease of *Eurotium* and *Wallemia* were also observed. After 84 days of LsR treatment, the proportion of *M. restricta* has returned to the same value as healthy group.

Phototrichogram test

A significant increase in hair number that reach 7% compared to Day 0 ($p=0.002$) was observed (**Fig. 5**).

Self-assessment

After 84 days of treatment with LsR extract, men reported their satisfaction about:

Hair growth and anti-hair loss efficacy

- 78% of the men reported a speed up the growth of their hair
- 72% of men observed a rapid action of the lotion with a decrease in the amount of hair in the brush, lost after the shampoo and on the clothes/pillows".
- 75% of men reported a stimulation of hair growth and a slowdown of hair fall
- 72% of men observed that hairs are visibly denser and 69% that they seem more abundant.

Hair aspect and properties

72 to 88% of men observed that the hair recovers its strength (78%) and vitality (81%) and appears more vigorous (88%), more resistant (88%) and less brittle (78%).

Discussion

The skin is the largest organ in the human body. It keeps the first barrier of the immune system that not only resists the invasion of foreign pathogens, but also protects tissues and organs. A diversified and abundant microbial community host the skin and this symbiotic relationship results, most of the time, as beneficial for both the host and microbial community. Bacteria mainly belong to *Corynebacteriaceae, Propionibacteriae*, and *Staphylococcaceae* [16], depending to the physiochemical properties of each skin site they host. However, little is still reported with regards to the microbiome inhabiting the scalp and hair growth disorders such as dandruff [17]. Characterization of scalp bacterial species involved in Alopecia androgenetica, Alopecia areata, has also been poorly investigated and, only recently, the piece bit of evidence has been reported [18]. We focused our attention on bacterial population of the scalp of healthy and AA subjects looking at main bacterial species on the scalp. Our results agree with *Pinto's* work [19], showing an increase of the ratio *C. acnes/S. epidermidis* in AGA subjects. *C. acnes* is able to synthesize many enzymes involved in the metabolism of porphyrins that, once activated, may contribute to oxidation and follicular inflammation. Virulence in the hair follicle is noted to cause hair loss as a consequence [9]. Therefore, a speculation about the role of the hypoxic condition of the follicular region may be speculated in AGA and this may encourage *C. acnes* overgrowth [9]. *C. acnes* predominance is also identified in non-lesional scalp of patients with seborrheic dermatitis, providing support for the development in sebaceous gland in AGA, which may attract the proliferation of *C. acnes* for lipids and fatty acids [20].

Data also suggested a higher diversity of bacterial species inhabiting the scalp of AGA subjects, such as *Stenotrophomonas sp.*, which is an opportunistic human pathogen, characterized by high keratinase activities [21].

On the basis of the present and previous results, a link with a higher susceptibility of an unhealthy scalp to be colonized by microorganisms could be postulated but further analysis are needed to understand the reason behind this high variety.

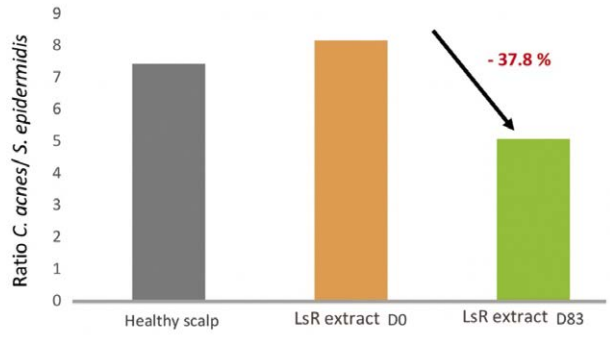

Fig. 4 Effect of LsR extract on the ratio *C. acnes/S. epidermidis.*

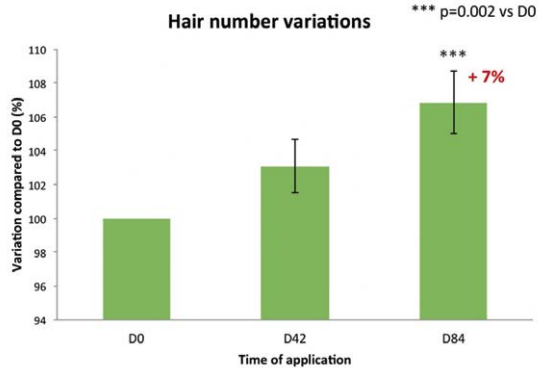

Fig. 5 Mean variation of hair number in type III alopecia after application of LsR extract. *** $p=0.002$ vs D0


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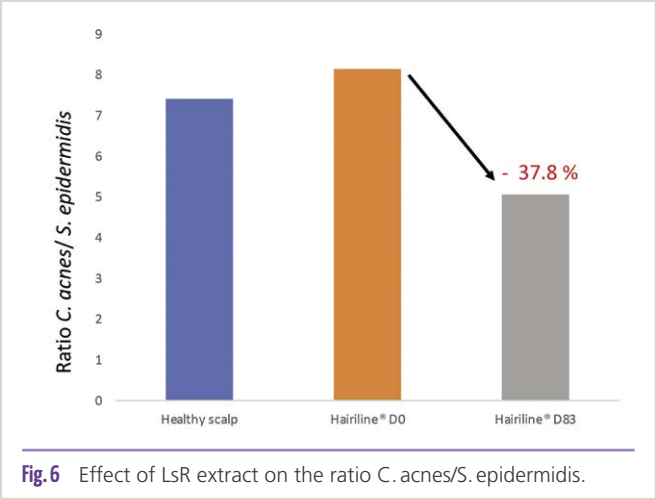

Fig. 6 Effect of LsR extract on the ratio C. acnes/S. epidermidis.

The prominent fungal species in healthy scalp belonged to the genera *Malassezia* (**Fig. 6**). At the species level, a high abundance of *M. restricta* and *M. globosa*, was observed as reported by *Grimshaw et al.* [22]. Contrary to *Huang et al.* [17], the abundance of these two strains were lower in AGA scalps. In healthy people, *Malassezia* maintains a harmonious and balanced symbiotic relationship with the host.

Treatment during 84 days with LsR extract tends to restore the "normal" fungal landscape and scalp microbiota, limiting specific species, inducing keratin alterations. The efficacy of the treatment with LsR extract on hair density was validated. Therefore, all investigated subjects after LsR extract treatment reported decrease in the amount of hair in the brush, lost after the shampoo and on the clothes/pillows, and a stimulation of hair growth and a slowdown of hair fall.

Conclusion

Our results confirm the presence of a significative bacterial and fungal disequilibrium on the scalp of AGA subjects compared to healthy population. 84 days of LsR treatment induced a reversible microbiome environment. These data are in line with the clinical efficacy of the treatment. This active ingredient offers a new natural solution for formulated products aiming to manage hair loss by acting on the scalp microbiome.

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Rebalancing the Excessive Sebum Production in the Scalp

I. Montaño, C. Pickel, F. Wandrey

An oily scalp is caused by over-reactive sebaceous glands on the scalp. The oil or sebum attracts dirt more easily, produces even dandruff, and makes the hair stick together. To reduce the sebum and enhance the barrier efficacy on oily scalp, Mibelle Biochemistry has developed an active ingredient based on the Chinese medicinal herb *Astragalus membranaceus*. AstraForce is a liposomal preparation of *Astragalus membranaceus* root extract. This plant is one of the most important Chinese medicinal herbs and its roots have been used for more than 2500 years in Chinese medicine to strengthen qi, the body's life force. This liposomal form facilitates the penetration of actives into the sebaceous duct allowing the active components to target the sebaceous gland more straightforwardly. The sebum-reducing effect of AstraForce has been proven on volunteers having oily scalp and hair while maintaining the barrier effectiveness. *In vitro* the active ingredient has reduced the activity of enzymes involved in sebum lipid metabolism. AstraForce thereby has a positive effect on scalp purification and hydration as well as reducing sebum production in the context of oily hair.

Introduction

The scalp is, as any other skin body area, an epithelium generating a *stratum corneum*. It is continuously renewed by a desquamation process forming an effective barrier against external attacks and minimising water loss from the body [1] (**Fig. 1**). It is a very complex assembly whose composition ensures its unique properties. The living keratinocytes are transformed into small enucleated flat bricks; proteins such as involucrin, loricrin, filaggrin etc reinforce the cornified envelope and rule hardness, force and flexibility properties. The corneocytes are strongly interconnected by corneodesmosomes and sealed by organised layers of extracellular complex lipids: cholesterol, ceramides and neutral lipids [2].

Healthy hair produces a certain amount of sebum, or oil, as a way to hydrate the scalp and protect the hair itself. The amount of oil produced varies depending on the hair type, the hygiene habits and other lifestyle factors. Sebum is involved in the development of the epidermal structure and maintenance of the epidermal permeability barrier [3], carrying anti-oxidants to the skin surface, protection from microbial colonization, generation of body odor and pheromone generation. Sebum is directly involved in skin-specific hormonal signaling, epidermal differentiation and protection of the skin from ultraviolet irradiation [4].

Sebum level on the scalp is primarily governed by the production and excretion by holocrine glands: sebaceous glands that are associated with hair follicles. As soon as excreted from the pilo-sebaceous duct, the oily human sebum naturally flows, spreads and later migrates onto the hair shaft surface by capillary forces. In fact, this sebum benefits the hair, but excessive sebum production is the cause for oily scalp and hair. Coated with sebum, hairs become greasy at root, progressively stuck together, trapping external dirt and dust and pollutants particles. Moreover, sebum components become progressively oxidized [5]. With time, the head of hair takes a dull and heavy appearance, generally perceived more as dirt than oil. Additionally, excesive scalp sebum privileges a disbalanced growth of the scalp resident microflora, for example yeasts of the Malassezia species (major causal factor of dandruff in prone people) [6]. Causes of excess sebum secretion include genes, hormonal imbalances, humidity, diet, etc. Hormonal imbalances as found during pregnancy, menopause, or puberty can trigger an oily scalp. Some internal diseases can cause increased sebum secretion too [7].

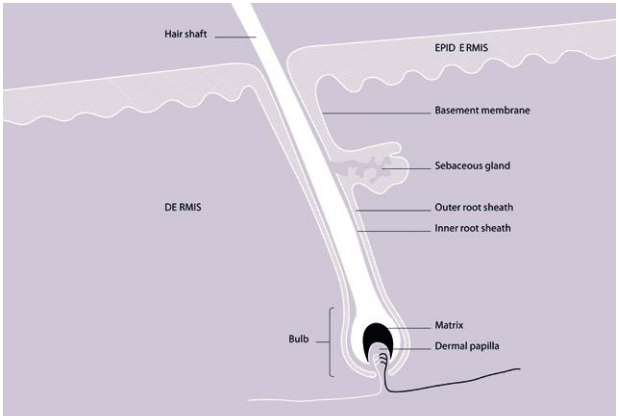

Fig. 1 Epidermal and dermal layers of the scalp, including the hair unit.

