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Cosmetic Performances Designed by Nature: Sustainable Emollients from Circular Economy

A. Adduci, S. Zanzottera

abstract

The present papers aims at demonstrating the concrete efforts in pursuing circular economy models to develop cosmetic ingredients. Primary focus on the capacity in promoting sustainable methods of production through the efficient use of resources deriving from other supply chains (non-edible fractions from food chain). Two main categories have been investigated: sustainable esters and botanical extracts from Mediterranean basin.

Introduction

What is SUSTAINABILITY? It the past years, it has been defined as the method used by biological systems to improve their resistance and production. Nevertheless, the 21st-century definition goes far beyond these narrow parameters.
In fact, today Sustainability is a balancing act. It takes in consideration the present and the future: as indicated in the Report of the World Commission on Environment and Development, sustainability meets the needs of the present without compromising the well-being of future generations.
The topic of sustainability is evolving linked to the interdependence of global markets and growing customer's awareness. As it is known, companies and customers need metrics by which to make decision and several customers have posited the question about how to assess sustainability in raw materials, and their own impact on Environment. Economic growth must take into account the availability of resources offered by our planet and the rate at which they are renewed. Over-exploitation of stock today will fall on future generations. It is therefore indispensable to rethink our economic models to make them more compatible with the regeneration rhythms of the planet's resources.
Availability and secure access to natural resources of the planet represent the indispensable basis for human life and socio-economic well-being of our society. However, in a globalized world in which is the estimated population growth is estimated to reach 9 billion people by 2050, the continued growth of demand and competition related to limited resources jeopardizes security of supply of the resources themselves. As result, an increased pressure and effects on the environment generating a crisis for the sustainability of existing production models and consumption (UN DESA, 2015).
Cosmetic market should take into account its performances to concur in a positive manner to achieve the challenging goals of sustainability. One example among all, the Sustainable Development Goals of the United Nations 2030 Agenda (UN, 2015). Concerted efforts are called for building an inclusive, sustainable and resilient future for the people and the planet. To reach this goal, governments, businesses and civil society together with the United Nations have started to mobilize actions to achieve the Sustainable Development Agenda by 2030. Universal, inclusive and indivisible, the Agenda calls for action by all countries to improve the lives of people everywhere.
Sustainable approaches, innovation, local organic agriculture and maintenance of biological diversity in a sustainable supply chain and in the global economic context, were deeply taken into consideration within a project developed by ROELMI HPC, the inventor of "NIP® Program", strictly committed in designing, developing and producing active and functional ingredients for Health & Personal Care markets.
Following this program, two main categories have been investigated: sustainable emollients and a new vision of botanicals from Mediterranean basin.

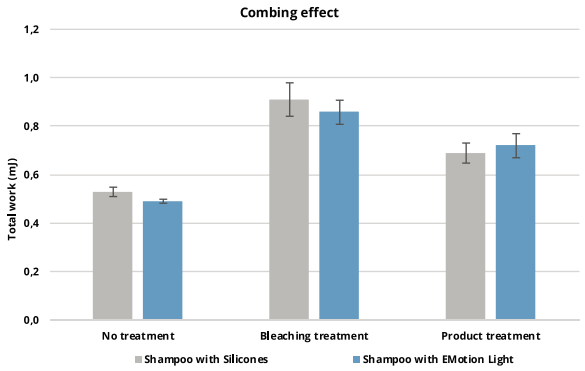
Focus on a new Category of Emollient Agents

Esters are one of most largely employed ingredients in cosmetic formulations as per their remarkable emollient capacity. Nowadays, several categories of them are under investigation because of their food chain origin. Growing interest in different raw materials sources, through a controlled supply chain aiming at minimize the impact on Environment, is now challenging the market to find a reliable opportunity.
An industrial plant, completely converted to "green chemistry" allows the creation of high-purity Pelargonic acid (above 98%) from local crops, by local cultivar in marginal lands, as starting base for the development of high-quality esters.
Targeting the cosmetic market, EMotion® Esters are the sustainable choice for formulators. Eco-designed esters

with surprising capacities: outstanding properties in terms of solubilisation and dispersion of UV filters and pigments, strong ability in conferring color intensity, homogeneity tint, good texture, bright and glossy effect to the formulation.
EMotion® Silky (INCI: Neopentyl Glycol Dipelargonate): emollient ester with a dry, silky, smooth and evanescent touch, characterized by easy spreading qualities, good and quick absorption. It can be used instead of other dry and silky-touch esters, having the same final performances. Esters with similar characteristics available on the market are: Isodecyl Neopentanoate, Isononyl Isononanoate, C12-15 Alkyl Benzoate and Ethylhexyl Palmitate. It has as a benchmark in terms of performance the silicone Cyclopentasiloxane. Thanks to these features, EMotion® Silky is particularly suggested for skin care, sun care and hair care products.
EMotion® Light (INCI: Tripelargonin): emollient ester with a light and soft touch, characterized by high spreadability and good absorption rate. It can be used in formulation instead of other emollient esters without leaving any greasy sensation on the skin. Esters with similar characteristics available on the market are Caprylic/Capric Triglyceride (MCT) and Isopropyl Palmitate. Thanks to its light touch, EMotion® Light is indicated for skin, sun and hair care as in make-up products.

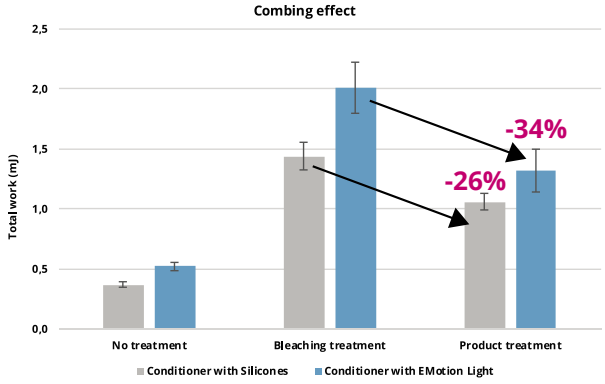
Development: Evidence of Efficacy

Which criteria can be used to assess the esters activity in Hair care? You can begin to answer this question by observing the chemical-physical parameters such as density, viscosity and the refractive index. The measurement of these values allows, from the theoretical point of view, to predict what performance of the cosmetic formula containing the ester will be.
There is a correspondence between density and weightless of the ester. The lower the density, the greater will be the feeling of lightness that the ester will give to the hair. A low viscosity helps the application of the product on the hair.
Starting from an ester with a refractive index closer to the hair in a normal state of health, make it able to give brightness to the damaged hair.
By comparison with the silicones on the market, our EMotion® Esters show values of density, viscosity and refractive index comparable and in some cases even better.
An *ex vivo* study, aimed to assess the combing properties of EMotion® Esters in comparison to silicones, was carried out on natural hair locks and products' effects were instrumentally evaluated by means of DIA-STRON fibra.one in an independent laboratory.
Commercially available human brown hair locks were used for the study according to the following study design:



Shampoo containing silicones (INCI: Aqua, Sodium Laureth Sulfate, Cocamidopropyl Betaine, Dimethicone, Phenoxyethanol, Parfum, Sodium Chloride, Glycol Distearate, Steareth-4, Citric Acid, Ethylhexylglycerin)
Shampoo containing the tested product (INCI: Aqua, Sodium Laureth Sulfate, Cocamido-propyl Betaine, Tripelargonin, Phenoxyethanol, Parfum, Sodium Chloride, Glycol Distearate, Steareth-4, Citric Acid, Ethylhexylglycerin)

Fig. 1 Combing effect in shampoo treatment.



Conditioner containing silicones (INCI: Aqua, Cetearyl Alcohol, Glyceryl Stearate, Peg-100 Stearate, Dimethicone, Ethylhexyl Palmitate, Polysorbate 80, Phenoxyethanol, Parfum, Ethylhexylglycerin)
Conditioner containing the tested product (INCI: Aqua, Cetearyl Alcohol, Glyceryl Stearate, Peg-100 Stearate, Tripelargonin, Ethylhexyl Palmitate, Polysorbate 80, Phenoxyethanol, Parfum, Ethylhexylglycerin)

Fig. 2 Combing effect in rinse-off conditioner treatment.

- 3 hair locks are treated with shampoo containing silicones
- 3 hair locks are treated with shampoo containing the tested product
- 3 hair locks are treated with conditioner containing silicones
- 3 hair locks are treated with conditioner containing the tested product

Hair locks were damaged with a bleaching treatment (30 minutes exposure to 20 volumes hydrogen peroxide + 50 minutes exposure to 30 volumes hydrogen peroxide) with commercially available products (dott. Solari COSMETICS Oxidizer in perfumed cream; HP FIRENZE Bleaching free-hand).
Three grams brown hair locks were prepared using an analytical balance (KERN ALJ 160-4NM, KERN & Sohn GmbH). After preparation hair locks are washed as follows: i) hair lock was made wet for 10 seconds using tap water, ii) 1 ml of neutral shampoo was distributed all over the hair lock length using a graduated pipette, iii) the neutral shampoo was rubbed all over the hair lock length during 20 seconds, iv) hair lock was rinsed during 30 seconds using tap water, v) hair lock is dabbed with a paper towel and dried using a hair dryer.
After bleaching treatment, a fixed amount of test products were distributed all over the hair lock length as follow: 1 ml of the test product on wet hair lock treated with shampoo formulas (benchmark and tested product); 500 mg of the test product on wet hair lock treated with conditioner formulas.
The evaluation of hair locks' combing properties was carried out using DIA-STRON fibra.one, a multi-functional tress testing instrument which allows to objectively evaluate combing properties of the hair locks before and after products application. In this study the total work parameter, calculated as the area under the curve (AUC) and expressed in mJ, is evaluated. This parameter represents the total work carried out by the comb to comb the whole hair lock.

Fig. 1 and **Fig. 2** report the mean data of the Total work parameter obtained for each study product. The data reported here below are the mean value calculated on 8 repeated measurements. Data are expressed as mJ.
In shampoo treatment, comparable results performed by cosmetic rinse-off formulas containing Tripelargonin in respect to silicones-based formulas.
Considering that the performances of the ester and silicones are evaluated in the last step (when the product is applied on strands of bleached hair), it is possible to notice that, in the conditioning treatment, the total work necessary to comb the strands decreases more after the use of Tripelargonin, compared to the conditioning formula based on silicones, reduction of 34% vs 26%. This result shows that Tripelargonin is able to provide a better combing effect of the hair compared to silicones.
An internal panel of no. 20 volunteers has tested two different cosmetic formulations to evaluate the sensorial feelings of sustainable emollients toward a benchmark:

- A hair serum containing 2% Tripelargonin has been compared versus the same formulation containing the same dosage of Caprylic/Capric Triglyceride.
- A hair serum containing 2% Neopentyl Glycol Dipelargonate has been compared versus the same formulation containing the same dosage of Isononyl Isononanoate.

Volunteers positively score the product pointing out: the higher softness sensation, the pleasant absence of greasy effect helping combing hair ability as well as a glossy hair appearance. **Fig. 3** summarizes the average score.

Further Developments

Continue developments of ingredients, in light of sustainability, are intended to enlarge the portfolio of emollients in

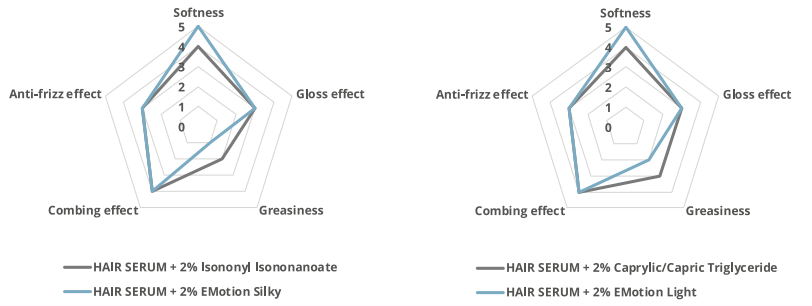


Fig. 3 Sensorial evaluation.

the next future. Protection of local biodiversity is becoming more and more important in the development of Personal Care ingredients. Through the ultimate frontier for botanical extracts, in line with Circular economy and welcoming the Nagoya protocol, coming from an innovative extraction process, using only sustainable solvents (Glycerin and Triperlargonin from non-edible native fractions (**Tab. 1**)), is now possible to create a responsible choice for natural herbal treatments.

Linking tradition and responsibility as major development drivers, Méditerranée Line represents phytotherapeutic and aromatic plants extracts for future cosmetics. Hydrosoluble or liposoluble extracts that could be used in all water and oil-based cosmetic formulations with a varying dosage, depending on finished product.

Conclusions

We believe that only the daily action with respect for the Environment could lead to a durable result. Following this leitmotiv, represented by a drop in our corporate logo, we perform sustainable innovation: a real step forward on the sustainability road. Our program NO IMPACT IN PROGRESS® (NIP) applies to all products and technologies, and it stands as a mission for every process focusing on Quality, People safety and Environment preservation.

In fact, we are approaching the future through innovation and evolution. We aim at protecting the value of Nature and People in product manufacturing. We care about the environmental impact of our productions by adopting eco-sustainable processes and renewable raw materials. We aim at keeping high quality standards as well as high efficacy.

We are strongly working in this direction when we develop new projects as well when we ameliorate existing processes. However, the single action becomes winning thanks to the interaction within a community. Join with us the sustainability. Join the NIP®.

Glycerin from non-edible olive fractions	Triperlargonin from local crops
Italian expertise in farming and olive processing technique	Integrated agricultural value chain for territorial regeneration
Non-edible sources of food supply chain reflecting circular economy model	Typical EU crops, grown on uncultivated and marginal lands
Soft technologies maintaining natural profiles	Innovative mechanical process for seeds crushing

Tab. 1

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In Active We Trust: Sustainability, Traceability and Transparency in Cosmetics

E. Besic Gyenge, S. Hettwer, B. Suter, B. Obermayer

abstract

Consumer's mind set is changing. That not only our food traceability is becoming important but also we start to care about our cloths supply chain and we ask ourselves – what is actually inside my cosmetic pot?
The products that make us feel good have to be good and honest. It is not enough to claim that products are safe, effective and sustainable. Today's consumers want to have proofs of it. It is going beyond believing. Therefore, cosmetic industry needs to gain unconditional trust of their customers. Good start would be to make the supply chain of the products transparent, make sustainable sourcing and involve and support local communities.

Introduction

Looking at the forecasts in the beauty industry it is evident that the focus should be on how to contribute positively to the world. Delivering an effective product was yesterday. Beauty industry and beauty brands needs to go much further. The consumers are choosing their products more mindfully and consciously. They are looking for effective product with positive social and environmental impacts. Ethics and social values are gaining more importance. "Purposeful beauty" is what consumers are willing loyally to buy. Total ingredient and their supply chain transparency, best practices in labour issues, social responsibility, empowerment and consciously tune with the nature are only the few of the goals that beauty industry needs to address.

UN sustainable development goals (SDGs) seems to strike the right note nowadays [1]. The 17 goals are applicable to all 195 countries, to all businesses and are the global measures for the joint effort to achieve a better and more sustainable future for all.

RAHN as a cosmetic active ingredient supplier acknowledges its responsibility and doing its best to support SDGs. We take great care to ensure that the development of our active ingredients follow sustainable sourcing, responsible production and readily biodegradable. Furthermore, life cycle assessment technique is used to calculate produced CO_2 through entire supply chain. Supporting international recognised climate projects not only makes RAHN's active ingredients carbon neutral but much more, it is helping others to live a more dignified life. Supporting the projects bring clean drinking water, clean energy, and light where needed. Healthy forests are home to an enormous diversity of species and are the basis of life for all people, which need to be protected. Finally yet importantly good health care and quality education have to be affordable to all human on our planet.