A Traditional Chinese herb to rebalance the scalp sebum production

Mibelle Biochemistry has developed the active ingredient AstraForce based on a traditional Chinese herb (INCI Astragalus Membranaceus Root Extract (and) Dipropylene Glycol (and) Glycerin (and) Lecithin (and) Phenoxyethanol (and) Aqua/Water) to rebalance the sebum production on oily scalp and hair. *Astragalus membranaceus* root extract fraction was incorporated into liposomes formed with lecithin. This liposomal form facilitates the penetration of actives into the sebaceous duct, which allows the actives to target the sebaceous gland more easily. AstraForce thereby has a positive effect on skin purification and hydration as well as on sebum production in the context of oily hair.

Astragalus membranaceus is a plant native to China and capable of growing in extreme habitats. Its roots strengthen the immune system and stimulate metabolism. This sweet tonic herb is known to be adaptogen: it helps the body to cope with stress and to maintain optimal homeostasis. In addition, it has anti-bacterial, anti-inflammatory and antiviral effects; properties that make it one of the most frequently used medicinal herb in food supplements and remedies.

Astragalus membranaceus contains a high percentage of astragalans, medicinally active polysaccharides known for enhancing specific immune functions such as the improvement of white blood cell response. Its composition includes also formononetin, an isoflavone with antioxidant effects on lipid peroxidation, and saponins (called astragalosides) which have the property of reducing inflammation.

Among the activities of Astragalus Membranaceus roots can be found that it enhances the immune system by increasing the production of interferon (an antiviral and anti-tumor agent naturally produced by the body) and stimulates natural killer cells. It also boosts T-cell production and stimulates macrophages, which in turn help other immune cells to fight bacteria, viruses, parasites, fungi, toxins, and diseased cells. As a general tonic, it regulates water circulation and helps the body to adapt to external influences by encouraging blood flow to the surface.

Study Results

Inhibition of the lipase activity

Lipase is an enzyme that converts sebum lipids into free fatty acids which are subsequently released onto the skin surface. A higher concentration of free fatty acids on the scalp can lead to bacterial growth and inflammation. Therefore, the reduction of the lipase activity of AstraForce was evaluated. For this assay, AstraForce was diluted in buffer at different concentrations (0.083%, 0.83%, 8.3%) and Miglyol was used as substrate for the lipase enzyme. After mixing and 1-hour incubation the optical density (OD) was determined at 340 nm (UV Spectrophotometer Shimadzu) and measurements showed the concentration of fatty acids produced by the lipase. Results showed that AstraForce was able to inhibit the formation of fatty acids (lipase activity) in a dose-dependent manner (**Fig. 2**). Thus, AstraForce is able to reduce the local inflammation caused by the over-production of free fatty acids secreted to the scalp.

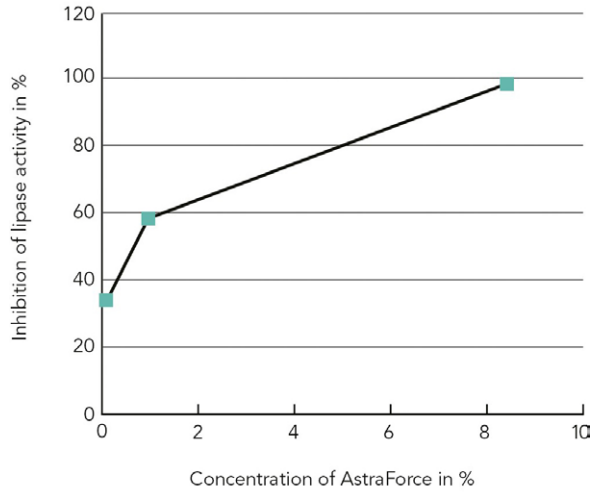

Fig.2 Inhibition of the lipase activity.
(©Mibelle AG Biochemistry 2007)

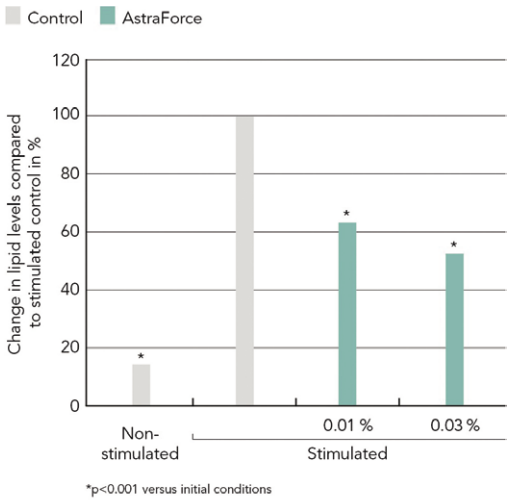

Fig.3 Reduction of Lipogenesis after 7 Days of Treatment. (©Mibelle Biochemistry)

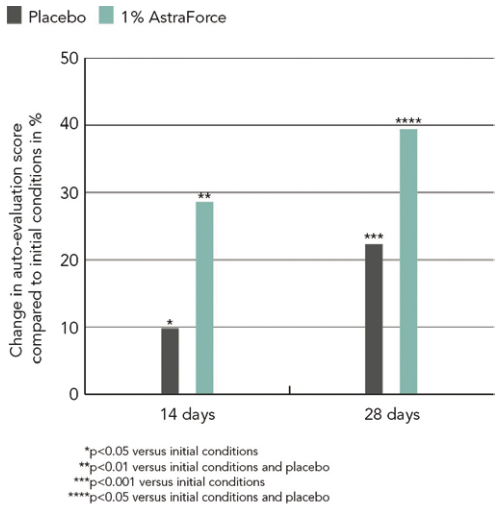

Fig.4 Sebum Reduction on volunteers with oily scalp. (©Mibelle Biochemistry)

Lipogenesis

The effect of AstraForce on lipogenesis was investigated in human sebocytes. These cells are in the sebaceous glands close to the hair follicles and secrete the oily liquid termed sebum. During the process of lipogenesis, the metabolite acetyl-CoA is converted to fatty acids which can subsequently be secreted in the sebum. Lipogenesis is increased in acne-prone skin and often excess sebum oils can clog pores, also in the scalp.

The sebocytes were seeded in 96-well plates and cultured for 24 hours in culture medium. The medium was then removed and replaced by assay medium containing or not (control) the test compound (0.01 % and 0.03 % AstraForce) or the reference (Cerulenin, 10 µM) and cells were pre-incubated for 4 hours. Then, the seborrheic mix was added to stimulate sebum production, and the cells were incubated for 7 days. At mid-term, i.e. after 3 days of incubation, half of the medium was removed, and the treatments were renewed (including seborrheic mix stimulation). Non-stimulated control conditions were also performed in parallel. At the end of incubation, the cells were rinsed, fixed and permeabilized. The lipid droplets contained in the cells were then labeled using a specific Bodipy® fluorescent lipid probe labeling mainly neutral lipids. In parallel, the cell nuclei were stained using a Hoechst solution. The fluorescence intensity was analyzed exclusively in the lipid droplets via image analysis. Therefore, non-specific fluorescent background signal was not considered in the image analysis. Results showed that AstraForce tested at 0.01 % and 0.03 % inhibited lipid droplet formation and accumulation in a concentration-dependent manner (**Fig. 3**).

Sebum-reducing efficacy of AstraForce on oily scalp and hair

In a randomized, placebo controlled clinical study, the sebum-reducing and barrier-enhancing efficacy of AstraForce on oily hair and scalp was investigated. Sixty volunteers (46 women and 14 men) with oily scalp and aged between 18 and 65 years washed their hair either with a shampoo containing 1 % AstraForce or the corresponding placebo 3 times per week for a period of 28 days. The measured parameters were sebum amount (by scoring of pictures taken with I-scope microcamera and Sebufix® illustrations), trans-epidermal water loss (TEWL, Nano Tewameter®) and auto perception of hair oiliness.

After 14 and 28 days of treatment with a shampoo containing 1 % AstraForce, the sebum amount observed on the scalp was significantly reduced by up to 38.4 % compared to initial conditions (**Fig. 4**). The microcamera images and the corresponding Sebufix® illustrations displayed the visible oil reduction on the scalp of volunteers that have applied the shampoo with AstraForce compared to initial conditions and to the placebo (**Fig. 5**). The sebum-reducing efficacy of AstraForce on the scalp was

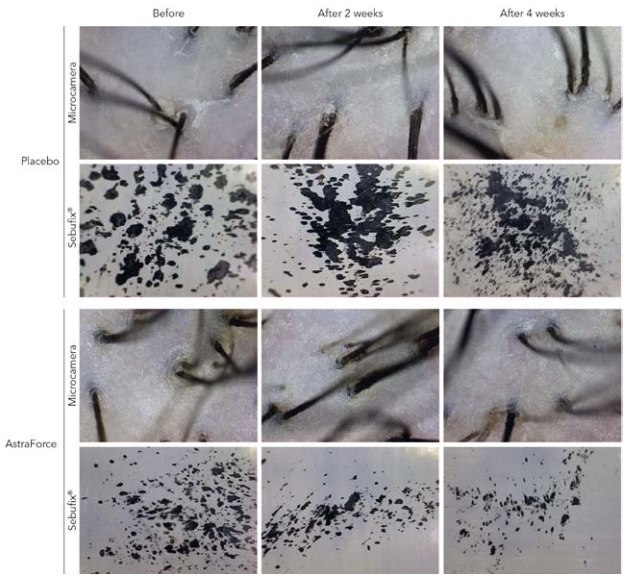

Fig.5 Microcamera images and the corresponding Sebufix® illustrations of the sebum present on the scalp of the volunteers at different time points. (©Mibelle Biochemistry)

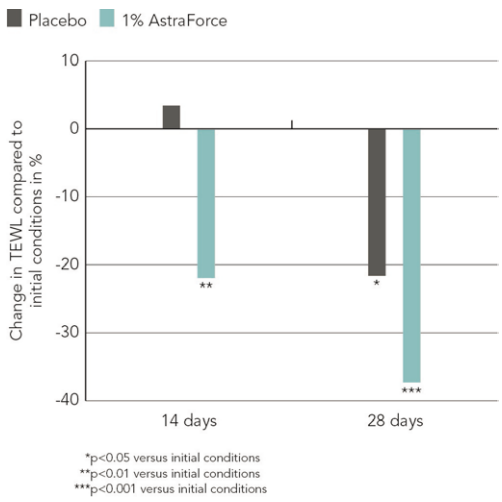

Fig.6 RReduction of trans-epidermal water loss (TEWL) on volunteers with oily scalp. (©Mibelle Biochemistry)

confirmed by the score given by the volunteers on the self-evaluation: an increased by 28.6 % after 14 and by 39.4 % after 28 days. This was significant compared to initial conditions and to the treatment with the placebo. The treatment with the shampoo containing 1 % AstraForce also reduced TEWL by 21.8 % after 14 days and by 37.1 % after 28 days (**Fig. 6**). Taken together these results showed the noticeable ability of AstraForce to reduce the sebum production without impairing the barrier function of the scalp.