Providing carbon neutral active ingredients

Life cycle assessment is a technique that is used to analyse systematically the impact on nature and environment throughout the entire life cycle of a product [2]. This is measured in terms of the generated amount of greenhouse gases, especially CO_2. There are several ways of analysing a product's life cycle and thus the amount of greenhouse gases produced. There are different "cradle-to-"approaches (**Fig. 1**). Cradle-to-cradle is a biomimetic approach, where products and systems are viewed as waste free nutrients circulating in healthy and safe metabolism as seen in the nature. Cradle-to-grave approach includes the extraction of raw materials to manufacturing, product use, and recycling/disposal. RAHN has selected the "cradle-to-gate" principle as the most appropriate one for a raw material supplier. In this case, analysed is the whole supply chain from seeding and harvesting, through extraction and processing of the raw material including raw material

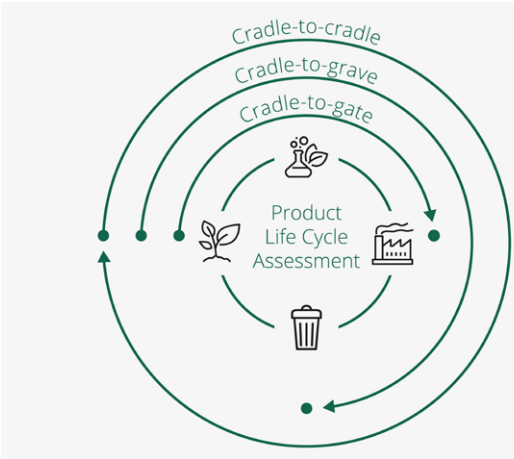

Fig. 1 Different Product Life Cycle Assessments.

packaging and transportation to our customers. Transparency in the supply chain highlights potential problems and offers opportunities for future optimisation. Furthermore, as doing so RAHN's trusted network partners reveal insights in their own working processes bringing more reliance in business relationship.
Product's life cycle assessment discloses the amount of greenhouse gases produced during the production. The CO_2 amount can be offset by different international climate projects. It is more than just CO_2 savings. Those projects are connected to the 17 UN SDGs and help people in many ways.

Examples from the House of RAHN

RAHN always strives to deliver the highest quality for its customers. Cosmetic actives from the House of RAHN are effective, sustainable, traceable, carbon neutral and combine technology and nature in its best.

Sustainable high-tech food for skin and hair

CELLACTIVE® (Water, Chlorella Vulgaris/Lupinus Albus Protein Ferment, Sodium Benzoate, Potassium Sorbate): this active contains two "king of foods": white lupin and microalgae *Chlorella vulgaris*. White lupin (*Lupinus albus*) seeds have a long history of use as human nutrition and in medicine. The symbiosis of the plant with rhizobia results in the fixation of atmospheric nitrogen for the production of proteins and other nitrogenous substances in seeds while at the same time these contain hardly any starch. *L. albus*' deep roots loosen the lower soil layers enabling optimal soil conditioning and fertility. Farmed *L. albus* does not need additional water or fertilisers. Cultivation of lupin is not only an excellent investment in the soil but in fact above it as well. The beautiful flowers create attractive meadows where our endangered and extremely important bees can collect pollen.
Microalgae have been around for aeons. Microalgae produce approximately half of the atmospheric oxygen on Earth. One of the most remarkable and the oldest known on the planet is the fresh water microalga *Chlorella vulgaris*. Its nutritional value is very high. 100 g of *Chlorella* contains 60 – 70 g protein (dry weight) and can supply the daily protein requirement of an adult. Its cultivation in photobioreactors is one of the most sustainable forms of production. Both superfoods are combined together in CELLACTIVE®, the cell boost-factor for skin and hair. The active ingredient promotes the integrity of the integumentary system at two levels: in the epidermis, it stimulates the production of adhesion proteins in order to improve cellular cohesion. Furthermore, it triggers the production of multiple extracellular matrix components in the dermis and helps skin to quickly regain its firmness and elasticity. Hair also benefits from the

use of CELLACTIVE®: it encourages the longevity of hair follicles thanks to invigorated cellular cohesion and improves hair quality parameters such as the anti-static effect and structure. CELLACTIVE® is carbon neutral and two climate protection projects (Stiftung Bergwaldprojekt in Switzerland and forest protecting project in April Salumei, Papua New Guinea) are supporting 10 out of 17 SDGs. For more information, visit the website: https://fpm.climatepartner.com/tracking/12934-1810-1001/en.

The upcycling wonder for cellular cleaning

REFORCYL®-AION (Propanediol, Water, Cucurbita Pepo (Pumpkin) Seed Extract, Citric Acid) is not only climate-neutral, it even applies the principles of a circular economy. To obtain this active ingredient, *Cucurbita pepo var. styriaca* is produced in a closed, sustainable loop, representing an exemplary pathway from cultivation to the final product. *Cucurbita pepo var. styriaca*, the pumpkin species used to produce REFORCYL®-AION, is cultivated by family-run organic farm in geographically protected regions in middle Europe. The shell-free seeds are used for oil production, the flesh remains on the field as a soil fertilizer. The remaining press cake is further processed to obtain valuable and precious REFORCYL®-AION extract. This raw material is 100 % biodegradable and not toxic for animals, plants or water organisms. The residual material from extract production is composted and is used as soil fertilizer.

REFORCYL®-AION rejuvenates and purifies the skin by activating the key parameters of a healthy autophagy process. Autophagy is a natural cellular cleaning program. Degradation products are enveloped by vesicles, enzymatically upcycled and then reused. Impaired autophagy weakens the skin barrier and promotes skin "garb-ageing". Clinical studies have shown that activating this form of cellular spring-cleaning markedly improves skin tone and leads to smooth, redensified and revitalised skin.

REFORCYL®-AION is climate neutral. The climate protection projects (Stiftung Bergwaldprojekt in Switzerland and Hydropower for the habitat of mountain gorillas in DC Congo) support 10 out of 17 SDGs. For more information, visit the website: https://fpm.climatepartner.com/tracking/12934-1903-1001/en.

Think Globally - Act Locally - from South to North

Sourcing is a very important issue in cosmetic industry. Not only an issue in developing countries. Here are three examples where local communities in South Africa and in Finland are involved in plant harvesting. LIFTONIN®-XPERT ECO, MYRAMAZE® and DEFENSIL®-SOFT are part of RAHN's Clean Beauty Line and they are all carbon neutral. The climate protection projects (Stiftung Bergwaldprojekt in Switzerland, Biomass and Solar energy in South Africa and Forest protection in Mongolia) support 14 out of 17 SDGs. For more information, visit the website: https://fpm.climatepartner.com/tracking/12934-2002-1001/en.

The smart collagen manager for multi generation efficacy

LIFTONIN®-XPERT ECO (Water, Pentylene Glycol, Mannan, Citric Acid) is an intelligent collagen booster obtained from the leaf sap of the South African medical plant *Bulbine frutescens*.

Bulbine frutescens is a small shrub growing in dry valleys in southern Africa. It belongs to the asphodel family, which also includes for example *Aloe barbadensis* (Aloe vera). Like the Aloe vera, *Bulbine frutescens* is a succulent plant and contains a gel-like sap in its leaves. For the manufacture of LIFTONIN®-XPERT ECO, pure sap is obtained by means of gentle cold pressing of the leaves. We enrich the mannan (or polymannose) fraction with the functional ingredient acetylated polymannose (APM) by size exclusion filtration with a corresponding cut-off pore size. Our plants are grown on an organic family farm in South Africa. The agriculture of *Bulbine frutescens* is certified organic and involves in all steps only local families.

LIFTONIN®-XPERT ECO offers an innovative mechanism that can compensate for an imbalance in the collagen metabolism of the dermis in a controlled manner. Its unique activity of fibroblast stimulation and of suppressing the development of inflammatory responses by inhibiting the leukotriene synthesis, makes LIFTONIN®-XPERT ECO a smart manager of the dermis structure. In this way, the formation of wrinkles can be delayed for a long time, and aged skin can be restored to a more youthful condition. LIFTONIN®-XPERT ECO helps everywhere that the long-term quality of the collagen is important: in the anti-ageing area as well as care for stretch marks and tattoos.

Water changes everything – Resurrection plant for stressed skin

MYRAMAZE® (Propanediol, Water, Myrothamnus flabellifolia Extract, Ascorbic Acid, Citric Acid) an extract of *Myrothamnus flabellifolia*, is like an oasis for stressed, "desert-like" skin with a particularly high proportion of protective substances. *Myrothamnus flabellifolia* is known as the resurrection plant (**Fig. 2**). When the first drops of rain fall, it goes through a resurrection-like process and is alive and green again within a day. A powerful cocktail of active ingredients is responsible for this plant's ability to revitalise and regenerate itself, and this makes *Myrothamnus* a highly interesting raw material for cosmetic applications. *Myrothamnus flabellifolia* grows on rocky peaks. Local communities are harvesting wild growing *Myrothamnus*. Only 10-25% of the plant is harvested. This is called rejuvenation or tapered cut, which is regenerated within 1 year. The plants are 20-30 years old.

MYRAMAZE® is made to protect the skin's cells against dryness and to stabilise the skin's moisture and lipid barrier. Thus,

MYRAMAZE® effectively increases the skin's resistance to irritation and promotes a speedy recovery. The skin is protected in times of "drought", and after the first "downpour" it flourishes again in the shortest possible amount of time.

Aurora Borealis Skin Guardians

DEFENSIL®-SOFT (Propanediol, Albatrellus Confluens (Mushroom) Extract, Citric Acid) an extract of Albatrellus mushrooms, which is able to eliminate the pain in the skin and regulate skin comfort zone.
Albatrellus mushrooms are growing on the ground of the boreal coniferous forests of the Taiga, under the magical light of Aurora borealis. You may call them "the guardians of the forest", as they are so-called mycorrhiza fungi being in a symbiotic association with the roots of the trees. By increasing the potential surface to prospect for water and minerals for the trees, they maximize the health and power of the forest. In return, the fungi receive glucose from the photosynthesis of the trees for their own growth. The Taiga is the northernmost forest formation on earth. It occurs without exception in the northern hemisphere. For DEFENSIL®-SOFT, we chose mushrooms from Finland, which is sparsely populated and known for its intact nature and clean air. To fulfill RAHN's high standard for the responsible treatment of eco-systems, our mushrooms are harvested by hand by experienced Finish mushroom pickers in cooperation with the local community.
DEFENSIL®-SOFT is based on the active principle of the edible Albatrellus mushrooms. The lead compounds grifolin, neogrifolin and scutigeral are natural inhibitors of the TRPV1 receptor and can address the trigger factors such as infrared radiation, acids, xenobiotics and inflammatory mediators at once. Blocking the TRPV1 receptor immediately prevents the transmission of the feeling of discomfort to the brain and prevents the release of CGRP, a very potent trigger of a massive inflammatory response. The skin returns to a state of relaxation and the urge to scratch is immediately suppressed. This prevents development of a lower threshold for skin irritation and thus the formation of a permanent sensitive skin. By efficiently blocking just the TRPV1 receptor, DEFENSIL®-SOFT is the versatile answer to minimise skin irritation or relieve stressed and sensitive skin.

Fig. 2 *Myrothamnus flabellifolia* the resurrection plant is capable of surviving long periods of drought in a completely desiccated state. After the first rain, it will turn green again within a few hours.

Conclusion

RAHN offers the customers transparency, traceability, efficient and sustainable active ingredients for various skin and hair care applications, at the same time is taking responsibility for nature, and engages for local communities. RAHN's cosmetic actives are trustful and fulfil all criteria for being used in "Purposeful beauty" products.

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A New Cosmetic Grade of PDO for Sustainable, High-performance and Conscious Beauty Products

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abstract

In the coming years, beauty biotechnology is likely to gain in importance, driven by concerns, particularly among younger generations, about the environment and limited natural resources. To this end, DSM is launching a new cosmetic grade of PDO (1.3-Propanediol) in partnership with the biochemistry company METEX NØØVISTA. The product, TILAMAR® PDO with NØØVISTA™, has a fully sustainable production process and its multifunctional properties and much in-demand skin microbiome friendliness have been demonstrated in clinical studies which are described in this article. It therefore offers manufacturers a way to reduce the complexity of their cosmetics formulations to meet the growing consumer demand for sustainable but high-performance personal care products that are also seen as a clean option.

What the Conscious Beauty trend means for the personal care industry

Today's beauty and personal care consumers have become more knowledgeable, more conscientious and more ideological in their buying choices. Performance and results are important to them, but, driven by broader health, environmental and societal concerns, they are also paying much closer attention to the ecological and social impact of the products they use [1]. This is particularly true of younger generations who are much better informed in general about the ingredients and products they purchase and actively look for brands that align with their values. However, across all age groups now, studies suggest that at least 50% of people buy from brands that act responsibly, even if this means spending more. [2]

Covid-19 has helped accelerate this trend. Indeed, an Accenture survey in April this year revealed that 45% of global consumers say they are making more sustainable choices than they were before the global pandemic, and that they are likely to continue to do so. [3]

As well as looking for sustainable and ethical practices at every stage of the production process, conscious beauty consumers place significant emphasis on claims such as "non-GMO" and "clean" beauty. They also pay attention to the number of ingredients on a label, tending to take 10 or fewer ingredients as an indication of how "clean" a product is. [4]

The trend for cleaner and more conscious beauty care is likely to be a considerable driver for change in the personal care industry. To be fit for the future, companies therefore need to consider the value they can bring to consumers beyond their products in terms of transparency and social and environmental responsibility. This will mean producing smarter and more sustainably.

The case for lab-grown personal care ingredients

Natural ingredients are often associated with sustainability and environmental friendliness in consumers' minds. However, there is a growing realization that this may not necessarily be the case. [5]

Environmental concerns and more awareness about limited natural resources are driving many consumers, especially younger ones, to consider alternatives such as beauty biotechnology. According to Mintel, 41% of consumers aged 16-34 in France and 43% of parents of children under 5 in Germany say they would be willing to buy cosmetic products made exclusively with lab-created ingredients. [6]

Motivated by a desire to find alternative, more sustainable cosmetic solutions, DSM's position is that industrial biotechnology has an important role to play in reducing natural resource consumption and facilitating the transition to an economy less dependent on fossil raw materials. To this end it has capitalized on its biotech capabilities to partner with METEX NØØVISTA (a biochemistry company specializing in developing industrial alternatives to petrochemical processes) to produce a new, sustainable, cosmetic grade of PDO (1.3-Propanediol).