Summary

The liposomal preparation of *Astragalus membranaceus* root extract (AstraForce), a traditional Chinese medicinal herb, was shown both in clinical studies and *in vitro* to reduce the sebum lipid production and the sebocytes activity while reducing the transepidermal water loss. Overall, the use of AstraForce lead to the rebalance of the excess of oil present on the scalp while improving the barrier function.

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An Eco-conscious Active Meeting the Specific Beauty Concerns of Olive Complexions

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abstract

With its novel eco-conscious active ingredient, Sederma offers a natural and ultra-customised solution to the specific beauty concerns of olive complexions. AMBERSTEM™ is a plant cell culture extract of *Buddleja davidii*, known as the butterfly-bush, providing a new glow to olive-toned skin.

Olive complexion is associated with skin phototypes III to V, which are distributed worldwide among multiple ethnic groups. This skin type is recognised as hypersensitive promoting pro-inflammatory hyperpigmentation, skin dullness and a greenish complexion.

This COSMOS-compliant active reduces skin pigmentation disorders, dullness and redness thanks to its anti-inflammatory and antioxidant properties as well as its melanin production inhibiting attributes. AMBERSTEM™ also reinforces the skin barrier and improves hydration by stimulating the hyaluronic acid synthesis. A clinical study confirmed that AMBERSTEM™ leads to fading of dark areas and reduces skin redness within only one month of application. In addition, most of the volunteers perceived a decrease in the intensity of dark areas and recognised their skin as being more luminous and well moisturised.

This innovative active ingredient issued from the safe and eco-designed technology of plant cell culture, evens the skin tone and fades dark areas providing a lucent and healthy amber tone for olive complexions.

Introduction

Diversity is a huge trend in the beauty industry, especially for the make-up category. This modern vision of beauty claims a more inclusive approach regarding the multitude of ethnicities, genders and age. For Beauty and Personal Care, it is about adopting a different state of mind by being more attentive and responsive to individual consumer needs and offering them more customised and diversified products. Sederma embraces this global trend by offering a dedicated solution for olive complexions, which are common in numerous ethnic groups, through its product launch of a plant cell culture extract of *Buddleja davidii*, known as the butterfly-bush.

Olive complexions are characterised by green undertones of the skin and are associated with skin phototypes III to V, which are distributed worldwide among multiple ethnic groups including Latin America, Middle East, South East Asia and the Mediterranean region. This skin type has specific beauty concerns and needs specific care, since it is recognised as hyper-inflammatory and hypersensitive. Due to exposome stresses including sun exposure, pollution, smoking or other lifestyle habits, the skin is more prone to damage such as micro-inflammation phenomena modifying its appearance. Complexion loses its natural radiance and appears dull and uneven. Furthermore, it tends to be greenish because oxidation and inflammation promote biliverdin and haemoglobin accumulation at the skin surface [1,2]. Consequently, end consumers with olive complexions strive for an even and homogeneous skin tone and intend to moderate the appearance of pigmentation disorders responsible for dark areas around the eyes and mouth. Indeed, flawless skin is recognised as being more attractive and healthier [3].

Plant cell culture extract of *Buddleja davidii* to serve the specific needs of olive complexions

With Amberstem™, Sederma is pleased to offer a natural and ultra-customised solution to target the unique beauty concerns of olive complexions. The active is obtained by plant cell culture, which is a safe and eco-designed technology. Plant cell culture allows access to a wide range of plant extracts while showing a high reduction in terms of water consumption and negligible soil occupation in comparison to traditional agriculture. It also ensures the complete absence of pesticides and other contaminants to decrease the toxicity risk to humans and to preserve the natural balance of the ecosystem. Additional benefits of the plant cell culture technology are no widespread use of solvents, no GMOs, no pollutants, no preservatives, no need for transportation, no over exploitation of land, protection of the plant and biodiversity and an unlimited availability together with a high and standardised quantity of active molecules. Sederma has developed an in-depth knowledge in this technology and offers a broad range of active ingredients with a defined and reproducible composition and proven efficacy to serve the increasing consumer awareness and demand for more natural, safe and sustainable products.

AMBERSTEM™, as a plant cell culture extract of *Buddleja davidii* contains verbascoside as an active molecule, possessing antioxidant and anti-inflammatory properties. The verbascoside concentration has been increased and standardised by finely controlled modulations of the culture parameters. Furthermore, the ultra-soft plant cell culture process allows to preserve up to 65 % of whole native cells in the product. These native cells can boost the efficacy of the active molecule of verbascoside to potentiate its performance up to 1.8 times greater than the isolated molecule of verbascoside. Besides the anti-inflammatory and antioxidant properties, the efficacy of AMBERSTEM™ with regards to pigmentation control is based on melanin production inhibition. Lastly, the reinforcement of the skin barrier improves skin hydration.

In vitro and *in vivo* tests

Various tests were performed to reveal the multiple benefits of AMBERSTEM™ to the skin.

In vitro, the antioxidant and anti-inflammatory properties of AMBERSTEM™ were confirmed by demonstrating a decrease in the production of reactive oxygen species, advanced glycation end products (AGEs) and pro-inflammatory mediators, including prostaglandin E2 and different interleukin types, such as IL-1α and IL-8. In addition, a control of the pigmentation metabolism was observed based on the inhibition of the tyrosinase activity, an inhibition of the melanin production and a reduction in the melanosome transfer. With respect to the inhibitory effect on the melanin production, moderately pigmented normal human melanocytes at confluence were brought into contact with AMBERSTEM™ for 6 to 11 days. At the end of the contact period, the modulation of the melanin production in normal human melanocytes was visualised by microscopy (**Fig. 1**) and revealed that the presence of AMBERSTEM™ reduced the melanin production in a significant way (right) in comparison with the control (left).

AMBERSTEM™ is also able to boost the skin barrier quality since a stimulating effect of AMBERSTEM™ on the hyaluronic acid synthesis enhancing skin moisturisation was detected. Furthermore, AMBERSTEM™ promotes the dermal-epidermal junction homeostasis by triggering the synthesis of collagen VII and laminins in comparison with the control.

Besides the *in vitro* tests, a clinical study including a panel of 26 female volunteers of Middle Eastern type with a mean age of 36 years was performed in Tunisia. The volunteers had skin phototype IV and showed an irregular and dull complexion with dark areas. These volunteers applied a cream containing

Fig. 1 Microscopic visualisation of the melanin production modulation in normal human melanocytes in the presence of AMBERSTEM™ (right) in comparison with the control (left).

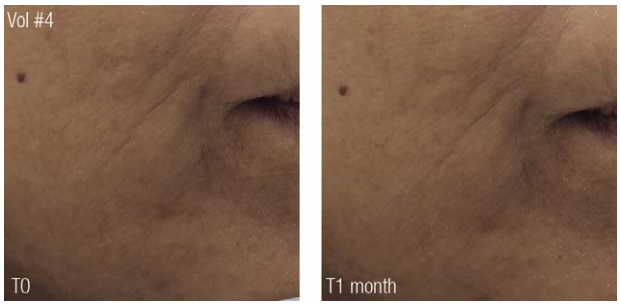

Fig. 2 Visible fading of dark areas under the eyes and around the mouth after one month of application of a cream containing 2% AMBERSTEM™ (right) in comparison with T0 (left).

2% AMBERSTEM™ twice daily on the face against a placebo in contralateral for the duration of one month.

To evaluate the skin texture, a VISIA®-system analysis was performed. With this device, standardised photos under different illuminations are obtained, while the integrated software reveals various parameters. The evaluation of the skin texture provides a measure of colour homogeneity between two areas and thus, detects elevations and depressions of the skin being linked to skin roughness. After one month of application of a cream containing 2% AMBERSTEM™, there were less visible skin imperfections in comparison to the placebo treatment and the skin appeared healthier and smoothed. To further assess an improvement in skin complexion, the VISIA®-system was used to analyse several colour parameters including an increase in luminosity as well as a reduction in skin redness and pigmentation. The results of the clinical study confirmed that the application of AMBERSTEM™ for one month leads to fading of dark areas and an improved skin luminosity (**Fig. 2**). AMBERSTEM™ exerted a significant brightening effect and visibly contributed to skin redness reduction for a more homogeneous and even complexion (**Fig. 3**).

Fig. 3 Visible reduction of skin redness after application of a cream containing 2% AMBERSTEM™ (right) in comparison with T0 (left).

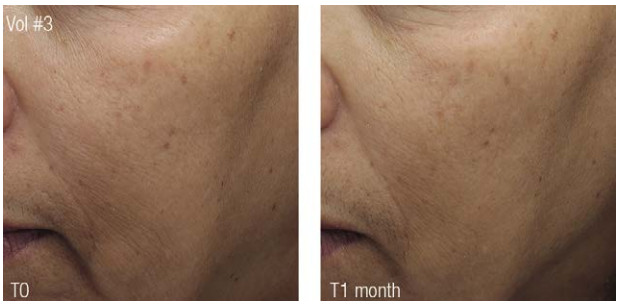

Fig. 4 Perceivable improvements of skin complexion after application of a cream containing 2% AMBERSTEM™ (right) in comparison with T0 (left). The volunteers noticed a visible reduction of the intensity of dark areas and felt their skin was more luminous, brighter and well moisturised.

Besides the VISIA®-system analyses, a self-evaluation was performed. At the end of 4 weeks of application of the cream with 2% AMBERSTEM™, the volunteers were asked to provide their opinion about the perceived improvements regarding skin complexion, imperfections, dark areas and their feeling of skin comfort and moisturisation. The self-evaluation revealed a very good perception of the effect of AMBERSTEM™ in comparison to the placebo. Most of the volunteers noticed a decrease in the intensity of dark areas and found their skin more luminous and well moisturised (**Fig. 4**).
AMBERSTEM™ evens the skin tone, reduces skin redness and fades dark areas providing a lucent and healthy amber tone for olive complexions. As a COSMOS-compliant active, this plant cell culture extract is of special interest for natural cosmetics. It can be easily incorporated into any type of facial care, make-up, sun and after-sun products.

Conclusion

Sederma is pleased to offer its innovative natural and ultra-customised solution to the specific needs of olive complexions. Due to its antioxidant and anti-inflammatory properties, AMBERSTEM™ reduces inflammatory hyperpigmentation, decreases dullness and redness, and fades dark areas around the eyes and the mouth. Furthermore, the skin barrier integrity is reinforced, and the skin is well hydrated bringing a healthy and luminous glow to olive complexions. Obtained by the eco-conscious technology of plant cell culture, AMBERSTEM™ serves the increasing customer demands for more natural and sustainable products. "Be ACTIVEly committed" with Sederma to translate sustainability, safety and ethics into leading innovation and marketing advantages.

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Bio-based preservation of home care formulations with Lactic Acid

K. von Nessen, F. Weiher, M. Neubauer

abstract

Natural origin, safety and sustainability range among the top trends in home care. This includes the preservatives used in such formulations. Consumers are becoming increasingly aware of the potential allergenic and sensitising properties of common active substances. Regulatory bodies are reacting to new scientific evidence and restricting the application of these ingredients. Here, we present L(+)-lactic acid as a viable alternative to synthetic and hazardous preservatives. We demonstrate its efficacy in simple aqueous surfactant solutions and typical home care formulations including softener, surface cleaner and hand dish wash detergent.

Introduction

The trend in consumer products towards more natural, more sustainable, gentler and safer formulations is unbroken. For non-food applications the cosmetics industry is the typical first mover and a good indicator as to which trends and developments will spread to other market segments. In the area of preservation, personal care products have seen the declining use of parabens and isothiazolinones for a long time. Both are suspected, with some evidence, of exhibiting harmful properties, including allergenic and sensitising effects. Among the replacements for these substances we find firstly phenoxyethanol, and, increasingly, preservatives known from and broadly used in the food industry.

In home care, methylisothiazolinone and quaternary ammonium compounds remain the most widely used preservatives. However, in recent years their share in new product launches has started to decrease. Phenoxyethanol, potassium sorbate and sodium benzoate are on the rise. These are certainly less harmful alternatives, but still not completely innocuous and definitively not of natural origin. Here, again, the cosmetics industry is already one step ahead. In this industry we observe a growing use of stabilising ingredients derived from natural processes such as fermentation or directly via plant extraction. L(+)-lactic acid is one of these ingredients: it is produced by fermentation of renewable resources, i.e. of natural origin. As a liquid it is easy to handle and to dose for home care formulations, which are typically liquid. Lactic acid is non-allergenic and non-sensitising. In the cleaning industry it is known for its descaling and disinfecting properties.

In the present article we will provide some basic efficacy data on the preservation performance of lactic acid and we will show that it is capable of keeping typical home care formulations microbiologically stable.

The need for such an alternative preservative is not just linked to above-mentioned market and consumer trends, but is also driven by regulatory developments. In the European Union, Regulation (EU) No 528/2012, the Biocidal Products Regulation (BPR), sets the legal framework for the approval and use of biocides of all kinds, including in-can preservatives, which fall under product type (PT) 6 [1]. The BPR leads to a consolidation of the biocides market, i.e. the number of available actives is drastically shrinking. For PT 6, there are currently only 11 approved substances, a further 37 ingredients are under evaluation. Apart from ethanol, lactic acid is the only ingredient of natural origin. Furthermore, some common actives are being re-evaluated in terms of health hazards; one prominent example is methylisothiazolinone, which will be classified as allergenic starting from concentrations as low as 15 ppm from 1 May 2020 [2]. Similar restrictions, stricter classifications and bans of common synthetic preservatives can be observed in

other parts of the world, too, and are not linked solely to the preservation of home and personal care products. Paints, inks and coatings are among other categories affected.

Experimental part

To assess the preservation efficacy of lactic acid we tested according to two different norms.

European Pharmacopoeia (Ph. Eur.) 5.1.3 describes a protocol to determine the microbiological stability of a given product [3]. It is one of the strictest tests on the market (as compared, for instance, to USP or DIN EN ISO 11930). Originally designed for topical preparations (cosmetic/pharmaceutical), it is widely used also for other applications. According to Ph. Eur. 5.1.3 the test item is inoculated with 10^5 to 10^6 colony forming units (CFU) of selected microorganisms per millilitre. The microorganisms include *Staphylococcus aureus* (gram-positive coccus), *Pseudomonas aeruginosa* (gram-negative bacillus), *Escherichia coli* (gram-negative bacillus), *Candida albicans* (yeast), and *Aspergillus brasiliensis* (mould). The prepared samples are stored at room temperature and the concentration of CFU/ml determined after defined intervals (2, 7, 14 and 28 days). Depending on the observed decay of microorganisms and the (non-) occurrence of growth, the test is rated as passed or failed based on the acceptance criteria (**Tab. 1**). There are two pass criteria, A and B. A refers to the recommended preservation efficacy. However, for many preparations, in particular for gentle formulations with neutral or close to neutral pH value, criterion A is difficult to achieve. It could only be met using rather harsh substances or by increasing the preservative concentration to undesirably high levels. This led to the introduction of criterion B. Here, the required log reduction of the inoculum is either lower than with criterion A or it is tested at a later point in time.

IBRG PDG 16-007.02 describes a method to determine the basic efficacy of biocidal active substances used to preserve aqueous-based products [4]. It is one of the recommended test protocols according to the ECHA Guidance on the BPR [5]. In contrast to Ph. Eur. 5.1.3 it involves not just one initial microbial inoculation, but several consecutive inoculations at weekly intervals to challenge the preservative system. Thus, this approach provides more realistic but also more demanding test conditions. Further, it includes additional microbial species compared to Ph. Eur.,

	Test criteria	Log reduction (Rx), NI = no increase vs. previous			
		2 d	7 d	14 d	28 d
Bacteria	A	2	3	-	NI
	B	-	-	3	NI
Fungi	A	-	-	2	NI
	B	-	-	1	NI

Tab. 1 Criteria of acceptance for Ph. Eur. test.

Test germ	0.94% Lactic Acid + 3% SLES			
	pH 2	pH 3	pH 3.5	pH 4
E. coli	A	A	A	A
P. aeruginosa	A	A	A	A
S. aureus	A	A	A	A
C. albicans	A	A	A	A
A. brasiliensis	A	A	A	F
Total test results	A	A	A	F

Tab. 2 Preservation efficacy of lactic acid in basic solutions acc. to Ph. Eur.

namely *Streptococcus epidermidis* (gram-positive coccus), *Klebsiella pneumoniae* (gram-negative bacillus), *Bacillus subtilis* (gram-positive bacillus), *Cryptococcus neoformans* (yeast) and, instead of *Aspergillus brasiliensis, Geotrichum candidum* (mould). Target inoculum is 10^5 CFU/ml, inoculation is repeated up to a maximum of three times. The test is passed when the preserved sample shows no microbial growth while the unpreserved sample shows growth.

Results and discussion

In a first step we analysed the basic preservation efficacy of lactic acid in simple aqueous surfactant solutions as a function of pH. The solutions consisted of 3% sodium lauryl ether sulfate (SLES) and 0.9% L(+)-lactic acid (active concentration). Test results according to Ph. Eur. 5.1.3 are displayed in **Tab. 2**. Up to a pH of 3.5 lactic acid is sufficiently effective to keep the system microbiologically stable. At pH 4 the test fails for the mould. As expected, the lower the pH the better the performance of the organic acid. Nevertheless, with efficacy proven up to pH 3.5, a broad range of acidic home care formulations can be addressed. The concentration of lactic acid has been set below 1% so as not to affect the hazard labelling of the final formulation.

Next, we tested the preservation activity of lactic acid in three different acidic home care model formulations: surface cleaner, fabric softener and hand dish wash detergent.

The composition of the surface cleaner is shown in **Tab. 3**. It is kept very simple with two anionic and one non-ionic sur-

Substance	Function	Surface cleaner	Fabric softener	Fabric softener concentrate	Hand dish wash detergent
		Active substance concentration in the formulation/%			
Sodium Lauryl Sulfate	Anionic surfactant	2			
Sodium Laureth Sulfate	Anionic surfactant	2			15
Decyl Glucoside	Non-ionic surfactant	2			
Coco Glucoside	Non-ionic surfactant				0.5
Cocamidopropylbetaine	Amphoteric surfactant				3
Dihydrogenated Tallow Hydroxyethylmonium Methosulfate	Cationic surfactant		8		
Dihydrogenated Palmoylethyl Hydroxyethylmonium Methosulfate	Cationic surfactant			20	
Calcium Chloride	Viscosity adjustment		0.025	0.075	
Sodium Chloride	Viscosity adjustment				4.5
Potassium Lactate	Moisturising agent				5
Lactic Acid	**Preservative**	**0.9**	**0.9**	**0.9**	**1.9**
Perfume	Fragrance	0.1	0.6	0.25	0.1
Colour	Colour	QS	QS	QS	QS
Aqua		QS to 100	QS to 100	QS to 100	QS to 100

Tab. 3 Composition of model formulations (active concentrations).

INNOVATIVE BIO-BASED SURFACTANTS FOR CLEANING PRODUCT APPLICATIONS

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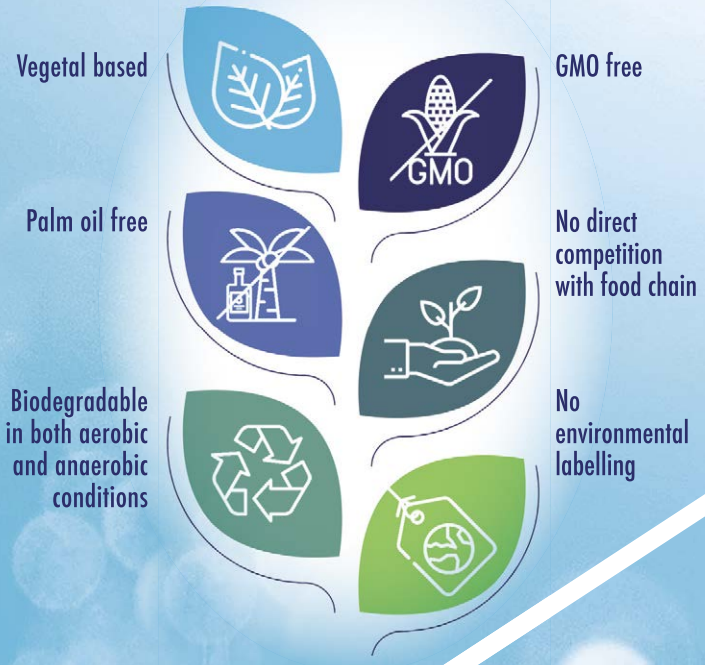

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Test germ	Surface cleaner		Fabric softener		Hand dish wash detergent	
	Unpreserved	Preserved	Unpreserved	Preserved	Unpreserved	Preserved
E. coli	-	A	A	B	A	A
P. aeruginosa	-	A	A	B	A	A
S. aureus	-	A	A	B	A	A
C. albicans	-	A	A	A	A	A
A. brasiliensis	-	A	F	B	F	A
Total test results	-	A	F	B	F	A

Tab. 4 Test results according to Ph. Eur. 5.1.3

Test germ	Inoculation	Surface cleaner		Fabric softener	
		Unpreserved	Preserved	Unpreserved	Preserved
Bacterial mixture	1.	Growth	Growth	Stable	Growth
	2.	Growth	Reduction	Growth	Reduction
	3.	Growth	Reduction	Reduction	Reduction
Fungal mixture	1.	Reduction	Reduction	Reduction	Reduction
	2.	Growth	Reduction	Growth	Reduction
	3.	Growth	Reduction	Growth	Reduction
Total test results		Failed	Passed	Failed	Passed

Tab. 5 Test results according to IBRG; table indicates growth, stability or reduction of microbial counts on day 7 after each inoculation.

factant, fragrance, colour and 0.9% lactic acid, at a pH 3. **Tab. 4** provides the test result according to Ph. Eur. – passed according to criterion A, in line with the base data from **Tab. 2**. The same formulation – but at pH 2 and additionally thickened with 0.2% xanthan gum – was also subjected to the IBRG protocol (**Tab. 5** and **Fig. 1**). Again, lactic acid passed the test. The detailed graphical representation underlines the powerful biocidal activity of lactic acid, leading to an almost complete reduction of the microbial count at the latest after the second inoculation (actual reported values are < 1.0 x 10^1). At the same time the unpreserved sample shows not just stable counts, but significant growth.