Introducing a sustainable grade of Propanediol

1.3-Propanediol is already an established ingredient, and its versatility and multifunctional nature make it an ideal candidate for simplified ingredient lists; but this newly developed grade is different. Because as well as being 100% bio-sourced from renewable, non-GMO and palm oil free feedstocks (sunflower and rapeseed plant), it is the first cosmetic grade PDO to be sourced in the EU and transformed with a patented fermentation process. It is produced according to an eco-de-

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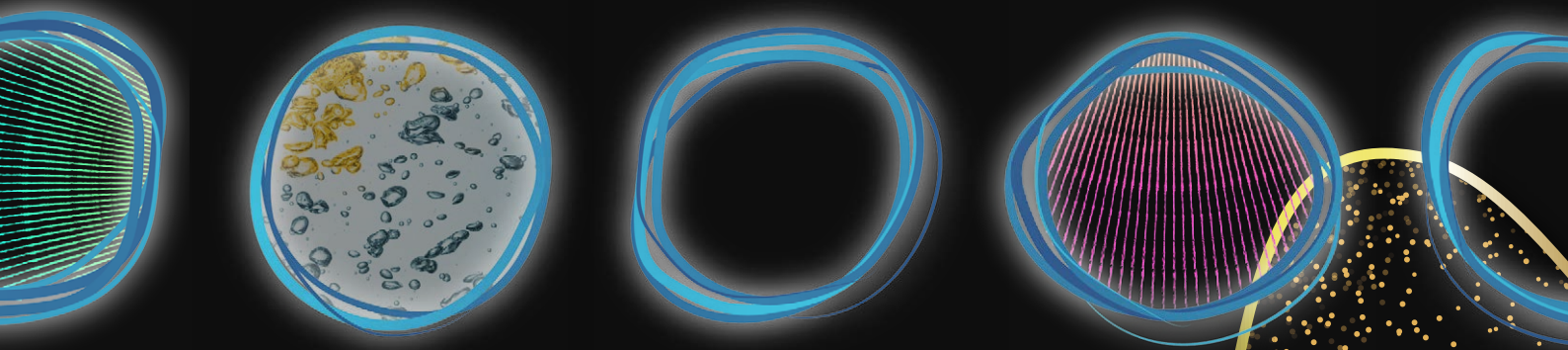

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signed process: 95% of incoming carbon is recovered, water is recycled, and energy and effluents are re-used for methane production and fertilizers respectively. Additionally, its production site has brought redevelopment and employment to a community in economic decline in France. To ensure that this PDO can address the need for sustainably produced and high-performance cosmetic ingredients which are gentle on the skin, it has been tested for microbiome friendliness, preservative boosting and skin moisturization properties, potential as a sensory enhancer and solvent, and has also undergone human skin patch tests.

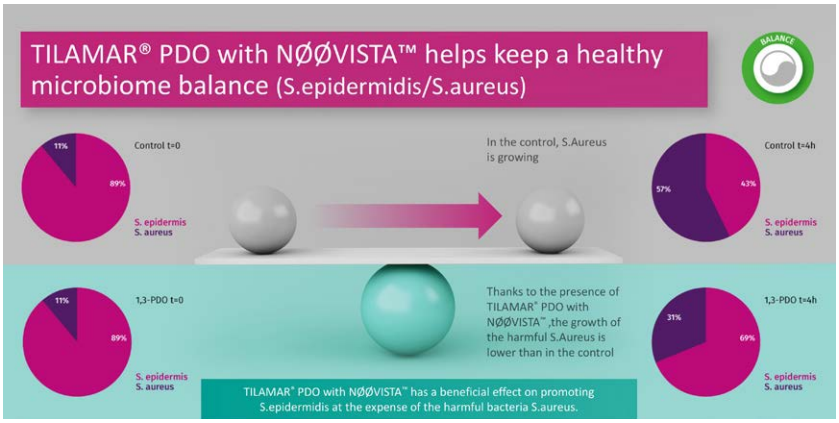

Fig. 1 Comparison of development of *S.aureus* and *S. epidermidis* levels over a 4 hour time period in *in vitro* tests with DSM's PDO and a control (PBS).

Scientific tests demonstrate new PDO's multifunctional performance

I. Impact on the balance of skin microbiota

There is growing recognition that a diverse, vital and balanced skin microbiome can have a fundamental influence on general skin health and specific conditions. The MyMicrobiome Standard [7] sets out a systematic procedure for examining a product's influence on the key organisms typical for a given skin area. This new PDO has been tested and certified as Microbiome Friendly in line with this standard, achieving a positive ranking of 1.2.

In placebo-controlled *in vitro* tests on dry and oily skin areas, at 2%, this PDO was shown to have a minimal impact on the diversity of skin microbiota (notably *M. globosa, M. luteus, S. oralis, S.mitis, P.acnes,* and *C.tuberculastearicum*). It was also found to have a negligible influence on growth of the number of key organisms both when directly applied to bacteria or fungi and when diffused to microbes (to simulate penetration to deep epidermidis layers to reach "non-surface" microbes).

Additionally, the ingredient was shown to respect the balance of the skin microbiome and to have a beneficial effect on promoting *S.epidermidis* which is recognized as an important bacteria in the maintenance of skin health, [8,9] at the expense of *S.aureus* which is known to negatively impact the skin barrier.

This is illustrated by the graph in **Fig. 1** which shows that in a control product, *S. aureus* levels increase from 11% to 57% within 4 hours, whereas with this new PDO, the level only increases from 11% to 31%. This enables S. epidermidis to thrive, maintaining a level of 69% compared to 43% in the control.

II. Preservation efficacy studies

A screening study was used to evaluate the new PDO's potential efficacy in preservative-free solutions and the use levels at which it has an antimicrobial boosting effect. Ethylhexylglycerin was used as a combination partner. Both substances, the new PDO and Ethylhexylglycerin, have been tested stand-alone as well as in combination.

Procedure

For this study, antimicrobial efficacy was assessed with a method analogous to the ISO 11930 challenge test method for an aqueous solution. A solution of 1.3-Propanediol was prepared under sterile conditions. Samples of the solution were placed in 96 deep well plates (1.6 ml/well) which were inoculated with *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans* and *Aspergillus brasiliensis*. Each well was thoroughly mixed to ensure a homogeneous distribution of the microorganism and then incubated at 22°C for 24hours. Remaining microbial populations were counted 24 hours after inoculation.

Results

As the table in **Tab. 1** shows, tested separately, use levels of 2% of the PDO and 0.1% of Ethylhexylglycerin are too low

Trial	2 % T	0.1 % EHG	0.1 % EHG +2 % T
Candida albicans Log step reduction	1.7	4.7	4.8
Escherichia Coli Log step reduction	-0.4	-0.4	5.9
Staphylococcus Aureus Log step reduction	-0.3	1.1	5.6
Pseudomonas Aeruginosa Log step reduction	-0.4	-0.4	5.5
Aspergillus Brasiliensis Log step reduction	1.5	1.7	4.5

EHG: Ethylhexylglycerin T: TILAMAR® PDO with NØØVISTA™

- Total Antimicrobial activity
- Antimicrobial activity ≥ 3 log steps
- Antimcrobial activity ≤ 3 log steps
- Increase of population

Tab. 1 Comparison of the antimicrobial efficacy of 2% DSM's PDO and 0.1% Ethylhexylglycerin, on their own and in combination.

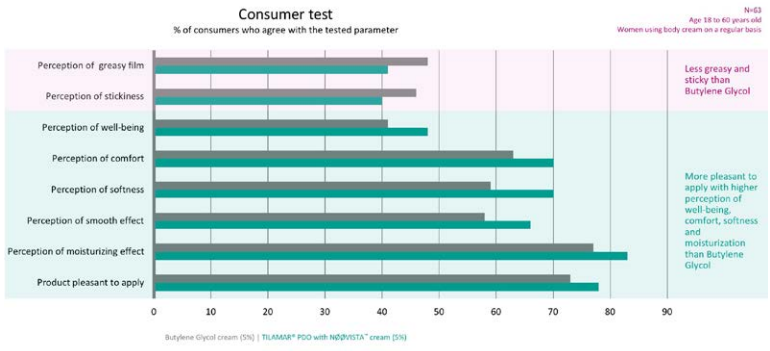

Fig. 2 Comparison of consumers' sensory perceptions of a body cream containing 5% of the new PDO and a body cream containing 5% with Butylene Glycol.

to provide comprehensive preservation. However, a combination of 2% of the PDO with 0.1% Ethylhexylglycerin demonstrated significant antimicrobial efficacy against all tested microbes under the test conditions followed.

III. Sensory enhancement study

The new PDO's sensory enhancement properties were evaluated using a consumer perception test.
The study involved 63 women aged 18-60 who used body cream regularly (at least 1-3 times per week). 51% of subjects had combination skin, 25% had dry skin and 24% had normal skin. Participants tested a body cream with 5% of the new PDO and a body cream with 5% Butylene Glycol. They then reported their perceptions of eight parameters which are detailed in the table in **Fig. 2**. As this table indicates, the cream formulated with the new PDO was perceived by participants to be less greasy and sticky than the cream with Butylene Glycol. It was also perceived to deliver higher levels of comfort, softness, smoothness and moisturization.

IV. Skin moisturization performance test

A corneometry test was used to assess this PDO's ability to enhance a formulation's moisturization performance.

Study design
Three products were tested for this study: A cream with 5% of the new PDO, a cream with 5% Butylene Glycol (a benchmark product) and a placebo cream.
The study subjects were 29 women: 55% aged 46-60 and 45% aged under 45. The distribution of skin types was 31% dry skin, 41% combination skin and 28% normal skin.
A technician performed randomized double-blind applications to three zones on each volunteer's inner forearm. Corneometry measurements for each of the three zones were taken at the baseline and after ten, thirty and sixty minutes.

Findings
As the graph in **Fig. 3** shows, the formulation containing the new PDO showed higher moisturization performance throughout the test period than both the formulation with Butylene Glycol and the placebo. Notably, after 10 minutes the PDO formulation was seen to increase moisturization more than the benchmark formulation and after 60 minutes it still showed increased moisturization compared to the benchmark formulation.

V. Human skin patch test

The protocol followed was slightly different to the protocol for standard irritation testing, which involves the one-time application of a substance for 48 hours under semi-occlusive conditions. The protocol chosen involved 2 consecutive applications on skin, each for 24 hours, resulting in 48 hours of application under occlusive conditions. This protocol was used to test safety with regard to skin irritation under worst case conditions.

Test procedure
A solution of 75% 1.3-Propanediol in 25% water was applied to the forearm of 20 male and female, Caucasian volunteers aged between 24 and 70 years old and with a phototype between I and IV. A control zone was treated with water as a neg-

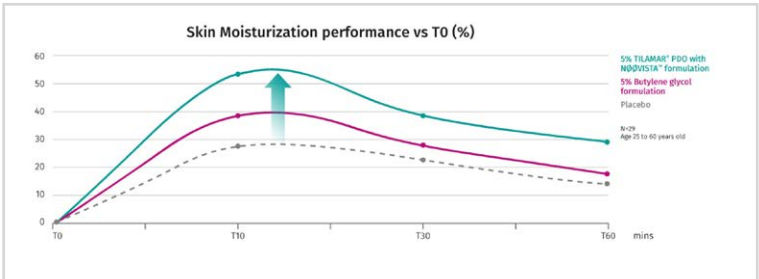

Fig. 3 Comparison of moisturization performance of a formulation containing 5% of DSM's PDO, a formulation with 5% Butylene Glycol and a placebo formulation.

ative control. After application of the test product, the test area was covered with an occlusive patch for 24 hours. The patches were then removed and 30 minutes later, readings were taken for the test areas. After this first set of readings had been taken, the test product was re-applied to the same area of the forearm which was again covered with an occlusive patch for a further 24 hours. A second set of readings was taken 30 minutes after the patches were removed at the end of this second 24-hour period. A third reading was also taken 24 hours after the second set of patches were removed.

Findings

Under these test conditions, the new PDO showed no clinical dermal irritation with an exposure of up to 75%.

In Summary

Biotechnology offers considerable potential for the development and commercialization of high-performance cosmetic products that are sourced and produced sustainably. To this end, DSM has launched TILAMAR® PDO with NØØVISTA™, a new cosmetic grade of 1.3-Propanediol, 100% bio-sourced from non-GMO and palm oil free feedstocks. As well as being the first European-made PDO, the ingredient is produced at a new eco-designed facility that is contributing to local industrial redevelopment and diversification.

TILAMAR® PDO with NØØVISTA™'s microbiome-friendly, preservative boosting, sensory enhancement and hydration properties, and its gentleness on the skin, have been demonstrated in a series of tests.

Because of its proven multifunctional properties, this high-quality, natural ingredient can be used to reduce the complexity of formulations. It is therefore a good option for formulators who are looking to future-proof their operations by adopting sustainable practices that also deliver performance products, thus fulfilling consumers' requirements for effective, cleaner, microbiome-friendly and more sustainable beauty and personal care.

Technical details:

- INCI: Propanediol
- Compatible with all cosmetic ingredients
- Applications: skin sun hair care, make-up, toiletries
- Globally approved in main relevant countries
- Microbiome friendly
- Readily biodegradable according to OECD 3018
- 100% naturality score under ISO 16128

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- **Reduces redness and increases skin elasticity**
- **Rejuvenates the deep layers of the skin**

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Microcrystalline Cellulose for Improved Texture and Sensory Properties of Solid Formulations by the Example of a Foundation

L. Boehm, J. Schulte, J. Brüggen

abstract

The desire for natural and environmentally friendly cosmetics is becoming ever greater. Today's modern consumers prefer products that do not require microplastics and plastic packaging but have the same convincing performance as conventional cosmetics. Solid formulations combine these requirements and are becoming more and more popular. The development of a solid foundation by CFF GmbH & Co. KG shows that there is even more room for natural and sustainable developments in the field of colour cosmetics. The developed formulation manages without microplastics and plastic packaging and is comparable to a liquid foundation. The solid foundation was tested in the subsequent assessments for the parameters pay-off, powderiness, tackiness, mattifying and coverage. The results show that microcrystalline cellulose has a positive effect on the sensory profile and texture of the formulation. Microcrystalline cellulose, which is 100 % of plant origin, and supports manufacturers in creating environmentally friendly and future-oriented products, can certainly replace microplastics.

Introduction

In recent years, our society has become increasingly aware of our environment. In the media as well as in the scientific world, the debate of the topics of microplastics and plastic packaging becomes more present. Consumers are being encouraged to rethink and want sustainable and above all environmentally friendly products. Trends such as "zero-waste" and "back-to-nature" are becoming more and more important and it is up to the producers to implement them successfully.

There is a new challenge for manufacturers of cosmetic products, because in order to meet consumer demands, products with sustainable packaging, natural ingredients and low water content must be developed.

In addition to meeting consumer demands, manufacturers also want to reduce their own carbon footprint, for example by reducing the transport of water in liquid products.

Such requirements certainly inspire new trends everywhere, which, depending on consumer acceptance, will accompany us in the market in the future. To avoid water and to produce shampoo, toothpaste & co in solid form is only one of the latest developments of the cosmetic industry. Thereby solid formulations combine several requirements for sustainability in one product and will therefore become more meaningful for the global cosmetics market in the future.

Cosmetics and care products in solid form can replace numerous conventional products while they are in no way inferior to conventional products in terms of performance. Solid cosmetics also have several advantages. In contrast to conventional products, they are usually more economical and do not require any preservatives. Due to their solid form, solid products are leak-proof and do not break during transport.

In the field of hair care and body care there are already numerous products on the market. Also an integral part of the market are solid shampoos, conditioners as well as solid cleansing products for face and body, while other areas develop more slowly and just a few solid products have been introduced until today. Especially in the field of colour cosmetics a lot of innovations are possible, as the abandonment of the use of microplastics and plastic packaging in decorative cosmetics has not been given much focus so far. Large packaging for small volume cosmetics and microplastics are still used.

Microplastics in the environment

The importance of replacing microplastics is becoming more necessary, because in the last years the problem of the pollution of our environment by microplastics in cosmetic products – has been strongly criticised. Sewage treatment plants retain more than 90 % of the microparticles contained in waste water. Despite these high retention rates, there are still between 86 and 8,851 plastic particles per cubic metre in purified water. As the plastic residues remain in the water and degrade very slowly, it can be assumed that the environmental concentration will continue to rise in the coming years. In order to halt the increase in environmental concentration, measures must be taken to counteract this trend. A first step is to change people's thinking about how to handle plastics and microplastics.

Microplastics enter the environment through different routes. There is a distinction between primary and secondary microplastic particles. In cosmetics, primary microplastic particles play a particularly important role. In cosmetic products, they

end up in the wastewater after the application of personal care products. It is known that almost 100 % of rinse-off cosmetics end up in wastewater. Colour cosmetics are among the leave-on products that end up in the household waste when make-up is removed. However, it can be assumed that a proportion of the leave-on products also end up in the waste water as a result of skin cleansing.
A natural and sustainable alternative to microplastics is SENSOCEL®8, a very fine microcrystalline cellulose which is ideal for refining the skin feel and improving the texture of liquid and solid formulations. It is scientifically proved that SENSOCEL®8 is biodegradable under freshwater conditions and is derived from renewable raw materials.

Development of a permanent foundation

The aim of our development and research was to create a solid foundation that has the same performance as a liquid product. Liquid foundations provide an optical optimisation of the skin by high coverage, mattifying of the the skin and by providing a powdery soft skin feel. At best, a liquid foundation is easy to apply and is neither sticky nor oily.
The aim of formulating a solid foundation was therefore also to achieve high coverage, a light skin feel with excellent mattifying and reduced tackiness. Another important development parameter was the reduced water content and packaging without plastic materials or containers. During application of the solid foundation to the skin, the consumer should not observe any differences in appearance or functionality.
In the following investigations, the developed formulation of the solid foundation was examined for texture, colour intensity and sensory properties.

Influence of microcrystalline cellulose on the solid foundation

After completing the development of the solid foundation, we investigated the influence of the microcrystalline cellulose SENSOCEL®8 on the formulation. Three formulations were produced and compared with each other. The first formulation, the so-called standard, did not contain microcrystalline cellulose. For the second formulation, 3 % SENSOCEL®8 was incorporated on top and for the third formulation, 5 % SENSOCEL®8 was incorporated on top (**Tab. 1**). The three formulations were evaluated sensorially and compared with each other. Afterwards the colour intensity of the three formulations was measured and compared.

Sensory evaluation of the solid foundation

In the first step, the solid formulations were evaluated in regards to their sensory properties and compared with each other.
A panel consisting of 25 persons carried out the evaluation. The following parameters were evaluated: tackiness, mattifying, pay-off, powderiness and coverage.

Ingredient	INCI	Supplier	Quantity [%]		
Phase A	**Temperature 80 °C**				
Solemix®GEL Cushion S-00	Proprietary Blend	Rossow	21.40	21.40	21.40
Coco Caprylate	Coco-Caprylate	Alexmo Cosmetics	14.50	14.50	14.50
Rice Bran Wax 2811	Oryza Sativa Bran Cera	KahlWax	14.50	14.50	14.50
SP-63	Copernicia Cerifera Cera	Strahl & Pitch	7.90	7.90	7.90
Talc, Perfume	Talc (and) Parfume	Johnson & Johnson GmbH	1.00	1.00	1.00
Phase B	**Temperature 80 °C**				
DK-PGT Paste IOY	Polyglyceryl-2 Triisostearate and Iron Oxides (CI 77492)	Daito Kasei	0.95	0.95	0.95
DK-PGT Paste IOR	Polyglyceryl-2 Triisostearate and Iron Oxide (CI 77491)	Daito Kasei	0.34	0.34	0.34
DK-PGT Paste Y6L	Polyglyceryl-2 Triisostearate and Yellow 6 Lake (CI 15985)	Daito Kasei	0.083	0.083	0.083
DK-PGT Paste B1L	Polyglyceryl-2 Triisostearate and Blue 1 Lake (CI 42090)	Daito Kasei	0.037	0.037	0.037
DK-PGT Paste R7	Polyglyceryl-2 Triisostearate and Red 7 (CI 15850)	Daito Kasei	0.02	0.02	0.02
SY-Glyster	Polyglyceryl-6 Polyricinolate	Rossow	7.00	7.00	7.00
Worlée Base AQ 77891/2	Aqua, CI 77891, Ammonium Acrylates Copolymer, Methylpropanediol, Sodium Acrylates Copolymer, Carpryl Glycol, Phenylpropanol, Aluminia, Triethoxycaprylylsilane	Worlèe-Chemie GmbH	8.57	8.57	8.57
Phase C	**Temperature 80 °C**				
Dem. Water	Water		20.00	20.00	20.00
Glycerin (99.8 %)	Glycerin	Alexmo Cosmetics	2.00	2.00	2.00
Lipidure®	Polyquaternium-51 and Water	Rossow	1.00	1.00	1.00
Epsom Salz	Magnesium Sulfate	Ademia Cosmétiques SL	0.70	0.70	0.70
Euxyl® PE 9010	2-Phenoxyethanol / 3-(2-Etthylhexyloxy)propane-1,2-diol	Schülke	q.s.	q.s	q.s
Extra Phase	**Temperature 80 °C**				
SENSOCEL®8	Microcrystalline Cellulose	CFF GmbH & Co.KG	/	3.00	5.00
Total			**100.00**	**103.00**	**105.00**

Tab. 1 Formulation of solid foundations without SENSOCEL®8, with 3 % SENSOCEL®8 and with 5 % SENSOCEL®8.

Fig. 1 shows the results of the sensory evaluation of the three formulations.
Looking at the results, it is clear that the use of microcrystalline cellulose improves the sensory properties. The standard formulation without SENSOCEL®8 shows only a moderate evaluation in terms of tackiness and mattifying. In contrast, the formulation with 3 % SENSOCEL®8 shows an improvement of one point in tackiness. The solid foundation is convincing and receives the highest score for the parameters mattifying, powderiness and coverage.
In the third formulation, the dosage of SENSOCEL®8 was increased to 5 %. The results show that an increased addition of SENSOCEL®8 does not cause any further change in tack, mattifying and powdery feel.
Microcrystalline cellulose has the property of binding water and oil. Therefore, the use of SENSOCEL®8 leads to a significantly firmer emulsion. The reduced pay-off from the formulation with 5 % SENSOCEL®8 is caused by the increased consistence, because pay-off correlates to consistence and texture. The average evaluation of the coverage is also related to the consistence of the emulsion.
The solid foundation with a dosage of 3 % SENSOCEL®8 performed best and was selected as the comparative model in the further course of the investigations.

Influence of microcrystalline cellulose on colour intensity

The next step was to investigate the influence of natural microcrystalline cellulose on the colour intensity of colour cosmetic products. Again, the three formulations (**Tab. 1**) were considered and compared with each other. For the colour measurements, a Minolta Spectrophotometer CM-3500 from FA. Konica Minolta was used. The results (**Tab. 2**) of the measurements show that colour intensification can be detected with increasing amounts of microcrystalline cellulose. With a higher content, the cellulose molecules cross-link more and more and form a network which additionally stabilises the pigments. Besides the luminance value, the red and yellow values were also increased by SENSOCEL®8. The determined colour differences ΔE were between 1.0 and 2.0, which are classified as visible colour differences.

	L*	a*	b*	ΔE
Solid Foundation Standard	60.50	11.63	19.39	
Solid Foundation with 3 % SENSOCEL®8	61.67	11.83	20.06	1.354
Solid Foundation with 5 % SENSOCEL®8	61.94	11.35	19.34	1.458

Tab. 2 Comparison of the results of colour measurement of the solid Foundation Standard, solid Foundation with 3 % SENSOCEL®8 and solid Foundation with 5 % SENSOCEL®8.

The comparison of a natural alternative to microplastic particles

Consumers want natural products without microplastic particles and yet do not want to waive fine textures and a pleasant skin feel. In order to offer consumers a suitable alternative to microplastics, the next step was to evaluate whether SENSOCEL®8 is a suitable alternative to microplastic particles in a solid foundation. In order to compare the performance of microplastic particles with SENSOCEL®8, polyamide (nylon-12) and polymethyl methacrylate (PMMA) were incorporated into the standard formulation from **Tab. 1**. For an optimal comparison, a dosage of 3 % was chosen.
In the course of the investigations, the three solid foundations, each containing 3 % SENSOCEL®8, nylon-12 and polymethyl methacrylate (PMMA), were compared with each other in terms of sensory properties, pay-off and texture.

Measurement of pay-off

The measurement of pay-off was carried out for the three solid formulations. **Fig. 2** shows the average value of the

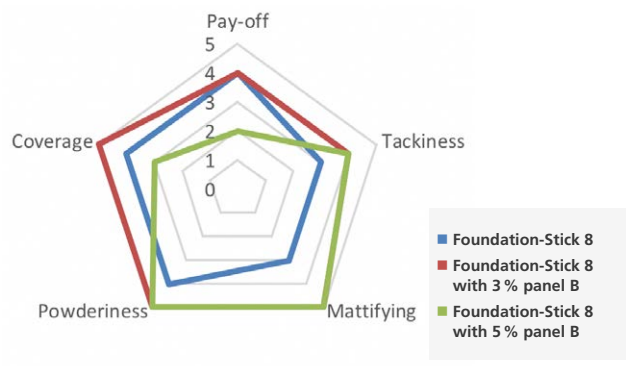

Fig. 1 Sensory comparison of three solid foundations with standard, 3 % SENSOCEL®8 and 5 % SENSOCEL®8.

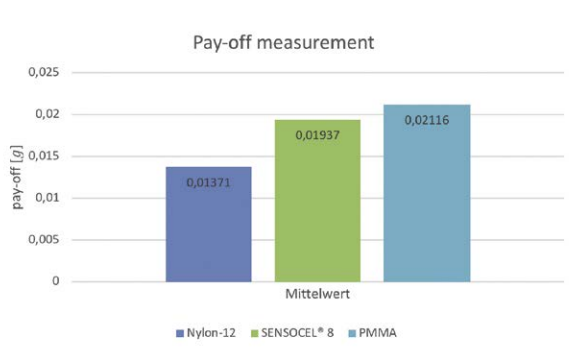

Fig. 2 Results of pay-off measurement of the solid foundation with Nylon-12, SENSOCEL®8 and PMMA.

measured pay-off of the three fixed formulations. The results show that the solid foundation with nylon-12 presented the lowest pay-off l compared to the foundations with SENSOCEL®8 and PMMA with 0.01371 g. With 0.01937 g, the formulation with SENSOCEL®8 showed an increase of almost 41 % compared to Nylon-12, while the formulation with PMMA showed the highest pay-off per application with an average of 0.02116 g.
The low pay-off of the nylon-12 formulation is caused by the viscosity regulating properties of the nylon, which resulted in a firm emulsion. Microcrystalline cellulose is also able to build up a 3D network, which, considering the binding capacity, has a viscosity regulating effect. In contrast, PMMA does not have a viscosity regulating effect. Therefore, the formulation with PMMA is apprehended as soft. As the pay-off is correlated to the consistence, the value of the pay-off of the formulation with PMMA is correspondingly the highest. However, the results show that SENSOCEL®8, despite a firmer base, showed only 9 % less pay-off than PMMA. SENSOCEL®8 therefore shows a comparable pay-off rate to the plastics and qualifies as a very good alternative to microplastics.

Results of the Sensory Assessment

The aim of the sensory assessment is to determine whether there is a difference between the solid foundations with plastics and the solid foundations with microcrystalline cellulose. An untrained panel tested the consumer perception. The aim of the sensory assessment was to find no or just minimum differences between the solid foundations with microplastics and SENSOCEL®8. From the result it can be concluded whether the replacement of the plastics is perceived by the consumers and whether SENSOCEL®8 proves to be a suitable alternative to microplastics.

For the sensory assessment, the three formulations, each containing Nylon-12, PMMA or SENSOCEL®8 on top, were compared. Since the dosage of 3 % SENSOCEL®8 had been proven to be a suitable alternative, the dosage of 3 % nylon-12 and 3 % PMMA was also set for the sensory assessment.
In order not to influence the panellists, the foundations were blind labelled as sample A (Nylon-12), sample B (SENSOCEL®8) and sample C (PMMA).
The results of the Sensory Assessment are shown in **Fig. 3**. The used particles, Nylon-12, PMMA and SENSOCEL®8, differ in structure and properties. All three ingredients have different surface properties, as well as different water binding capacities and oil absorption.
Nylon-12 has a water-binding capacity of 1.90 g water/g. This is higher than the water binding capacity of PMMA (1.40 g water/g). However, both particles have a similar capacity to absorb oil . Due to the increased water binding capacity, the texture of the solid foundation with 3 % nylon-12 is firmer than the formulation with 3 % PMMA.

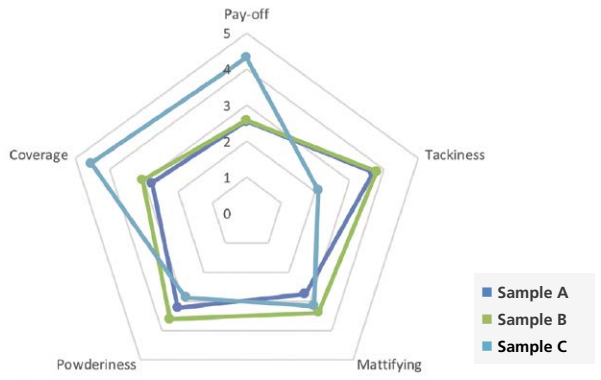

Fig. 3 Sensory comparison of three solid foundations with sample A (nylon), sample B (SENSOCEL®8) and sample C (PMMA).

The consistence of the formulation has an influence on the pay-off and the associated coverage of the solid foundation.
The low oil absorption of both plastic ingredients is caused by their low lipophilicity. Furthermore, the absorption is related to the body as a whole, as nylon and PMMA both consist of whole bodies. The surface texture of both plastics is almost or perfectly round, which leads to a pleasant skin feel. This is one of the reasons why plastics are often used in colour cosmetic products.
Whereas Microcrystalline cellulose is a fibre with cavities, so-called capillaries. These cavities lead to a high water binding capacity that, at 4.05 g water/g, is more than twice as high as nylon. Due to its high binding capacity, SENSOCEL®8 helps to optimize the properties of a solid emulsion. It should be noted that the solid foundation with SENSOCEL®8, despite its high consistence, achieved a higher value in regards to the pay-off than nylon-12, also due to the high absorption, as the fibres are surrounded by the emulsion not only from the outside but also from the inside. With each application of the firm foundation to the skin, fibres are removed into the smallest skin wrinkles, resulting in a pleasant skin feel and a soft focus effect.
In summary, the results of the sensory assessment show that SENSOCEL®8 has a very similar performance to Nylon-12 and PMMA in a solid foundation.
In addition to the question of a difference between the three foundations, the evaluation sheet also asked for the preferred pattern. 5 panellists chose Stick A and 6 preferred Stick C, while 14 panellists chose Stick B. The question of preference showed that the formulation with SENSOCEL®8 was significantly more popular than the formulations with microplastic particles.