Tab. 3 shows the fabric softener formulation. It primarily consists of the esterquat – the actual active component – and some calcium chloride for viscosity adjustment. Test results are displayed in **Tabs. 4** and **5**. Both Ph. Eur. (for the low-concentration formula, pH 3) and IBRG (for the concentrate, pH 2) were passed with lactic acid, while controls show growth. Again, microbial counts could be reduced significantly, evidencing the strong disinfectant and preservative properties of this bio-based ingredient.

Finally, we developed and tested a hand dish wash detergent. Its composition is shown in **Tab. 3**. Besides the surfactant system we included potassium lactate as moisturiser and sodium chloride as thickening agent. Due to the relatively high pH of 4, we increased the concentration of lactic acid to 1.9% to achieve the preservation target. Indeed, as detailed in **Tab. 4**, the formulation with lactic acid passed the Ph. Eur. test, while the unpreserved formulation failed for mould. So, even under somewhat demanding conditions, i.e. pH closer to the neutral zone, lactic acid still exhibits reliable stabilising properties against microbial spoilage.

The present test series confirms the capability of lactic acid to preserve different home care formulations. Though by its nature as an organic acid it is limited to the acidic range of cleaning and laundry products, the data show that lactic acid guarantees product stability up to pH 4 as sole preservative. As such, it could replace many common synthetic and hazardous preservatives and contribute to the safety and sustainability of formulations. In an earlier publication we also addressed the use of lactic acid as stabilising agent at an even higher,

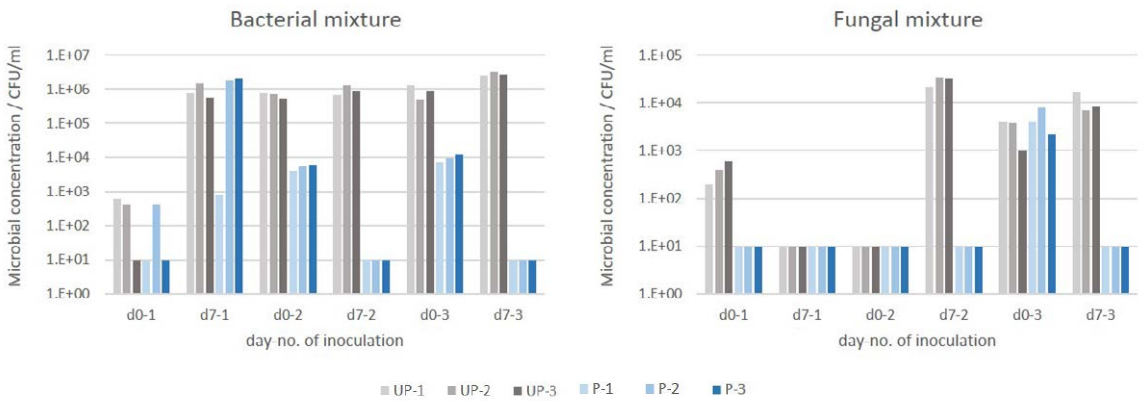

Fig. 1 Detailed IBRG test results for the surface cleaner (UP – unpreserved samples, P – preserved samples)

skin-neutral pH [6]. While it is indeed possible to use lactic acid in this way, a booster is needed for extra stabilisation power, particularly against moulds. We used 1,2-hexanediol as the booster. Further boosters we evaluated and found suitable include anisic acid and caprylic acid. Such substances allow the efficacy range of lactic acid to be extended into neutral pH levels, which is important for more sensitive applications in cosmetics and personal care.

Summary

Global trends point towards the replacement of synthetic and hazardous chemicals by safe and bio-based ingredients. The field of preservatives is still largely dominated by traditional actives, including isothiazolinones and quaternary compounds, while there is an increasing pressure from authorities and consumers to find and implement alternatives. Here, we demonstrated that L(+)-lactic acid is one promising option to comply with this development.
Tests according to the strict and well-established Ph. Eur. and IBRG norms have proven the preservative efficacy of lactic acid in basic aqueous surfactant solutions and model formulations, including surface cleaner, fabric softener and hand dish wash detergent. As a natural-origin ingredient which is readily biodegradable and neither allergenic nor sensitising, lactic acid meets contemporary preservation expectations without compromising on biocidal performance.

Literature

[1] Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products.

[2] Commission Regulation (EU) 2018/1480 of 4 October 2018 amending, for the purposes of its adaptation to technical and scientific progress, Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures and correcting Commission Regulation (EU) 2017/776.

[3] European Pharmacopeia (7th ed.), 5.1.3. Efficacy of antimicrobial preservation.

[4] IBRG (International Biodeterioration Research Group) PDG 16-007.02, Tier 1 Method for Determining the Basic Efficacy of Biocidal Active Substances used to Preserve Aqueous-Based Products.

[5] Guidance on the Biocidal Products Regulation: Volume II Efficacy – Assessment and Evaluation (Parts B + C), April 2018.

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Mattifying Cream | SC-FR-18-BC-50802-07

Phase	Ingredients	INCI	% by weight	Function
A	Emulgade® Sucro Plus	Sucrose Polystearate, Cetyl Palmitate	3.00	Emulsifier (O/W)
	Cutina® PES	Pentaerythrityl Distearate	1.00	Consistency agent
	Myritol® 318	Caprylic/Capric Triglyceride	3.00	Emollient
	Cetiol® C 5C	Coco-Caprylate/Caprate	3.00	Emollient
	Cetiol® CC	Dicaprylyl Carbonate	3.00	Emollient
	Cosmedia® SP	Sodium Polyacrylate	0.70	Rheology modifier
B	Water, demin.	Aqua	80.90	
	Glycerin	Glycerin	2.00	Humectant
	Eumulgin® SG	Sodium Stearoyl Glutamate	0.50	Emulsifier (O/W)
	Preservative*		qs	Preservative
C	Bix'Activ™ BC10050	Bixa Orellana Seed Extract, Maltodextrin	0.25	Active ingredient
	Water, demin.	Aqua	2.00	
D	Perfume*	Parfum	q.s.	Fragrance
E	Citric Acid (10% solution)	Citric Acid	0.65	pH Adjustment

Specifications:
pH value (23°C): 6.20
Viscosity (Brookfield; RVT; spindle TC, Helipath; 20 rpm; 23°C): 15 000 mPa s

Performance:
Additional performance has not been evaluated

Manufacturing process:
Heat phases A and B at 75°C.
Add phase A into B under mixing.
Allow to cool to room temperature under mixing. Add phase C and D at 30°C under mixing.
Adjust pH with phase E.

Additional information:
Preservative*: Elestab 388 at 2.50%
Perfume*: Just Delicious RS32785 Technicoflor 0.20%

Stability test:
Stable 3 months at 4°C, RT, 40°C, 45°C

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Pore Refining Toner | SC-FR-18-BC-50848-01

Phase	Ingredients	INCI	% by weight	Function
A	Water, demin.	Aqua	87.65	
	Glycerin	Glycerin	4.00	Humectant
	EDTA® BD	Disodium EDTA	0.05	Complexing agent
	Euxyl K 712 (Schülke)	Aqua, Sodium Benzoate, Potassium Sorbate	1.00	Preservative
	Eumulgin® SML 20	Polysorbate 20	1.00	Emulsifier (O/W)
	Pluracare® L 64 G	Poloxamer 184	2.00	Surfactant
	Zinc Gluconate (Corbion)	Zinc Gluconate	0.05	Active ingredient
B	Water, demin.	Aqua	3.00	
	Bix'Activ™ BC10050	Bixa Orellana Seed Extract, Maltodextrin	0.25	Active ingredient
	Citric Acid (10% solution)	Citric Acid	0.40	pH Adjustment
C	Cetiol® HE	PEG-7 Glyceryl Cocoate	0.50	Emollient
	Perfume*	Parfum	0.10	Fragrance

Specifications:
pH value (23°C): 5.10

Performance:
Additional performance has not been evaluated

Manufacturing process:
1- Mix phase A, phase B and phase C at RT.
2- Add phase B and phase C under phase A while stirring.
Perfume* Lotus Rose RS41228 (Technicoflor)

Stability test
Stable 3 months at 4°C, RT, 40°C, 45°C

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Natural Plant Products inc.

Nourishing Botanicals Hair Mask | #101-104A

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Phase	Ingredient INCI NAME	Trade Name	%
A	Water	Deionized Water	79.89
	Behentrimonium Chloride	Behentrimonium Chloride	1.00
	Panthenol	DL-Panthenol	1.00
B	Cetearyl Olivate (and) Sorbitan Olivate	Olivem 1000[1]	4.00
	Ceteareth-6 Olivate	Olivem 800[1]	1.00
	Cetyl Alcohol	Cetyl Alcohol	2.00
	Cetearyl Alcohol	Cetearyl Alcohol	3.00
	Limnanthes Alba (Meadowfoam) Seed Oil	**Meadowfoam XPR*[2]**	**2.00**
	Raphanus Sativus (Radish) Seed Oil	**Daikon Seed Extract[2]**	**2.00**
	Persea Gratissima (Avocado) Oil	Avocado Oil[3]	0.50
	Butyrospermum Parkii (Shea) Butter	Shea Butter	1.00
C	Phenoxyethanol	Phenoxyethanol	1.00
	Hydrolyzed Silk	Hydrolyzed Silk	1.00
	Fragrance	Rose Geranium Essential Oil[4]	0.38
	Fragrance	Litsea Cubeba Essential Oil[4]	0.23
Total			**100.00**

*Meadowfoam Seed Oil and Meadowfoam XPR can be used interchangeably in this formulation.