Conclusion

The results of the conducted tests show that the application of SENSOCEL®8 in solid colour cosmetic products is comparable to the plastics used so far. SENSOCEL®8 fulfils similar positive aspects of plastics used so far for cosmetic formulations. This includes the viscosity regulating effects, improvement of the skin feel, mattifying and coverage. With SENSOCEL®8, a 100 % plant-based option, is created to replace microplastics in colour cosmetic products in the future, and to support the further reduction of the amount of microplastics remaining in the environment.
The presented results were obtained using a solid foundation. The results prove that SENSOCEL®8 has positive properties in solid cosmetics and improves the formulation in terms of sensory properties and texture. Solid formulations will continue to play an important role in the future and will increasingly influence the global cosmetics market, as solid cosmetic and hygiene products reflect the spirit of the time in which they stand for less plastic and less packaging waste.

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An Active Ingredient Derived from *Picrorhiza scrophulariiflora* Roots for Prevention and Limitation of Hair Greying: What's about Self-esteem and Mood?

R. Boutin, J.B. Guyon, C.Boutot, E. Ranouille, L. Poulet, J.Y. Berthon, E. Filaire

abstract

Hair greying is one of the phenotypic changes during ageing, cosmetic research focusing on preventing or limiting this process. The aim of this investigation was to evaluate 1) using an *in vitro* model, the effect of *Picrorhiza scrophulariiflora* roots (*PsR*) extract versus placebo on oxidative stress and melanogenesis pathway 2) using a clinical study, the efficacy of *PsR* extract to restore white/greyed hair to its natural color. Two parallel groups of 44 volunteers (29 females and 15 men) with 20% to 50% of white hair (Mean age: 49 years) either applied *PsR* extract 1% or placebo on hair and scalp twice a day during 154 days. Evaluation of *PsR* extract efficacy was analyzed after 77 days and 154 days by 1) a measure of the density (number·cm^{-2}) of white hair 2) a self-assessment questionnaire. Self-esteem and emotion were investigated using the Rosenberg Self-Esteem Scale and the Brief Mood Introspection Scale. *In vitro* results showed that *PsR* extract increases significantly melanin synthesis, enhances the expression of antioxidant genes and reduces oxidative stress. *PsR* extract treatment restores the natural hair color (measuring by grey hair density), increases significantly self-esteem and modulates emotional valence, by significantly decreasing unpleasant emotions.

Introduction

The appearance of hair plays an important role in people's overall physical appearance and self-perception. With today's increasing life expectation, the desire to look youthful plays a bigger role than ever [1]. The discovery of pharmacological targets and the development of safe and effective drugs indicate strategies of the drug industry for maintenance of healthy and beautiful hair, specifically when hair age. Hair aging comprises weathering of the hair shaft and aging of the hair follicle. The latter manifests as greying and androgenetic and senescent alopecia. Hair greying (or canitie) is understood as a progressive loss of pigment from the growing hair shaft. According to the 50-50-50 rule about 50% of the population experiences about 50% of grey hair at the age of 50 years [2]. Several hypotheses have been put forward to explain the biological process of hair follicle pigmentation and its senescence. The decrease of hair pigmentation is always associated to a decrease in functional melanocytes number and melanocytes activity in the hair follicle matrix [3].

Besides, in grey hair follicles, melanocytes are frequently highly vacuolated which is a common mark of increased cellular oxidative stress and associated with cellular loss of function [4]. This oxidative stress is generated by endogenous and environmental processes, including UV exposure, inflammation and even emotional stress. Reactive Oxygen Species (ROS) damage biomolecules and induce mutations in mitochondrial and nuclear DNA. In melanocytes, in addition to chronological aging and (to a lesser extent) UV-induced damage, ROS are also generated during melanogenesis, increasing the level of oxidative stress. Catalase is the key enzyme responsible for hydrogen peroxide degradation in melanocytes. *In vitro*, the levels of catalase expression and activity correlate with the total cellular melanin content, and *ex vivo* they correlate with skin color. *Kauser et al.* [5] showed that whereas superoxide dismustase (SOD) expression levels did not markedly change with age in both matched cell populations, the expression and activity levels of catalase were reduced to higher degrees in older follicular melanocytes vs. epidermal melanocytes. *Schallreuter et al.* [6] also provided detailed documentation on the deregulation of the innate antioxidant system of grey hair bulbar melanocytes and the subsequent accumulation of hydrogen peroxide at millimolar concentrations in the grey and white hair shafts . Interestingly, a significant reduction in catalase expression, in the expression of methionine sulfoxide reductases and in the functional repair activity was demonstrated throughout the entire hair follicles, not only in the melanocytes. The ROS-induced greying concept therefore was expanded by these studies to include an oxidative insult to the whole affected follicle, not only to its bulbar melanocytes. The repigmenting potential of grey hair, combined with the vitiligo-pseudocatalase experience of repigmenting eyelashes and the new findings of catalase depletion in grey hair follicles, led to the development of numerous 'anti-greying' strategies and products. The dietary consumption of catalase-rich foods such as spinach and avocado were also suggested as a natural solution for reducing hair greying, and catalase-based nutritional supplements, containing both pure catalase and tyrosine, or comprising plant extracts that claim to boost catalase activity, are now commercially available.

Despite a constant advance in understanding the mechanisms underlying the development of canities, the increased awareness and demand for treatment, solutions remain limited. Nevertheless, as hair color is socially important, numerous strategies have been developed to hide, prevent or reverse hair greying. Natural ingredients such as coconut oil, curry leaves, amaranth and gooseberry, as well as amino acids and nutrients are used in certain traditions and societies with claimed effectiveness. Nutritional supplements including various vitamins or minerals such as biotin calcium panthenate, zinc, copper and selenium are also prescribed, but their efficacy remains questionable [7]. More recently, melanocyte grafting used in repigmentation of vitiligo areas has been suggested to repigment senescence grey hair [8]. Efficient molecules used for treating vitiligo could be also transposed to limit underlying mechanisms of human canities. Indeed, hair greying could be paralleled to vitiligo, a disease of depigmented skin lesions [9]. Since ancient time, herbal products of different nature and effects had been used for the treatment of vitiligo. Ayurvedic medicine had also tried to treat vitiligo with herbal products, such as the genus *Picrorhiza* [10]. Several iridoid glucosides have been isolated from *Picrorhiza* species (such as *Picrorhiza scrophulariiflora* roots – *PsR*), we can particularly cite Picroside II, which has an anti-apoptotic effect following different cellular injuries by increasing the anti-apoptotic BCL-2 protein. This anti-apoptotic activity has been associated with a wide range of pharmacological effects, including neuroprotective, hepatoprotective, anti-apoptosis, anti-inflammatory effects [11]. Antioxidant properties have also been described [12].

The aim of this investigation was to evaluate 1) using an *in vitro* model, the effect of *Picrorhiza scrophulariiflora* roots (*PsR*) extract (trade name: Arcolys®) versus control on oxidative stress and melanogenesis pathway 2) using a clinical study, the efficacy of *PsR* extract to restore white/greyed hair to its natural color.

Material and Methods

Preparation of Extract

The dried roots of *Picrorhiza scrophulariiflora* were collected in the Sichuan Province of China, where they were cultivated at an altitude ranging from 2600 to 3200 m. They were harvested in September, after 3 to 4 years of development. Dried cut roots of *P. scrophulariiflora* were extracted by 50% alcohol at room temperature over 12 hours. After 10 µm clarification, the extracted solution was concentrated, under vacuum at 55°C, up to 5% of dry matter in propan-1,3-diol/water 50/50. The decontamination was realized by filtration under 2 µm. *PsR* extract contains a minimum of 4.0% per dry matter of picroside II.

In vitro Test

In order to highlight biological activities of *PsR* extract, we used several cellular models (human primary dermal cells from melanocytes, dermal papilla cells and keratinocytes).
Firstly, the potential of *PsR* extract to limit accumulation of ROS in human follicle dermal papilla cells (HDPC) was evaluated. For that, HDPC were exposed to H_2O_2-induced oxidative stress (250µM H_2O_2 during 30 minutes) and the ability of *PsR* extract (tested at 0.1 and 0.2% by 24h pretreatment before oxidative stress) to counteract the production of reactive oxygen species (ROS) was tested. The intracellular ROS reacted with the fluorogenic probe, resulting in a fluorometric product. The fluorescence emission intensity was measured (λex = 485nm / λem = 538nm) using an EnVision® microplate reader (PerkinElmer). ROS production was expressed in fluorescence units. Relative quantification was calculated and compared to the control with H_2O_2-induced oxidative stress (100%).
Secondly, we focused on the antioxidative activity of *PsR* extract. For that, we studied the effect of *PsR* extract on the expression of actors involved in antioxidative cellular response in melanocyte cells: Nuclear factor erythroid 2-like 2 (NRF2 or NFE2L2), Heme oxygenase 1 (HMOX-1) and the cystine/glutamate antiporter solute carrier family 7 member 11 (SLC7A11). The up-regulation of these markers has been involved in response to cellular oxidative stress. In this experiment, the effect of *PsR* extract on gene expression of these antioxidant actors was investigated under basal conditions and under H_2O_2-induced oxidative stress. Gene expression analysis was performed by RT-qPCR on RNA samples from melanocytes culture. Variations of mRNA expression are expressed as percentage of control under basal condition. Each experimental condition was performed in triplicates that were pooled before the RNA extraction. Therefore, results represent the mean expression of 3 samples per condition.
Thirdly, the effect on *PsR* extract on tyrosinase activity was evaluated. The enzymatic activity of the various cell extracts was evaluated by measuring the optical density (OD) at 540 nm (Versamax microplate reader, Molecular Devices) and using a standard range of tyrosinase fungus (0.39 to 400 $U \cdot mL^{-1}$).
Finally, melanin production was evaluated in a coculture model of normal human epidermal melanocytes (NHEM) and normal human epidermal keratinocytes (NHEK) under basal and oxidative stress conditions and the stimulating effect of *PsR* extract was evaluated.

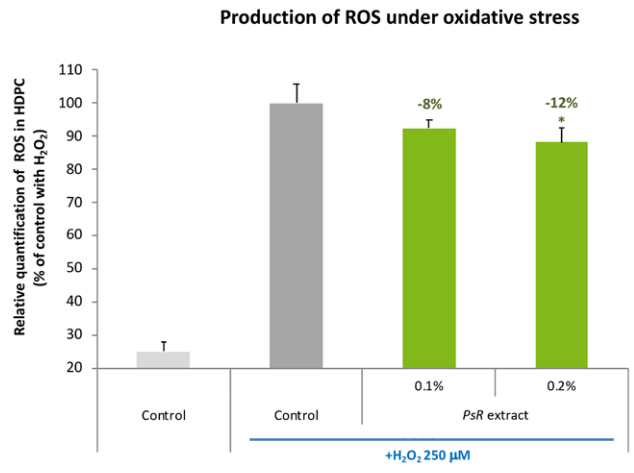

Fig. 1 ROS production in follicle dermal papilla cells after 24-hour treatments with *PsR* extract under oxidative stress conditions (H_2O_2 stress) at different concentrations.
Means ± SD are presented. *p<0.05.

In vivo Clinical Study

Two parallel groups of 44 volunteers (29 females and 15 men) with 20% to 50% of white hair (Mean age: 49 years) either applied *PsR* extract 1% or placebo on hair and scalp twice a day during 154 days (5 months). Evaluation of *PsR* extract efficacy was analyzed after 77 days (2.5 months) and 154 days (5 months) by 1) a measure of the density (number·cm^{-2}) of white hair 2) a self-assessment questionnaire. Before and at the end of the study a psychobiological evaluation of volunteers was performed. For that, individual self-esteem was investigated using the Rosenberg Self-Esteem Scale (RSES) [13]. Mood was evaluated by the Brief Mood Introspection Scale (BMIS) [14]. For this investigation, we only focused on the pleasant-unpleasant mood.

Results

In vitro Results

PsR Extract Limits the ROS Production in Dermal Papilla Cells

H_2O_2 treatment of dermal papilla cells induced an increase in ROS production (**Fig. 1**). A pre-treatment of 24 hours with *PsR* extract at 0.2% before oxidative stress conducted to a significant lower production of ROS compared to the H_2O_2 control ($p<0.05$).

PsR Extract Enhances the Expression of Antioxidant Genes in Melanocytes

Under basal conditions, 48 hours of *PsR* extract treatment at 0.1% and 0.2% applied to melanocyte cells increased *NRF2*

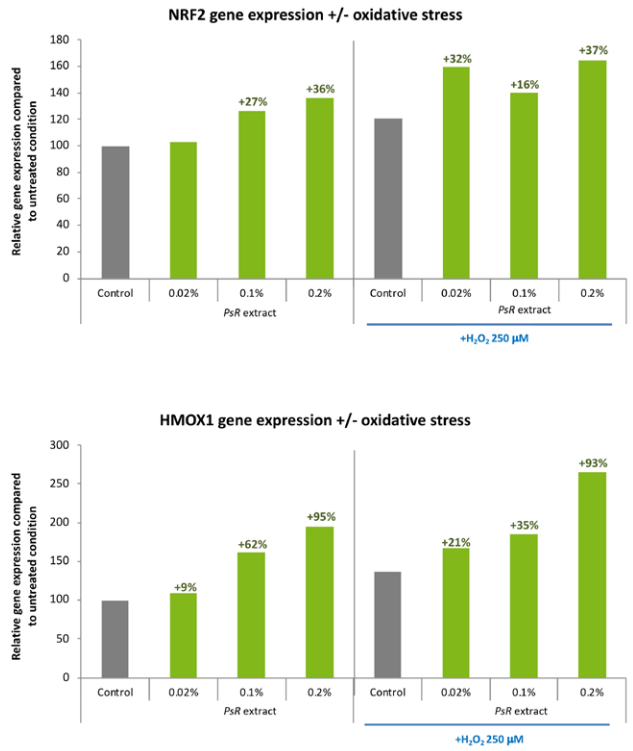

Fig. 2 **a)** NRF2 and **b)** HMOX-1 gene expression in melanocytes after 48-hour treatments with *PsR* extract under basal and oxidative stress conditions (H_2O_2 stress) at different concentrations.

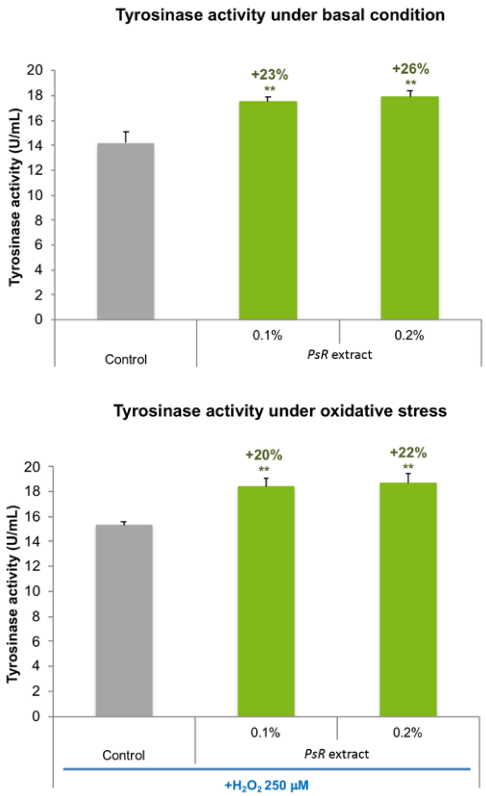

Fig. 3 Tyrosinase activity in melanocytes under basal condition after 72-hour treatments with *PsR* extract at different concentrations. Means ± SD are presented. **p<0.01

gene expression (+27% and +36%, respectively) compared to the non-treated control (**Fig. 2a**). An increase of *HMOX-1* gene expression was also noted (**Fig. 2b**). Under oxidative stress, *NRF2* expression was increased by 32%, 16% and 37% respectively at 0.02%, 0.1% and 0.2% of *PsR* extract compared to the H_2O_2 control. Increase by 21%, 35% and 93% at 0.02%, 0.1% and 0.2% of *PsR* extract, respectively were also noted for *HMOX-1* gene expression.