Suppliers:
[1] Hallstar/Ross Organics; [2] Natural Plant Products; [3] Charkit Chemical Company; [4] New Directions Aromatics

Procedure:
Combine Phase A ingredients and heat to 75-80°C. In a separate vessel, combine Phase B ingredients and heat to 75-80°C. Add Phase B to Phase A with rapid propeller stirring to emulsify. Homogenize and cool to 45°C with moderate propeller stirring. Add Phase C ingredients.

Stability:
One month at 45°C.

Application Instructions:
Apply a generous amount to dry or damp hair and comb through. Leave on hair for five to ten minutes and rinse thoroughly. Can be used one to two times weekly, or as an everyday conditioner.

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Natural Plant Products inc.

Fresh Start Moisturizing Body Scrub | #100-124B

Packed with natural oils and exfoliators, our scrub provides welcome relief to tired, dry, dull skin. Meadowfoam Seed Oil and Daikon Seed Extract leave skin feeling smooth and moisturized yet not greasy. Oat Lipid e, rich in ceramides, locks in moisture while OleoFLEX helps lock oils onto the skin. Vegetable Petrolatum (an all-natural alternative to petrolatum) prevents water loss. Sugar acts as a gentle, natural exfoliator. Oat COM colloidal oatmeal soothes irritated skin.

Phase	Ingredient INCI NAME	Trade Name	%
A	**Limnanthes Alba (Meadowfoam) Seed Oil**	**Meadowfoam Seed Oil or Meadowfoam XPR*[1]**	**14.40**
	Raphanus Sativus (Radish) Seed Extract	**Daikon Seed Extract[1]**	**14.00**
	Ricinus Communis (Castor) Seed Oil (and) Hydrogenated Castor Oil (and) Copernicia Cerifera (Carnauba) Wax	Vegetable Petrolatum R15 [2]	5.00
	Avena Sativa (Oat) Kernel Oil	Oat Lipide [3]	2.00
	Helianthus Annuus (Sunflower) Seed Oil (and) Caprylic/Capric Triglyceride (and) Styrene/Butadiene Copolymer	OleoFLEX™ EG 200[4]	8.00
	Helianthus Annuus (sunflower) Seed Oil (and) Carthamus Tinctorius (Safflower) Seed Oil (and) Styrene/Butadiene Copolymer	OleoFLEX™ FG 100[4]	7.00
	Oryza Sativa (Rice) Bran Wax	Rice Bran Wax[5]	1.20
B	Phenoxyethanol (and) Ethylhexylglycerin	CustoCide PE815[6]	1.00
	Fragrance	Rain Orchid[7]	0.40
C	Avena Sativa (Oat) Kernel Flour	Oat COM[3]	5.00
	Sucrose	Sugar	42.00
Total			**100.00**

Suggested Usage:
Apply the scrub to clean, damp skin. Massage in a circular motion over the entire body. Rinse off thoroughly with lukewarm water.

Suppliers:
[1] Natural Plant Products; [2] Charkit Chemical Company; [3] Oat Cosmetics; [4] Applechem; [5] Koster Keunen; [6] Custom Ingredients; [7] Majestic Mountain Sage

Procedure:
Combine Phase A ingredients with propeller stirring while heating to 75-80°C. Cool to 45°C and add Phase B. Disperse Phase C with stirring until uniform.

Stability:
One month at 45°C.

Tip:
Follow with our Body Oil #100-37

GREENTECH

Rising Sun | Melanin Booster | E PS -011-07

RISING SUN contains EPSILINE®, a melanin booster. As a result, it enables to activate and extend the tan to keep a sun-kissed complexion throughout the year. A good-looking effect guaranteed also by the presence of buriti oil in suspension in small bubles thanks to a natural and original setting agent. Rich in carotenoids, Rising Sun will instantly sublime your skin. A 100% natural and pleasant formula, not sticky and easy penetrating, to use without any limits.

Phase	MATERIAL NAME	INCI	Supplier	Properties	% Material
A	DEMINERALIZED WATER	Aqua (Water)	-	-	93.20
	PENTIOL GREEN +	Pentylene Glycol	MINASOLVE	Solvant	3.00
	EPSILINE NAT (001222)	**Porphyridium Cruentum (and) Propanediol**	**GREENTECH**	Active	**2.00**
B	CITRIC ACID SOLUTION (30% in demineralized water)	Aqua (water) (and) Citric Acid	-	pH Adjusting	0.10
C	ALGOGEL SCG2081	Xanthan Gum (and) Ceratonia Siliqua Gum	UNIPEX	Gelling Agent	0.25
	GENUVISCO CARRAGEENAN CG-131	Chondrus Crispus Powder	AZELIS	Gelling Agent	0.25
D	**BURITI Oil** (710073)	**Mauritia Flexuosa Fruit Oil**	**GREENTECH**	UV-Protection, Antioxydant, Regenerating, Nourishing	**1.00**
	COVIOX T70C	Tocopherol	BASF	Antioxydant	0.20
Total					**100.00**

OPERATING INSTRUCTIONS:
- Add Pentiol Green + and EPSILINE® in water and mix 2 min
- Adjust the pH with B around 7
- Heat to 85°C
- Add Algogel and Genuvisco Carrageenan CG-131 and mix until the gel formation (10 min)
- Cool to 50 °C and add D under slowly stirring (2 min)
- When all oil droplets are into the gel, stop the mixing and let cool to room temperature (25°C)
- pH: 7.14

WARNING: The company cannot assume any liability or risk involved in the use of its products since the conditions of use are beyond our control. We assume no responsibility concerning the formulations which are brought to the market and which contain one or several of our products. It is incumbent to the formulators to take all necessary precautions and, in particular, to comply with all required legal and regulatory steps and formalities.

Greentech GmbH, www.greentechgmbh.de

GREENTECH Receives Innovation Award for EPSILINE® Tan Maximiser

Starnberg, Germany | April 21, 2020

The human striving for beauty and the striving for a radiant suntan often go hand in hand.
This motivates our scientists to search for active ingredients that prevent the skin from aging while promoting a beautiful naturally shiny suntan and allowing the positive side of light to be enjoyed without harm.
We are convinced that well-being and radiant beauty come from the sun. That's why we focus our efforts on ensuring that women can enjoy the positive side of light without harm.
Today we have "excellent" news, because our Tan Maximizer EPSILINE® was awarded the BSB Innovation Prize in silver.*

*2nd price in the category Most Innovative Raw Material – Natural Products

A 100% natural formulation for a melanin booster see above. The Gel activates and extends the tan for a sun-kissed look.

www.greentechgmbh.de

COLORS & EFFECTS

Colors & Effects® Donates 1,000 Trees in Haiti on Behalf of Customers through an Incentivized Customer Survey

Ludwigshafen, Germany | April 15, 2020

Colors & Effects® gives back to the environment while connecting with customers in an authentic way to better understand customer needs.

Over the past six months, Colors & Effects conducted a global customer survey, which was distributed to customers from the Printing, Cosmetics and Agriculture industries, to assess the company's performance in meeting customer needs. To encourage survey responses, Colors & Effects partnered with One Tree Planted, a non-profit organization focused on global reforestation, and committed to plant one tree for each completed customer survey along with a 1:1 company match.

Colors & Effects selected trees as the customer survey incentive because of the vast environmental, societal and economic benefits that trees provide. Partnering with One Tree Planted, whose mission is to make it simple for anyone to help the environment by planting trees, supports sustainability efforts across the globe. In 2019, 4 million trees were planted around the world by One Tree Planted, and the organization aims to plant 15 million trees in 2020.

"The topic of sustainability is universal, and most industries and individuals can relate to the importance of trees," said *Brian Marsicano*, Head of Global Business Management, Printing, Specialties & Cosmetics, Colors & Effects. "Offering a tree in exchange for a few minutes of our customers' time gives customers and Colors & Effects an easy way to make a positive impact on the environment. Seemingly small efforts add up to make a big difference."

In total, Colors & Effects donated 1,000 trees to One Tree Planted on behalf of customers through this initiative. Each customer received a personalized certificate representing the tree to be planted in their name, and all trees will be planted in Haiti – a region that will reap both environmental and societal benefits from the planting of additional trees.

To learn more about Colors & Effects' commitment to sustainability:

www.colors-effects.eu

OMYA

Omya Completes Acquisition Formulae Development LLC, a Contract R&D Formulator for Natural Cosmetics in the US

Cincinnati, USA | April 16, 2020

Omya, a leading global distributor and manufacturer of specialty ingredients, has successfully completed the acquisition of Formulae Development, LLC., an innovative contract R&D company specializing in natural formulations for Personal Care, located in Hazlet, NJ, US.

Formulae, a boutique custom laboratory with fifteen years' experience in the personal care industry, has an established reputation as a provider of trend-setting solutions to the natural cosmetic market. With the acquisition, Omya is strengthening its position as a leader in cosmetic research and development within the Americas.

By leveraging both Formulae's commitment to customer satisfaction through creation of exceptional finished products and Omya's international network of technical innovation centers, the combined businesses will be best positioned to serve the needs of both customers and principals nationwide.

Omya now has a strong North American platform for Personal Care with locations in Long Beach, CA, Hazlet, NJ and Mexico City offering their customers and supply partners first class products, formulation know-how, technical service and customer support.

Omya welcomes Formulae Development to the Omya Group and remains excited about the acquisition and growth prospects of the combined businesses.

www.omya.com
www.formulaelab.com

PRODUCT LAUNCH

BASF: Scalposine™ – New Detox Ritual Promotes a Healthy Scalp and Microbial Diversity

Dusseldorf-Holthausen, Germany | April 15, 2020

Today's hectic lifestyle as well as environmental influences such as dust and pollution negatively modify the physiological parameters of the scalp, making hair and scalp concerns more prevalent around the world. An unhealthy scalp is often oily, covered with dandruff and can become sensitive. In response, BASF has created **Scalposine™** – a true scalp detox that can restore beauty and health. The new active ingredient is proven to soothe and purify the scalp by decreasing the production of sebum and replenishing scalp microbiota.

Resetting the microbiome for a healthy scalp

Virtually unexplored until now, the scalp supports several types of micro-organisms living in harmony with our scalp cells. In a metagenomic study, BASF explored the disruptive influence of sebum on this fragile microbiotic balance. The analysis confirmed that the diversity of the microbiota is lower on an oily scalp than on a normal scalp. Scalposine at 1 percent significantly increased the diversity of the scalp's microbiota after one month of application – with the number of taxa increasing by 36 percent as compared to the placebo. What's more, the active ingredient exhibited a prebiotic effect in that it boosted recolonization with six strains of bacteria previously identified by BASF researchers as being beneficial for a healthy scalp overall.