Finally, under basal and oxidative conditions, 48 hours of *PsR* extract treatment increased *SLC7A11* gene expression compared to the non-treated control.

PsR Extract Stimulates the Gene Expression and Activity of Tyrosinase and Enhances Melanogenesis

Under basal conditions, 48 hours of *PsR* extract treatment at 0.1% and 0.2% applied to melanocyte cells increased tyrosinase (*TYR*) gene expression (+67% and +87%, respectively) compared to the control. Under oxidative stress, an increase of *TYR* gene expression of +11%, +33% and +52% at 0.02%, 0.1% and 0.2% of *PsR* extract, respectively was also noted compared to the H_2O_2 control.

As shown in **Fig. 3**, even after a H_2O_2-induced oxidative stress, pre-treatment of melanocytes during 72 hours with *PsR* extract at 0.1% and 0.2% significantly increased tyrosinase activity as compared to the control ($p<0.01$).

Finally, under basal condition and oxidative stress, *PsR* extract enhances melanogenesis and increases melanin production, inducing pigmentation (**Fig. 4**).

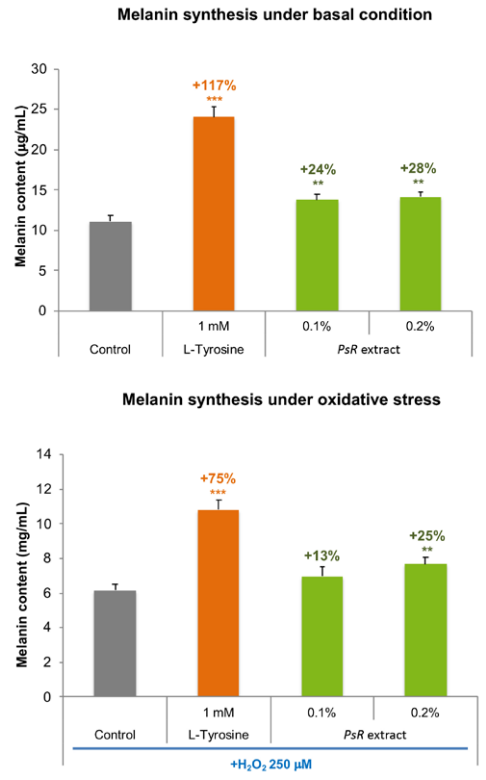

Fig. 4 Melanin content in melanocyte and keratinocyte cocultures after 10-day treatments with *PsR* extract at different concentrations and with repeated H_2O_2-induced oxidative stress. Means ± SD are presented. **p<0.01, ***p<0.001

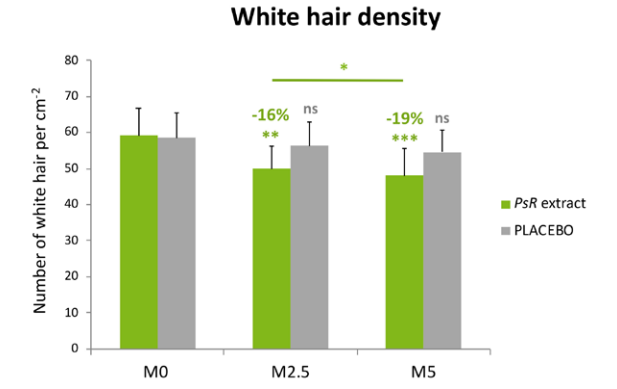

Fig. 5 Evolution of number of white hair per cm^{-2} during the experimentation (Mean ± SD). **p<0.01, ***p<0.001
ns: not significant vs M0, #p<0.05 vs M2.5.

Fig. 6 Visible effects of *PsR* extract.

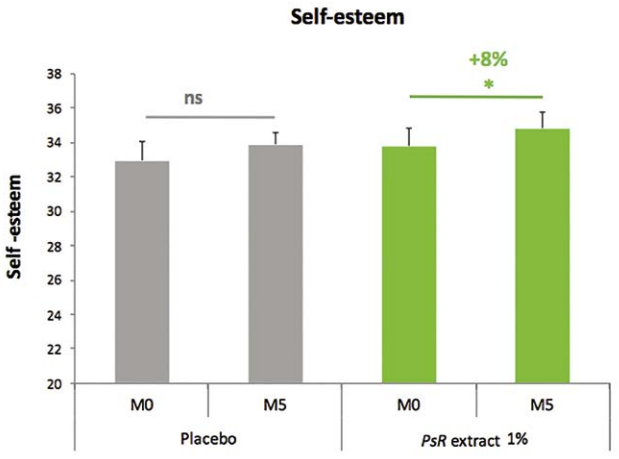

Fig. 7 Evolution of the Self-esteem score during the experimentation (Mean ± SD): *p<0.05 ns: not significant vs M0.

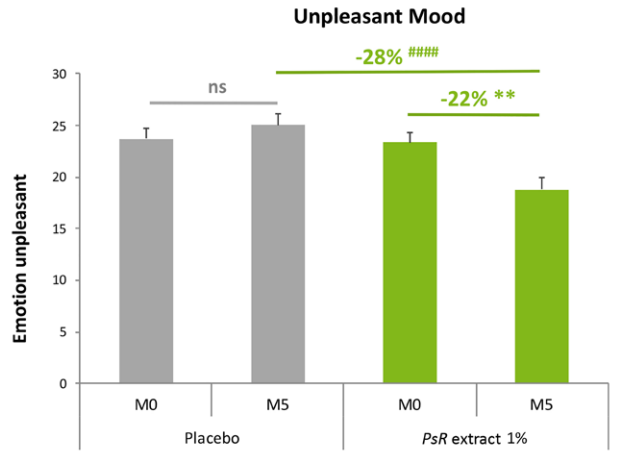

Fig. 8 Evolution of the Unpleasant mood score during the experimentation (Mean ± SD). **p <0.01, ns: not significant vs M0, ####p<0.0001 vs placebo

In vivo results

PsR Extract Restores the Natural Hair Color

At baseline, no difference in the proportion of white hair was observed between groups (**Fig. 5**). *PsR* extract induces a significant decrease in the white hair density through the experimentation.

The efficacy of *PsR* extract is illustrated in these photos (**Fig. 6**). Moreover, 80% of the women reported a good effect of the *PsR* extract on their hair repigmentation.

Psychological Measures

Self-esteem was evaluated at M0 and M5 using the Rosenberg scale. An improvement of self-esteem can be observed at M5, as shown in **Fig. 7**.

Emotional valence is a dimension continuum of pleasant and unpleasant emotions, which can be measured using the Brief Mood Introspection Scale [14]. **Fig. 8** shows the efficacy of *PsR* extract on this parameter, a decrease in unpleasant emotion being noted during the hair treatment.

Discussion

Greying of hair or canitie is an inevitable phenomenon that occurs commonly with age. Theories for the gradual loss of pigmentation include exhaustion of enzymes involved in melanogenesis, impaired DNA repair, loss of telomerase, antioxidant mechanisms, and antiapoptotic signals. By analogy with the free radical theory of ageing, a 'free radical theory of greying' has also been proposed [15]. Besides, having healthy hair is a sign of health, youth and vitality. As hair greying is perceived as a sign of progressing old age, hair greying can affect self-esteem and confidence [7], thus can induce alteration of positive emotion.

Considering the major role of oxidative stress in the occurrence of grey hair, we developed an active ingredient from *Picrorhiza scrophulariiflora* roots (*PsR* extract), titrated in Picroside II, used in Ayurvedic medicine for the treatment of vitiligo.

Our *in vitro* and *in vivo* investigations revealed a great number of biological activities of this *PsR* extract, which contribute to the process of hair pigmentation. Indeed, the results of *in vitro* studies showed its capacity to increase significantly melanin synthesis in a co-culture model of normal human epidermal melanocytes (NHEM) and normal human epidermal keratinocytes (NHEK) under basal and oxidative stress condi-

tions. The physiological hair greying that occurs with ageing is also known to result, in part, from accumulation of oxidative damage generated during normal metabolism [16]. It damages cellular structures via the formation of ROS such as H_2O_2 and superoxide. Moreover, endogenous oxidative stress is high in hair follicles and it is important to note that melanogenesis produces itself a lot of ROS via the hydroxylation of tyrosine and the oxidation of DOPA to melanin. Growing number of data provided the clear evidence of primordial role of antioxidant deficiencies and consequent hydrogen peroxide accumulation in the phenomenon of hair greying. Our data show that *PsR* extract had enhanced the expression of antioxidant genes in melanocytes, consolidating its potential to reduce the incidence and the severity of hair greying.

The relationship between hair and self-image is universal, transcending race, culture and socioeconomic standing. Emotional stress and anxiety have been noted in line with the occurrence of hair greying [17]. Moreover, it has been shown that anxiety and depression may play roles in the etiopathogenesis of hair greying by increasing exogenous oxidative stress. To decrease the high emotional stress and anxiety may be useful for prevention and treatment of hair greying [17]. Our clinical study shows that *PsR* extract treatment restores the natural hair color (measuring by grey hair density), increases significantly self-esteem and modulate emotional valence, by significantly decreasing unpleasant emotions, using the Brief Mood Introspection Scale [14].

Conclusion

Hair greying is one of the phenotypic changes during ageing, cosmetic research focusing on preventing or limiting this process. Our data show that the natural active ingredient we propose, titrated in picroside II, has high potential cosmetic applications, biological efficacy and clinical study results supporting this claim. is an active ingredient and constitutes a new natural solution for hair greying. By acting on hair pigmentation, the hair regains health and beauty. Self-esteem and positive emotions are found again.

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Fig. 1 wild *Centella Asiatica*

Sustainable Innovation Starts with Smart Sourcing

B. Barlog

Eco-design is a practice that has become unavoidable in all industrial fields: automotive, packaging, textile, … Examples of new eco-designed products are not lacking. Eco-design consists of integrating the preservation of the environment at all stages of a product's life cycle, from the sourcing of raw materials to the end of life, through the manufacturing and distribution processes. The cosmetic industry is no exception and innovates in this field. The sourcing of ingredients occupies a central place in the eco-design approach and the use of natural and renewable ingredients has become essential. It is also a key argument in brand communication as consumers often associate naturality with safety. This craze for plant-based raw materials nevertheless has its limits since it increases the pressure on natural resources: the preservation of biodiversity has thus become a major concern for ingredient manufacturers.

Eco-design in cosmetics also involves saving drinking water. According to a recent report by the World Resources Institute, 33 cities worldwide, with a total population of over 250 million, are currently experiencing severe water stress. By 2030, this population is expected to exceed 470 million [1]. Overconsumption of drinking water for industrial purposes is no longer acceptable.

Seppic has taken the measure of these stakes and has worked on different axes as socially and environmentally respectful plant sourcing, "upcycling" and biotechnologies during its latest product developments to offer new ingredients sourced sustainably, responding to current environmental issues, and answering cosmetic market expectations [2].

A Commitment to Sustainable Wild Botanicals Collection

Serdex, a subsidiary of Seppic, manufactures highly purified active ingredients extracted from *Centella Asiatica* (**Fig. 1**) and other Malagasy plants. Being respectful to traditional know-how and developing local suppliers in areas from where the plants originate, is at the heart of sustainable development of Serdex.

For the sustainable sourcing of wild *Centella Asiatica* plants, 3 key pillars are considered: First, to ensure traceability and quality. Through an unique sourcing organization in cooperation with two local suppliers based on a long-term relationship, the traceability is guaranteed. The plant quality is specified by technical parameters and is determined by defined operating procedures. The creation of a local quality control lab supports the know-how transfer to implement quality assurance measurements. The number of local employees is increasing and helps to develop the local economic situation.

The second pillar is the protection of local resources: The exact volume of plants is ordered annually prior to the collection season. This ensures that only the right quantities are collected. All harvesters have training programs to follow good collecting practices, which are permanently adapted to the context. Around 3000 harvesters and their families benefit from the supply chain.

The third and last pillar is the commitment to sustainable development like projects for education and the improvement of standard of living. The schooling rate in these areas has increased significantly thanks to the building of 100 classrooms since 2003.

As a member of Union for Ethical BioTrade (UEBT), Serdex is committed in the continuous improvement of its organization and management of botanicals supply in order to respect the biodiversity, sociological and ecological issues in connection with wild botanicals collection.

During the last membership audit in 2017, 95% of UEBT membership obligations were met, reflecting one of *Centella Asiatica's* most complete and developed supply chains in Madagascar.

„Upcycling", or How to Valorize Waste from Other Industries

Another part of the solution may lie in a better use of resources already exploited by other industries and the recycling of their manufacturing waste.

Babassu is a Brazilian nut whose oil is used locally in the food industry and in fuels. Seppic uses part of its shell (the mesocarp), usually considered as waste, to create a natural texturizing powder (INCI: Amylopectin). Designed for skincare and make-up applications, this powder leaves a soft finish on the skin and absorbs oil excess. The babassu hull supply chain is validated by Origens Brasil, an organization that ensures equitable sharing of economic resources among local communities in the supply chain.

Seaweed cell waters help to limit the impact of freshwater use in cosmetic formulations. They are collected during the drying process of algae, which are mainly exploited for their dry extract by the agro-food industry in Brittany. These cellular waters can be used in cosmetic formulas: the production

Fig. 2 Seaweed cell waters help to limit the impact of freshwater use

Fig. 3 Epiphytic macroalgae in laboratory

of 1 liter of cellular water involves 26 times less drinking water than the production of 1 liter of osmosis water generally used.

Biotechnology to Reveal Rare Natural Resources without Exploitation

Our patented plant cell culture biotechnology avoids plant harvest since it relies on a laboratory cell culture from seeds. Especially, it allows the production of plant cells of protected species on the coast. Thus, *Eryngium maritimum*, a protected species in several regions including Brittany, can be valued in a laboratory process. Plant cell culture technology makes this sourcing available on the cosmetic market.

Another biotechnology is the first world wide technology to cultivate macroalgae cells in the laboratory to offer cosmetic active ingredients. It enables the valuation of rare microscopic species that are barely available in the ocean, such as *Acrochaetium Moniliforme*, an epiphytic macroalgae (INCI: Aqua (and) Butylene Glycol (and) Hydrolyzed Rhodophyceae Extract), whose species was identified by the National Museum of Natural History before being cultivated by Seppic and its in actives specialized wesource teams.

This biotechnology also allows the promotion of ephemeral and unstable life forms: Sporophyte is the common macroalgae form. Gametophytes are cells liberated by the sporophytes in the reproduction life cycle, as an ephemeral stage. Gametophytes are the Source of Life for the survival of the species. In the ocean, gametophytes are unstable and not available in large quantities. In photobioreactors, gametophytes are stable thanks to specific conditions.

One example is the gametophyte extract from the *Undaria Pinnatifida* seaweed (INCI: Caprylic/Capric Triglyceride – *Undaria Pinnatifida* Extract) taken from macroalgae cells grown in a laboratory and harvested at an ephemeral stage in the life cycle of *Undaria Pinnatifida* seaweed. The smart sourcing due to sustainable biotechnology is not the only advantage, but it also shows a positive effect on the efficacy. In different tests the gametophyte extract had better results than a common sporophyte seaweed extract of *Undaria Pinnatifida*.

Seppic is committed to sustainable cosmetics by placing human health and environment preservation at the heart of its innovation. The search for original sourcings, limiting planetary resources exploitation, is part of the eco-design approach undertaken by the group [2].

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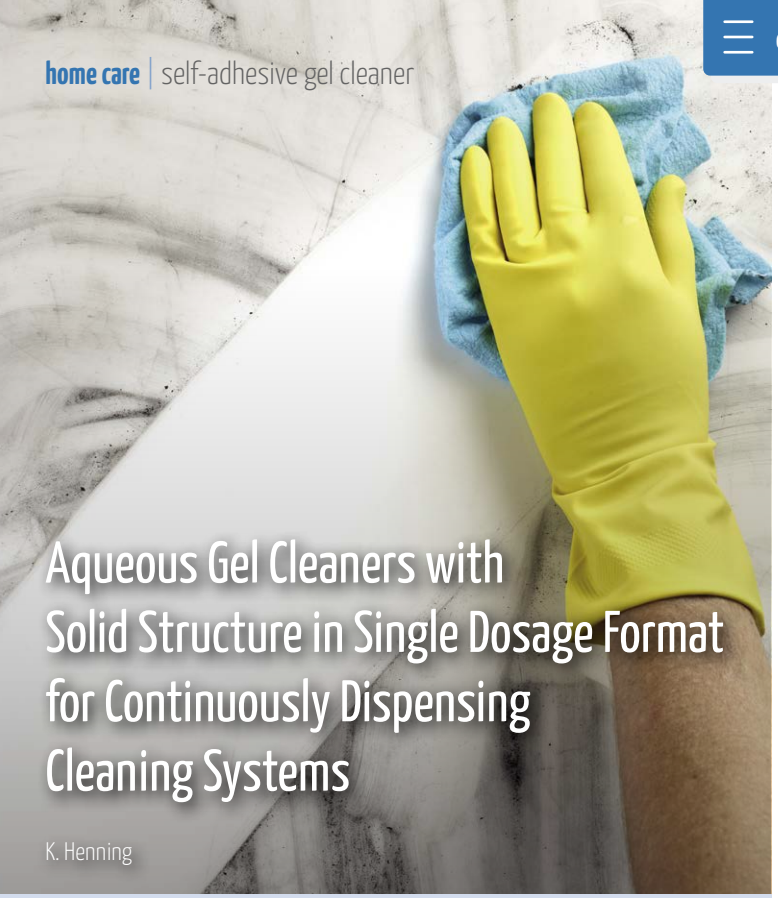

Aqueous Gel Cleaners with Solid Structure in Single Dosage Format for Continuously Dispensing Cleaning Systems

K. Henning

Solid aqueous gel cleaners which are self-adhesive when applied to a hard surface, comprising an alcohol ethoxylate containing 20 ethoxy units, a polymeric alkylene oxide block copolymer, a co-curing agent such as mineral oil and at least 25% by weight of water. They can be produced in suitable single-dose formats for cleaning hard surfaces, such as the inside surface of a toilet bowl, for easy handling by the consumer.

Aqueous gels for the household and I&I sector

Gel-based cleaners are useful for many household and I&I applications. In most cases they have a soft and easy free-flowing rheological property, so they are generally dispensed from containers or fixtures without direct handling by the user. However, for some cleaning applications, manipulation of the cleaner is highly desirable. These include the placement and adhesion of single dosage formulations in the toilet bowl, urinal or shower wall surface where the gel cleaner is intended to remain for a prolonged period of time and is only slowly released by repeated flushing with water.

Other examples of placing a single dosage format are gel cleaners in a specific dispensing chamber, such as in a toilet bowl rim block holder or from the cleaner dosage chamber of an automatic dishwasher.

For cleaning applications of this type, it may be desirable to use an aqueous gel with a solid structure that resists deformation and can be easily handled by the end user.

It is also desirable that gels for single-dose formats retain their shape after production and storage until they are used by the end user. In order to meet this requirement, such gels should be resistant to changes in shape due to heat exposure until the final use.

Aqueous gels with solid structure for toilet cleaner gels

Aqueous gels with a solid structure are particularly suitable for cleaning hard surfaces, such as the inside surface of a toilet bowl. They can be produced in suitable single-dose formats for easy handling by the consumer. Such gels contain water as a major component, are inexpensive to produce and have a favourable toxicity profile.

The gels, which are solid for single dosage formats, are resistant to deformation even at increased temperature due to the set gel melting temperature. As water is a main component of the gels, it is advantageous if the gels can be processed and produced at atmospheric ambient pressure and temperatures that are significantly below the boiling point of water.

The solid cleaning gels are suitable for cleaning hard surfaces, including plates and other dishes, as well as toilet bowls, urinals, shower enclosure and bathtub surfaces.

Composition

The aqueous gel cleaners typically have self-adhesive properties, i.e. the gel is self-adhesive when applied to a hard surface. In some cases, the gel can adhere more strongly to the surface if it has already been moistened with water.

The cleaning gels contain

- ethoxylated alcohol
- polymeric alkylene oxide block copolymer
- co-curing agents like mineral oil
- water.

The cleaning formulations may contain an alkoxylated alcohol (e.g. ethoxylated alcohol), polymeric alkylene oxide block copolymer, a co-curing agent such as mineral oil and water.

The ethoxylated alcohol may contain 20 to 50 ethoxy units. The alkylene oxide polymeric block copolymer may be an ethylene oxide-propylene oxide block copolymer, for example an EO-PO block copolymer, an EO-PO-EO block copolymer, a C8-C18 alcohol-EO-PO adduct, a C8-C18 alcohol-PO-EO adduct and/or an EO-PO dialkyl ether.

Non-ionic surfactants

The aqueous gels usually contain non-ionic surfactant comprising a polyalkoxy group (so-called non-ionic polyalkoxy surfactant), a cohesive agent and water. For example, the gel contains 15 to 40% by weight of nonionic polyalkoxy surfactant, 1 to 10% by weight of a co-curing agent, which may contain a non-polar hydrocarbon and/or an alkyl ester of an aliphatic acid, and at least 25% by weight, more often at least 40% by weight, of water. Typically, the nonionic polyalkoxy surfactant has on average at least 15 alkylene oxide units, e.g. at least 15 ethylene oxide and/or propylene oxide units. The nonionic polyalkoxy surfactant may include an ethoxylated linear aliphatic alcohol and/or a polymeric alkylene oxide block copolymer.

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The non-ionic polyalkoxy surfactants used in the present cleaning gels typically have an average molecular weight of at least about 600. Suitable EO-PO-EO block copolymers used as non-ionic polyalkoxy surfactants typically have an average molecular weight of at least 1,000 to 5,000. Suitable alcohol-EO-PO block copolymers and/or alcohol-PO-EO block copolymers used as nonionic polyalkoxy surfactant typically have an average molecular weight of at least about 600 to 2,000. Suitable ethoxylated aliphatic alcohols used as nonionic polyalkoxy surfactant typically have an average molecular weight of at least 1,000 to 2,000.

Other components

The gel cleaners may contain a natural or synthetic polymer resin, a polyol humectant (such as glycerol, sorbitol and/or another sugar alcohol) or an anionic surfactant and/or amphoteric surfactants and/or a cationic surfactant and/or a nonionic surfactant other than an alkoxylated alcohol. Where appropriate, it may also contain one or more auxiliaries such as a perfume, a complexing agent and/or a bleaching agent.

Hardness and strength

Aqueous gel cleaners typically have a high hardness and strength. The hardness is at least 150 to 300 g and the gel melting temperature is 50 to 90 °C.

These solid gels represent a random solid consisting of a liquid with a network of interacting particles or polymers, and which do not exhibit yield stress. The gel melting temperature indicates the temperature at which the solid gel abruptly changes into a fluid with a low viscosity of < 5 Pa by increasing the temperature.

The gel melting temperature is determined with a Brookfield RS Plus Rheometer (Brookfield Engineering Laboratories, Inc., Middleboro, MA) using a C25-1/30 cone/plate geometry with a gap setting of 0.04 mm, a temperature rise of 0.125 °C/s and a constant shear rate of 1/s.

The gel hardness is expressed in grams (g) and refers to the strength of a gel. The gel hardness is determined at 22 °C using a Brookfield LFRA 1500 Texture Analyzer with probe TA41 (6 mm cylinder diameter, 35 mm length) with a trigger of 5.0 g, a penetration distance of 3.0 mm and a velocity of 0.5 mm/s, recorded as peak load values.

Examples

Tab. 1 shows examples of compositions of the solid gels described. The formulations D, E, F, G, O, P and Q have a gel hardness value of at least 150 g. They contain as primary surfactant C16-C18 alcohol ethoxylate surfactant (Genapol T-250), ethylene oxide-propylene oxide block copolymer, mineral oil and water. In comparison, gels A and B, which did not contain at least the 4 components, have a hardness value of less than 150 g. For example, samples A and B did not contain ethylene oxide-propylene oxide block copolymer and had hardness values in the range of 73.5 and 106.5 g respectively.

Tab. 2 shows compositions of aqueous solid gel cleaners containing various C16-C18 alcohol ethoxylates with 25 moles of ethylene oxide and having a gel hardness of at least 150 g.

Ingredients	Proportions (weight %)		
	10	11	12
Water, de-ionised	61.12	61.15	61.15
Genapol T-250	23.00	-	-
Lutensol AT-25	-	23.00	-
Novel 1618CG-25	-	-	23.00
Genapol EP-2584 EO-PO-Copolymer	4.00	4.00	4.00
Genapol LA-070	4.50	4.50	4.50
Xanthan Gum	0.03	0.03	0.03
Mineral oil	2.35	2.35	2.35
Fragrances	5.00	5.00	5.00
Gel hardness (g)	234.7	229.2	275.3
Gel melting point (°C)	61	55	59

Tab. 2 Compositions of aqueous solid gel cleaners containing various C16-C18 alcohol ethoxylates with 25 mol ethylene oxide.

Ingredients	Proportions (weight %)								
	1	2	3	4	5	6	7	8	9
Water, de-ionised	58.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0
Genapol T-250[1]	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
EO-PO-block copolymer, surfactant	-	-	4.0	4.0	4.0	4.0	4.0	8.0	8.0
Genapol X-100[2]	8.0	8.0	4.0	4.0	4.0	4.0	4.0	-	-
Fragrances	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Glycerine	5.0	5.0	5.0	5.0	5.0	5.0	5.0	-	5.0
Mineral oil	-	2.0	2.0	2.0	2.0	2.0	2.5	2.0	2.0
Gel hardness (g)	73.5	106.5	221.0	220.9	235.8	201.9	241.9	239.6	238.9
Gel melting point (°C)	48	67	63	65	71	71	67	69.6	67.7

[1] C16-C18-Cetyl/Stearyl/Oleyl-Ethoxylate with 25 EO, [2] Clariant fatty alcohol polyglycol ether with 10 EO, Clariant

Tab. 1 Compositions of aqueous solid gel cleaners.

Remarkably, composition 12, which is prepared using the alcohol ethoxylate Novel 1618CG-25 (Sasol North America, Houston, USA), shows a much higher gel hardness than similarly composed formulations 10 and 11 with the exception of the source of the C16-C18 alcohol ethoxylate with 25 moles of ethylene oxide.

Composition 12 has the highest gel hardness of various examples described.

Tab. 3 shows exemplary formulations prepared with curing agents with different chemical structures or functional groups (13 = mineral oil, 14 = naphthenic oil, 15 = isopropyl myristate, 16 = alfol 1216 synthetic C12-C16 alcohol mixture from Sasol Corp.), 17 = Genapol LA 010 lauryl alcohol ethoxylate with 1 mol EO from Clariant Corp.) and a gel hardness of ≥ 150 g.

Ingredients	Proportions (weight %)				
	13	14	15	16	17
Water, de-ionised	61.12	61.20	61.20	61.20	61.20
Genapol T-250	23.00	23.00	23.00	23.00	23.00
Genapol EP-2584, EO-PO-Block copolymer	4.00	4.00	4.00	4.00	4.00
Genapol LA-070	4.50	4.50	4.50	4.50	4.50
Cohardener	2.35	2.30	2.30	2.30	2.30
Fragrances	5.00	5.00	5.00	5.00	5.00
Xanthan Gum	0.03	-	-	-	-
Gel hardness (g)	234.7	232.1	228.1	215.9	170.4
Gel melting point (°C)	61	58	60	57	54

Tab. 3 Compositions of aqueous solid gel cleaners with different curing agents.

References

"Gel cleaning composition" Patent Nr.: WO 2017/011203 (US 2017/0009189) Publication: 10/01/2017 (12/01/2017) Applicant: S.C. Johnson & Son, Inc. Racine, WI USA

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PURAC® Sanilac

Disinfect surfaces effectively and cut alcohol use

Corbion Keep creating

DISINFECTANT SURFACE SPRAY

> Lower alcohol content > Antibacterial & antivirus claim > Lactic Acid EPA & BPR Approved for PT1, 2, 3, and 4

Ingredients	INCI	wt%	Function
Ethanol	Ethanol	40	Disinfectant & evaporator
PURAC® Sanilac 80	Lactic Acid (and) Water	1.88	Disinfectant
Water	Aqua	q.s. 100	

Manufacturing procedure
Mix all ingredients until dissolved. Measure the pH and adjust if necessary.

Product characteristics
Appearance: Transparent Liquid
pH: 3.5-4.0

Efficacy data: Disinfectant Surface Spray

Formula pH 3.5	EN1276 (Gr-/Gr+)	EN1275 C. albicans	EN14476 Enveloped viruses	EN14476 Corona virus*
Sanitizer, 1.88% PURAC Sanilac 80				

*Tested at Bluetest Laboratories. Mouse coronavirus as human surrogate.
EN1276 and EN1275: 1 min contact time, 80% solution, dirty conditions, > log 5 reduction
EN14476: 1 min contact time, 80% solution, dirty conditions, > 4 log reduction

PURAC® Sanilac

Disinfect surfaces effectively and cut alcohol use

Corbion Keep creating

ALL-PURPOSE DISINFECTANT CLEANER

> Alcohol free > Antibacterial & antivirus claim > Safe solution > Lactic Acid EPA & BPR Approved for PT1, 2, 3, and 4

Ingredients	INCI	wt%	Function
Texapon® LS 35[1]	Sodium Lauryl Sulfate	1	Surfactant
Glucopon® 425N/HH[1]	Alkyl poly glucoside	0.5	Surfactant
PURAC® Sanilac 80[2]	L-Lactic acid (and) Aqua	3	Disinfectant
Water	Aqua	q.s. 100	

Manufacturing procedure
Maintain a preferred formulation pH<4 for broad range efficacy and below pH 5 for viricidal efficacy. Combine with anionic or cationic surfactants to achieve antimicrobial efficacy. A nonionic surfactant can be added, however, doing so will not increase antimicrobial efficacy. Chelating agents can boost antimicrobial performance.
Usage of PURAC Sanilac at 1.5–3% is required to obtain kill against a broad range of microbes.