Reducing sebum production for a purified scalp

Excessive sebum production in hair follicles not only fosters the reduction of beneficial bacteria strains but irritates the scalp, causes skin flaking and hair to appear greasy. In vitro trials showed that Scalposine at a dose of 0.7 percent effectively reduces the gene expression of 5α-reductase 1, the enzyme initiating the process of sebum production, by as much as 77 percent. A one-month placebo-controlled clinical study confirmed the active ingredient's ability to lower the level of scalp sebum. Furthermore, 82 percent of study participants reported an immediate soothing effect on the scalp, while some even saw flakiness decrease after 28 days of application.

With Scalposine (INCI: Glycerin (and) Water (and) Sarcosine), BASF has developed a holistic approach based on Sarcosine, an amino acid derivative found naturally in the human body. It is a precursor of glycine, an amino acid essential for building major skin macromolecules such as elastin and collagen.

www.care-chemicals.basf.com

Mibelle Biochemistry presents:

PhytoCellTec™ Malus Domestica Hair Plant Stem Cells for Hair Follicle Rejuvenation

Buchs, Switzerland | April 23, 2020

Since its launch back in 2008, **PhytoCellTec™ Malus Domestica** is Mibelle Biochemistry's bestselling product. The innovation of the plant cell culture technology has been a break-trough in stem cell cosmetics, seeing steady growth ever since. To further push this technology, we have investigated in new studies and are now launching **PhytoCellTec™ Malus Domestica** Hair, the first plant stem cell active ingredient on the market for which the effect was evaluated on human hair stem cells. This unique and revolutionary ingredient is able to protect the most precious hair cells, the hair stem cells, against premature aging and loss.

Studies have shown that PhytoCellTec™ Malus Domestica Hair:

- helps keratinocyte and dermal papilla stem cells to maintain their stem cell characteristics
- stimulates hair growth
- prolongs the anagen phase of hair
- delays hair aging
- prevents hair loss

Further, new study results for skin are available (increase of skin thickness, new clinical test results on wrinkles).

www.mibellebiochemistry.com

PRODUCT LAUNCH

Vytrus Biotech Launches KANNABIA SENSE, a New Ingredient that will Revolutionize the Cosmetic Industry

Barcelona, Spain | April 3, 2020

Vytrus Biotech, the company specialised in plant stem cell culture for the cosmetic and pharmaceutical sectors, announced yesterday the launch of a new ingredient that will revolutionize the cosmetic industry, **KANNABIA SENSE**[PLF]. It consists of the first natural active ingredient made from Cannabis sativa plant stem cells.

This active interacts with the skin microbiota's postbiotic generation to modulate the skin neurochemical networks and enhance the feeling of comfort and self-confidence through the Microbiota-Skin-Brain Axis (MSBA).

Òscar Expósito, CEO, CSO and co-founder of Vytrus Biotech says: 'We are talking about a product that will revolutionize the sector because **KANNABIA SENSE**[PLF] plays a key role in activating the brain through the skin as our ingredient activates the same brain areas as oxytocin, the hormone of happiness, among others. Our team is very excited and satisfied with the achievement since it is a very special ingredient, that we could even talk about a sensory ingredient.'

This active ingredient presents, as a differentiating and relevant fact, that it gets away from the narcotic concept, as it is free of the cannabinoids Cannabidiol (CBD) and Tetrahydrocannabinol (THC) in its composition. It has been developed using an innovative Phyto-Lipidic Fractions technology based on a process designed to enrich cell culture in signaling lipids that activate the Microbiota-Skin-Brain axis (MSBA).

The mechanism of action of the active consists of stimulating the skin microbiota so that its bacteria, in a natural way, produce a postbiotic cocktail that stimulates the synthesis of cutaneous oxytocin that ignites a systemic well-being response that results in a healthier and stronger appearance of our skin.

The biotechnology company has carried out numerous clinical assays to demonstrate with very good results the effectiveness of the active ingredient in small doses. Its properties are multiple and the most notable was the one analysed by the sophisticated functional Magnetic Resonance Imaging (fMRI), where brain activity and activated areas of the brain are measured in response to certain stimuli. 'In our volunteers, we observed that applying a topical lotion with 2% of **KANNABIA SENSE**[PLF], the areas of the brain related to pleasure were activated within just 15 minutes of application, with even higher and more positive effects at 28 days, following the same brain activation pattern produced by chocolate', adds Òscar Expósito.

KANNABIA SENSEPLF has multiple benefits: it activates the brain areas related to pleasure, induces a better self-perception and improves the skin characteristics associated with aging, health, youth and greater physical attractiveness (hydration, wrinkle reduction, skin radiance).

www.vytrus.com

ROELMI HPC: At the Forefront of Sustainability

Origgio, Italy | April 3, 2020

ROELMI HPC pursues sustainable development in the continuing study and research of ingredients that meet the NIP® (No Impact In Progress) criteria with regard to efficacy, safety for people, and safety for the environment.

MEDITERRANEE LINE is a selection of natural extracts from renewable sources allowing for an increase in the character of naturality in your formula; from Mediterranean millennial cultivation to sustainable botanical extracts for future personal care applications.

Intrinsic benefits of plants, known worldwide in the phytotherapeutic tradition, are here reinvented in water-soluble or liposoluble extracts from officinal and aromatic plants of typical Mediterranean origin and cultivation. Through a sustainable extraction process, using only biodegradable solvents (Glycerin from non-edible olive fractions and Triperlargonin from cardoon seeds.), is now possible to create a responsible choice for natural herbal treatments.

www.roelmihpc.com

PRODUCT LAUNCH

mibelle GROUP biochemistry

Mibelle Biochemistry Presents:

Alpine Rose Active Clearing Age-promoting Cells

Buchs, Switzerland | April 1, 2020

Eliminating senescent cells has emerged as a promising anti-aging therapy in the medical field in the past few years and with Alpine Rose Active this novel "senolytics" concept is now for the first time adapted for cosmetics. **Alpine Rose Active** was shown to specifically clean-up misdirected, age-promoting senescent cells and in clinical studies to significantly reduce skin redness, increase skin elasticity and protect from UVA induced photo-aging.

- Eliminates senescent skin cells
- Reduces redness and increases skin elasticity
- Rejuvenates the deep layers of the skin
- Protects skin proteins from oxidative stress

Alpine Rose Active is a purified extract leaves of the organic alpine rose, one of the most typical and iconic Swiss alpine plants. This robust and hardy plant grows in the high Alpine regions of Switzerland and is carefully harvested by sustainable wildcrafting. EcoCert certified.

www.mibellebiochemistry.com

BIOSYNTHETIC TECHNOLOGIES

Biosynthetic Technologies Present:

BioEstolides a Novel an Exciting New Plant-based Ester that is Made from Natural Seed Oils for Personal Care Applications

Indianapolis (IN), USA | April 2, 2020

BioEstolide™ is an innovative new safe synthetic product with enhanced overall stability. It is commonly used as an emollient due to its moisturization characteristics and a light, satiny feel. This unique patented ester is made from natural seed oils and delivers enhanced performance in personal care formulations. BioEstolides™ deliver superior oxidative stability and hydrolytic stability making them longer lasting and easier to formulate with in a wide range of personal care applications.
Biosynthetic® Technologies' flexible chemistry allows for the products to be specifically designed to meet a wide range of formulation requirements. The estolide is made by linking natural fatty acids together to form oligomers. The fatty acids can come from almost any natural oil source. In this instance the BioEstolides™ are formed using fatty acids from castor oil. This unique estolide structure provides the product unique protection from oxidation so it does not easily go rancid or break down over time.

Features and Benefits:

- Moisturization – **BioEstolides™** hydrate, soften and smooth the skin surface without leaving an oily residue on the skin
- Sensory Enhancer – **BioEstolides™** have a luxurious soft feel.
- Enhanced Oxidative Stability – **BioEstolides™** have excellent oxidative stability enhancing the shelf life of the product over other naturally derived oils.
- Enhanced Hydrolytic Stability – The chemical structure of
- BioEstolides™ protects the molecule and improves hydrolytic stability.
- High Refractive Index – **BioEstolides™** have a high refractive index enhancing the look of a formulation
- Pigment Dispersion – The polar nature of the **BioEstolide™** chemistry allows it easily hold pigment
- Thickening – **BioEstolides™** function as a thickening agent in personal care formulations to enhance the consistency, viscosity and volume of personal care products.
- Non-Toxic – **BioEstolide™** are considered non-toxic and noncomedogenic.
- UV Protection – **BioEstolide™** has some inherent UV blocking properties to boost UV protection naturally in a formulation.

www.biosynthetic.com

PRODUCT LAUNCH

Givaudan Active Beauty Explores New Avenues with Vegetal by Launching K-phyto™ [SC] Camellia and K-phyto™ [PP] GHK

Givaudan

Argenteuil, France | April 6, 2020

After one year of partnering with the South Korean beauty innovation company, BIO-FD&C C o., Ltd., the leading company in plant cell culture, Givaudan Active Beauty unveils two new active ingredients crafted by Green Biotechnology. Inspired by the latest K-Beauty trends, K-phyto™ [SC] C amellia is an extract of plant stem cells designed to address dry scalps and dandruff, while K-phyto™ [PP] GHK is a phytopeptide aimed to reduce skin sebum production.

Mathias Fleury, Global Category Manager for Biotechnology Actives said: "The exclusive partnership with Bio FD&C leverages the untapped power of plants through stem cell cultures and unique phytopeptides. It allows our experts to offer innovative natural and reliable solutions for hair and skin care issues such as dry scalp and oily skin, while protecting our planet."

K-phyto™ [SC] Camellia, to rebalance itchy and flaky scalp

A dry and itchy scalp is a global hair condition to solve. If 26%[1] of US adults have hair concerns related to dryness, 41% of Brazilians show an interest in trying scalp care treatment products. In APAC, botanical claims drive haircare new product launch by 70%[1] with popular ingredients such as Camellia (also known as Tsubaki).

K-phyto™ [SC] Camellia is a powerful active obtained from Camellia phytoplacenta cells culture. By using plant cells culture, our scientists have been able to isolate and replicate these cells from a C amellia flower (traditionally used in Asia for its scalp care and hair conditioning properties) , originating from the famous Korean Jeju Island, without endangering Nature's resources. This unique active will increase the scalp moisture content, up to +13.8%, reinforce the epidermal cohesion of the scalp keratinocytes, resulting in a reduced number of dry flakes and dandruffs down to -33.6%, and significantly soothe the scalp, with a reduction of its erythema down to -6.6%.

If **K-phyto™ [SC] Camellia** offers major benefits in one week, it also delivers great results after just one single shampoo application, restoring hydration, improving soothing and reducing flakes better than the placebo conditions, for a perfect instant gratification effect.

K-phyto™ [PP] GHK, the phyto-boosted peptide for oily skin

Oily skin is a frustrating condition that can affect consumers' self-confidence, especially in today's focus on maintaining a "picture-perfect image". Both female and male consumers are seeking solutions for this common skin complaint leading to acne. 50%[1] of 20-24 year old C hinese have experienced acne in the last six months and 43%[1] of 18-24 year olds Americans use acne products at home.

K-phyto™ [PP] GHK is an innovative molecule that combines the best of botanicals and peptides to act on sebum production's mechanisms. Thanks to the phytopeptide technology (combining a peptide with a natural phytochemical molecule), it offers a full set of actions, starting with preserved antioxida nt and anti-ageing activities compared to the initial molecules (caffeic acid and matrikine GHK). Clinical studies have shown significant benefits (versus placebo) on reduction of the facial sebum production in just 2 weeks (-35.5%), with an even more impressive efficacy after one month of use (67.5%), up to five times better than placebo.

[1] Mintel

www.givaudan.com

PRODUCT LAUNCH

Archroma to Introduce a New Thickener for Sanitizing Gels to Address Global Shortage due to COVID-19 Crisis

Reinach, Switzerland | April 7, 2020

Archroma, a global leader in color and specialty chemicals towards sustainable solutions, today announced the introduction of **Mowiplus® HPC 9600**, a new thickener for sanitizing gels to address global shortage due to COVID-19 crisis.

Hand sanitizers are typically made of alcohol and additives, to which a thickener is often added to create the gel texture. Gel sanitizers are considered more user-friendly than liquids, as they avoid spilling and thus wasting the precious sanitizer material that is in critical need for the fight against the coronavirus outbreak.

The thickener typically used for the production of hand sanitizing gels and other home care and personal care products, is currently in global shortage due to the COVID-19 coronavirus. Experts from the Archroma team in Brazil, anticipating shortages just as they had happened during previous outbreaks such as H1N1, decided to look into the matter.

The result is **Mowiplus® HPC 9600**, an alternative that offers good performance and cost levels, and even allows to skip the 12-hours hydration process needed traditionally, thus saving valuable time in a crisis that need all the sanitizers it can get.

"Everyone at Archroma is currently engaged in the fight against COVID-19, at home and at work, as we do everything we can to protect our loved ones, our colleagues, and ourselves", comments Marcelo Ribeiro, Head of Sales Brazil at Archroma.

"With **Mowiplus® HPC 9600** we are actually able to directly make a difference and contribute to the fight, by delivering a product that helps to make a more convenient end-product, and to preserve every drop of precious hand sanitizer. It's our nature, and that makes us very proud", adds Regina Oliveira, Head of Sales Latin America at Archroma.

The new product is listed in the INCI (International Nomenclature of Cosmetic Ingredients) and meets the July 2016 RDC N°83 ANVISA / MERCOSUL Technical Regulation for personal hygiene products, cosmetics and perfumes.

Mowiplus® HPC 9600 is currently available in Brazil.

® Trademarks of Archroma registered in many countries.

www.archroma.com

Nouryon Introduces Natural Polymer for Sustainable Sunscreen Formulations

Amsterdam, Netherlands | April 9, 2020

Nouryon has introduced a natural film-forming polymer for use in high sun protection factor (SPF) emulsion sunscreens. SolAmaze™ Natural, which is bio-based and readily biodegradable, addresses the fast-growing consumer demand for natural and clean label ingredients in personal care products.

"When creating high-performing sunscreens, formulators routinely rely on synthetic ingredients that are often persistent in the environment," said *Suzanne Carroll*, Vice President Home and Personal Care at Nouryon. "**SolAmaze Natural** polymer allows our customers to develop more natural, sustainable sunscreens while also providing superior water resistance and an improved feel on the skin."

SolAmaze Natural is compatible with other ingredients used in sunscreen formulations and can be used across a range of end products. These include both traditional organic and mineral sunscreens, as well as SPF moisturizers, color cosmetics, and face and body lotions. It is non-toxic to aquatic life and produced from non-hazardous raw materials.

"The persistence of chemicals in our environment is increasingly in the focus of consumers," said *Larry Ryan*, Executive Vice President and President, Performance Formulations and The Americas for Nouryon. "By developing natural-based products we are giving formulators more options so that they can meet consumers' demands for more sustainable product solutions."

SolAmaze is the latest in a series of natural products introduced by Nouryon for the personal care market. These include Amaze™ Nordic Barley, a certified natural starch that is used to replace petrochemical-based ingredients in skin and hair care products; and Amaze™ SP, a plant-based polymer that helps formulators to create more natural hairstyle products for consumers.

www.nouryon.com

Prove it with Pink: Colors & Effects launches Cloisonné Vibrant Raspberry

Ludwigshafen, Germany | March 31, 2020

This Spring, bold magenta coloring meets natural, clean beauty to bring **Cloisonné® Vibrant Raspberry** F90H, an intense magenta metallic-like effect pigment, to the cosmetic market. Colors & Effects® will formally introduce **Cloisonné Vibrant Raspberry** to the market on April 1st during the InCosmetics Global virtual conference.

Cloisonné Vibrant Raspberry, a clean and vegan pigment based on sustainably sourced natural mica, offers brilliant chroma, lightness and sparkle and delivers a beautiful magenta pigment with superior color intensity.

"With this new pigment, our global innovation team continues to provide the cosmetics industry with disruptive technologies founded on sustainably sourced materials," said *Gabe Uzunian*, Head of Development and Expert Services, Cosmetic Effect Pigments at BASF Colors & Effects. "Patent-pending and several years in development, this is a novel approach to creating highly chromatic effects in the red color space."

"Today's well-informed consumers call for clean, simple cruelty-free products, and they're interested in ingredient transparency now more than ever," noted *Diane Jansson*, Global Business Manager, Effects Pigments for Cosmetics, BASF Colors &

Effects. "As a carmine-free pigment that's globally approved for use in all products, **Cloisonné Vibrant Raspberry** fills a gap in the market by offering a solution for a natural, vegan product in this unique color space along with unmatched transparency and environmentally conscious processes in its production."

The new campaign, "Prove it with Pink," urges people to stand with nature and express themselves through eye-catching effects. Natural, clean beauty and bright, vivid colors converge to bring conscious living that comes with a strong, confident appearance.

The natural mica ingredient in **Cloisonné Vibrant Raspberry** is sourced from Colors & Effects' wholly owned mine in Hartwell, Georgia, USA using fully ethical, traceable and environmentally friendly processes.

www.colors-effects.eu

events CONFIRMED

28 – 30 OCTOBER 2020

SEPAWA® CONGRESS

AND EUROPEAN DETERGENTS CONFERENCE
ECC ESTREL CONGRESS CENTER BERLIN

SEPAWA® CONGRESS 2020 We Stay On Track

Thannhausen, Germany | April 23, 2020

Whilst the Covid–19 pandemic is the prime issue these days, we stay tuned for the 67th SEPAWA® CONGRESS 2020 on **28–30 October**.
We are of course monitoring the developments of the situation and consider the governmental decisions and will react accordingly. For the time being, we and the Estrel venue management are convinced that the SEPAWA® CONGRESS can take place as scheduled.
Since the overall principle of the SEPAWA® CONGRESS is based on sustainability and stand construction and other build-up procedures are rather simple, it allows for flexibility and quick reaction.
Nevertheless we will take all necessary precautions to make sure that the health of our participants is safeguarded.
We will keep you all informed about any new developments. Stay healthy and confident! **See you in late October in Berlin!**

www.sepawa-congress.com

HPCI CEE Adheres to Dates in October 2020

hpci CENTRAL & EASTERN EUROPE

Warsaw, Poland | April 9, 2020

The Corona pandemic has the world in its grip and we are all in the middle of it. Trade fairs worldwide are particularly affected by postponements and cancellations. As a result, a lot of industry events are currently slipping into the autumn. The current situation is very dynamic and changes daily. Nobody knows when the restrictions in the individual countries will be relaxed again and to what extent. We also do not know how long crowds of people will not be allowed.
It is possible that smaller local trade fairs in regions and countries that have not been so severely affected will be more likely to take place again than large international events in more severely affected countries. Everything is uncertain at this time – unfortunately!
At the moment, the organizers continue to adhere to the published dates for the 10th Edition of HPCI CEE in Conjunction with CosmeticBusiness Poland (**7-8 October 2020**, Expo XXI, Warsaw, Poland) and push ahead with their preparations. Of course, the organizers evaluate and analyse are the situation daily and will keep all exhibitors informed.

www.hpci-events.com

events POSTPONED

in-cosmetics® global 30 YEARS OF INNOVATION
Barcelona • 6-8 October 2020

A Statement from REED Exhibitions – Organisers of in-cosmetics Global:

London, UK | April 8, 2020

Reed Exhibitions today announced that **in-cosmetics Global will be rescheduled**. Following the steep escalation of COVID-19 across Europe, and in particular Spain, in-cosmetics Global will now take place from **6-8 October 2020** at Fira Barcelona, Spain.
Speaking about the announcement, Cathy Laporte, Portfolio Director at Reed Exhibitions, said: "The situation surrounding COVID-19 is constantly changing. The health and safety of our exhibitors, visitors and staff is our number one priority and we will remain guided by the expert advice of the public health authorities. We understand that the global pandemic is having planning and financial implications for the industry. We have therefore proactively taken this decision well in advance of the current June dates to allow exhibitors and visitors more time to prepare and gain maximum value for the event when it happens.
"It has been a difficult few months globally, but it has been inspiring to see the resilience of the industry, and how companies have been adapting to the situation, in some cases repurposing their factories to support public health authorities with the production of much needed healthcare products. As event organisers, we are proud to serve such an innovative and caring industry, and we can't wait to get the global personal care and beauty community together once again in Barcelona in October. We want everyone to enjoy attending in-cosmetics Global as they have done so in the past."
For updates and further information, please visit the event website:

www.in-cosmetics.com/global

HPCI South Africa Johannesburg, South Africa

hpci SOUTH AFRICA

New Date: 8-9 September 2021

Cosmetology – Theory and Practice

Research, Test Methods, Analysis, Formulas

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Karlheinz Schrader and Andreas Domsch

This work in **3 volumes** represents a symbiosis of two standard works and provides a comprehensive overview of the field of cosmetology. »Grundlagen und Rezepturen der Kosmetika« (Schrader) and »Die kosmetischen Präparate« (Domsch) have been combined into a text book and reference work in one.

The aim of creating this book was to provide cosmetic chemists, dermatologists, pharmacists and biologists, as well as other scientists involved in cosmetology an introductory overview of the interesting and multifaceted field of cosmetics.

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