Product characteristics
Appearance: Clear liquid
pH: 4.0

Suppliers
[1] BASF, [2] Corbion

Efficacy data: All-purpose Disinfectant Cleaner

Formula pH 4	EN1276 (Gr-/Gr+)	EN1275 C. albicans	EN14476 Enveloped viruses
Cleaner, 3% PURAC Sanilac 80			

EN1276 and EN1275: 1 min contact time, 80% solution, dirty conditions, > log 5 reduction
EN14476: 1 min contact time, 80% solution, dirty conditions, > log 4 reduction
*Tested at Bluetest Laboratories
- Enveloped virus: H1N1 Influenza A virus ATCC VR1469
- Enveloped virus: Human herpes-1 virus ATCC VR733
- Enveloped virus: Feline Immunodeficiency virus CRFK cells, human HIV surrogate
- Enveloped virus: Duck hepatitis B virus, human Hepatitis B surrogate

PURAC® Sanilac

Deliver mild, effective hand hygiene using far less alcohol

Corbion
Keep creating

HANDSOAP

> Antibacterial & antivirus claim > Safe solution > Lactic Acid BPR Approved for PT1, 2, 3, and 4

Ingredients	INCI	wt%	Function
Texapon ALS Benz[1]	Ammonium Lauryl Sulfate	14.54	Surfactant
Stepanol DCFAS-N[2]	Sodium cocosulfate	5.49	Surfactant
PURAC® Sanilac 80[3]	L-Lactic acid (and) Aqua	3.12	Antibacterial
Propanediol	Propanediol	0.51	Humectant
EDTA	Tetrasodium ethylenediaminetetraacetate	0.20	Chelating agent
pH adjuster	pH adjuster	q.s. 4	pH adjuster
Water	Aqua	q.s. 100	

Manufacturing procedure
Mix all ingredients until dissolved. Measure the pH and adjust if necessary. Maintain a preferred formulation pH of 3.5–4.0.
Chelating agents can boost antimicrobial performance. Usage of Sanilac at 1.5–3% is required to achieve kill against a broad range microbes. Sodium coco sulfate can be replaced by sodium lauryl sulfate with equal efficacy, although the resulting formulation will be less mild.

Product characteristics
Appearance: Clear liquid
Viscosity: 300 cps

Suppliers
[1] BASF, [2] Stepan, [3] Corbion

Efficacy data: Handsoap

Formula pH 4	EN1276 (Gr-/Gr+)	EN1275 C. albicans	EN14476 Enveloped viruses	EN14476 Corona virus*
Handsoap, 3% PURAC Sanilac 80				

*Tested at Bluetest Laboratories. Mouse coronavirus as human surrogate.
EN1276 and EN1275: 1 min contact time, 80% solution, dirty conditions, > log 5 reduction
EN14476: 1 min contact time, 50% solution, dirty conditions, > log 4 reduction

naturamus – Sustainable Innovations for a Forward-thinking Cosmetics Industry

Interview with Ralf Kunert, Managing Director, naturamus GmbH

Ralf Kunert

Mr. Kunert, what does naturamus stand out for?
For the production and marketing of innovative cosmetic raw materials. We focus on finding solutions for a growing market for sustainable cosmetics.

Why do you claim to be sustainable?
The naturamus team develops ecologically and socially sustainable cosmetic raw materials the market has not known before. For example, almost 20 years ago we developed the first organic shea butter with Agrifaso. Together with our partner, Castor Products Company, (CPC), we also were the first to develop Fair for Life certified organic castor oil with.
We see ourselves as a recognizer of innovative solutions. We see a sentence like "this does not exist" as a mandate for action. But our focus is not only on measurable product quality, but also on the conditions at the origin of the raw material. We promote ecological agriculture as well as fair working conditions and traceable supply chains. A noticeably growing demand for organic raw materials, or the expected supply chain law in Germany prove that we are in line with the trend.

The "Supply Chain Act", you mentioned, will transfer the responsibility for manufacturing practice to traders and producers like you. How do you deal with this?
Product traceability and supply chain transparency are the keys to success here. This is part of our self-understanding. We work directly with our international partners and guarantee product traceability. The manufacturing practice of our partner project "Limbua" in Kenya gives prove to this. Thanks to a sophisticated and self-developed tracking system, the employees of Limbua can trace the macadamia nuts back to the individual farmers. In our opinion this is absolutely unique and worth supporting.
Therefore, we are constantly expanding our cooperation with Limbua. The 5000 smallholders with whom Limbua cooperates grow avocados, among other things, in addition to macadamia nuts. We in turn support Limbua in marketing organic Fair for Life certified avocado oil for the cosmetic industry.
This shows that our business relations with Argentina, India, Kenya, Afghanistan, Spain or Italy have been growing for years. We visit our partners as often as possible. Our cooperation is always designed for the long term. Therefore, we know our partners very well and can evaluate working

conditions. If our partners face challenges, we can look for solutions together.
In addition, all our partners are at least certified organic; some have Fair for Life certification. This shows that our partners and we are subject to the control of external auditors. Compliance with high environmental, product quality and work standards are regularly monitored.

You have spoken of innovations can you give an example?
We develop raw materials that the market did not know in organic quality before. For example, together with our Argentinean partner "Fuhrmann Argentina", we developed the world's first certified organic wool wax. Wool wax is a traditional cosmetic and pharmaceutical raw material that is a by-product of wool production. So actually, nothing new. Nevertheless, up to now no producer has been able to produce wool wax in organic quality due to the complexity of the process handling.

You mentioned that you also process by yourselves. What exactly do you do and why?
At the beginning, I've mentioned that we don't base our quality standards only on the product quality itself. We also attach importance to process quality in manufacturing.
In our oil mill, we, therefore, process organic and Demeter seeds such as almonds, apricot kernels and macadamia nuts particularly gently into native premium oils for the European and US food and natural cosmetics markets. By adhering to the strictest hygiene standards, we produce pure batches and varieties. Our years of expertise make us a carefully working, reliable oil partner.
In recent years, we have been able to perfect our production processes not only in the oil mill. In our second area of production, our experience has also enabled us to reduce the methyl eugenol (ME) content in organic rose oils (analog cert.) with as little change as possible to the sensory notes of the rose oils. In addition, we produce organic hydrolates with essential oils which promise consistent quality throughout the year and have microbiological advantages in comparison to genuine products.

If you summarize this again, what is the strength of naturamus?
We recognize challenges in the cosmetics industry and offer solutions for our clients. We distinguish ourselves through integrity, traceability and transparency, and we work out customer-specific opportunities that meet the expectations of critical consumers.

www.naturamus.de

Emogreen™, Nature-made Chemistry: Now Mass Balance Certified!

Interview with Sabrina MIZAEL, Emollient Product Manager and Coordinator of the Communication Campaign at Seppic

Sabrina Mizael

Seppic released a video about its Emogreen™ range. A tribute to our planet's beauty, this short video , reveals the environmental advantages of Emogreen™, a range of plant-based alkanes. Why did you decide to communicate about alkanes?

In the cosmetics industry, alkanes are well-known for their sensorial properties. They have been widely used for a long time all around the world. Historically, they are from synthetic or mineral origin. Although these compounds can be obtained from plants, it should be said that due to their INCI name (Alkane), brands and consumers still stigmatize them, because they think it is a synthetic product derived from fossil sources. In essence, alkanes do not have the best image.

At Seppic, we understand this concern, so we decided to emphasize that alkanes can also be of natural origin, since plants themselves synthesize them. That is what our video storytelling (by Make It Bloom!) depicts: since nature is made up of atoms and molecules, everything is chemistry! Chemistry and nature are not opposed.

As the cosmetics market is constantly looking for innovative, efficient, affordable and environmentally friendly ingredients, we decided to launch the Emogreen™, two non-polar emollients satisfying all these criteria. They are NATRUE certified and COSMOS and ECOCERT approved and 100% derived from responsible plant biomass. The palm oil biomass is non-GMO, traceable back to the plantations, and Emogreen™ range is now Mass Balance certified* in accordance with the RSPO standard. These emollients are also readily biodegradable (86% to 89% biodegradable at 28 days under OECD protocol 301B). As a matter of fact, as soon as they were launched, they were praised by professionals who rewarded the innovation, sensoriality, and sustainability of the two oils: Gold Award at In-Cosmetics Asia in the "innovative functional ingredient" category, and most sustainable ingredient award granted by the New York Society of Cosmetics Chemists at the symposium dedicated to "The future of Sustainability". Two other Asian trophies rewarded their skin feel with the Best Sensory Ingredient Award and Best Sensory Enhancer Award.

The video reveals Emogreen™'s advantages with regards to sustainability and responsibility. Can you tell us more?

Consumers want natural and biodegradable cosmetics with a minimal environmental impact. The Emogreen™ range contributes to this revolution towards more responsible beauty, that is why we decided to emphasize Seppic's commitment in our development strategy: offering a new generation of emollients based on renewable resources and involving sophisticated purification processes. In addition to a neutral carbon footprint calculated "from cradle to gate" (from the plantation to leaving the factory), a key advantage compared to silicone oils, which are five times more energy-intensive, our applicative studies show that Emogreen™ are also excellent sensorial alternatives to these oils.

Do you mean that Emogreen™ have further assets to the natural origin described in the video?

Yes, the Emogreen™ range provides emotional advantages, demonstrated by in-depth sensorial analysis studies. Some of these studies even involved neuroscience methods, such as the study of prosody (voice musicality and intensity) as different formulas were applied by panellists. Emogreen™ generated very positive emotions and achieved the feat of equalling the velvety feel, the infinite sliding effect or the powdery qualities of silicone oils, which everyone knows are much praised by consumers.

Do you have a message for formulators?

Yes, absolutely! Highly pure (unique patented purification process), inert, non-oxidisable, stable, and non-comedogenic… Emogreen™ are versatile oils. Not only are these emollients easy to incorporate to formulas thanks to their fluid qualities and transparency, but they are also compatible with all types of oily phases (vegetable oils, esters, silicone oils, mineral oils…). Seppic performed a lot of tests proving that Emogreen™ can be used for all cosmetics applications (skincare, hair care, sun care, makeup, cleansing, etc.). Some of their specificities even make them unique in several applications. For example, Emogreen™ provides better cleansing results than other market references, like silicones or isododecane, and they offer the advantage of being natural and readily biodegradable.

Both a commitment to sustainable beauty and a source of sensuality, the Emogreen™ range represents a new generation of emollients that respects current and future generations!

www.seppic.com

Recharging Skin Cell's Batteries with a Root-powered Active

Advertorial | Muttenz/Switzerland | October 14, 2020. ATP is the universal energy-rich molecule used by our cells to perform their biological functions. With stress and aging, the production of ATP decreases and cells lack energy. For the skin, this means a slower renewal of essential components of the extracellular matrix such as collagen and elastic fibers, leading to wrinkles and skin sagging.

Rootness™ Energize, a new active ingredient rich in bryonolic acid obtained from natural and sustainable sourcing (the Plant Milking™ technology), demonstrated a strong capacity to reactivate ATP production in cells. On reconstructed skin epidermis, gene expression analysis by Affymetrix technique showed that Rootness™ Energize at 0.5% stimulates the expression of key sets of genes involved in the three main metabolic pathways: glycolysis, PPP and TCA cycle. Protein expression analysis on a 42-year-old's skin explant treated with Rootness™ Energize at 1% confirmed these results. Furthermore, Rootness™ Energize improves transportation of metabolites via SLC25 transporters towards mitochondria, where they are used by the respiratory chain to produce ATP.

Further study on 44-year-old fibroblasts also revealed that 1% Rootness Energize increases mitochondrial maximal respiration by 111%, spare respiration capacity by +147%, and ATP production by +63%, thus protecting and boosting bioenergetic cell parameters.

With an increased level in metabolites and ATP production, cells are able to synthetize more components essential to the extracellular matrix. This was confirmed through ex-vivo tests: immunolabeling and staining was done on a 42-year-old's skin explant with 1% Rootness™ Energize, and showed an increase in the presence of collagen IV (that supports epidermis and dermis cohesion) and elastic fibers (that prevent loss of elasticity) after 7 days of contact.

Thanks to Rootness™ Energize wide mechanism of action, skin quality is visibly improved. Clinical tests were conducted on 20 Caucasian women aged from 45 to 55 years old, with a lack of skin firmness and describing themselves as stressed. They applied Rootness™ Energize at 1% in a formulation and a placebo twice daily in a half-face study. At 28 and 62 days, firmness, tonicity, elasticity and skin viscoelasticity were assessed. After 62 days, firmness had significantly increased by +20%, tonicity by +21%, and elasticity by +27%. In comparison, the placebo modified the same parameters by respectively +3%, +4% and +4.5%.

Sustainably sourced from the roots of Luffa cylindrica, powered with Plant Milking™ technology, Rootness™ Energize is an ingredient of choice for formulators who are developing new skin care products to support consumers who need to recharge their skin's cellular batteries.

www.clariant.com

ECO BLING & RETRO POP

Putting the fun factor into sustainability

Sustainability is a massive trend, and there are few areas where it hasn't popped up, including marketing and product communication. Fragrance house Düllberg Konzentra shows how to approach the topic with humour and irony.

Everyone's talking about sustainability and there is a downside: the term is becoming diluted, verging on a cliché, meaning that "sustainability" is losing its impact in communications. The fragrance house Düllberg Konzentra, headquartered in Hamburg, is setting out to change that. "Naturalness and sustainability have definitely arrived in the mainstream", says *Christian Lüke* Head of R&D&Marketing at Düllberg Konzentra. "They have become the new normal. Eco is good, right and sensible – and that's perhaps why it is almost a bit dull."

Düllberg Konzentra has taken this insight and used it to fire up a new concept for skincare products: Freaky opens up a new playing field for how we think about sustainability – and also shows that you can take a serious topic and make it even more impactful by adding some fun. *Christian Lüke*: "For us, 'Go green' means – 'Go freestyle'!"

The underlying idea extends beyond launching appealing new fragrance formulations: Freaky is an overall concept comprised of several products, complete with matching colour worlds and sophisticated wording. It is a world that seems to have been turned on its head: natural formulations that imitate synthetic ingredients and are then garnished with a colourful retro vibe.

"Eco Bling" is playfully cheeky with effective textures and intentionally loud, bold colours. "Of course, all the ingredients, materials and formulations are eco-friendly and sustainable", says *Christian Lüke*. "Retro Pop" takes a different approach and is an ironically kitsch homage to the late 80s and the beginning of the 90s: think early Photoshop, MTV style and Stranger Things.

The ranges poke fun at the greenwashing that marks out much modern marketing: "Terms like 'naturalness' and 'sustainability' have lost their appeal, while buzzwords such as 'vegan', 'gluten-free', 'lactose-free', 'caffeine-free' or even 'frutan', have spilled over into other areas of life, reaching far beyond food and cosmetics into fashion, furniture, toys or even travel", says *Lisa Achilles*, Marketing at Düllberg-Konzentra.

Lisa Achilles advises caution when using supposedly positive descriptions like 'vegan'. "They do not necessarily contribute to the success of a product, even if they are applicable. What is appealing for one person, can be interpreted by another as: 'This product is not made for me, so I'm not buying it.'"

Freaky uses obviously absurd and lurid eco declarations to ironically poke fun at the excessive use of greenwashing in communications.

Lisa Achilles describes it as "a peaceful but also powerful form of activism." "We are parodying the way that some people seem to want to see a long list of hip, green words." The result is astonishing ingredients like 100% caffeine-free lavender, lactose-free grapefruit and sugar-free rosemary.

Düllberg Konzentra's recipe is to counter media overkill and overcommunication with humour and consumer insights. *Lisa Achilles*: "We don't want to take 'eco' ad absurdum. On the contrary, we want to celebrate nature and sustainability with deep relish, and at the same time ironically illuminate a questionable trend. We are striking back with reason, using its sharpest weapons: humour and creativity."

Düllberg Konzentra provides selected essential oils and perfume oils for the fragrance and beauty industry. **www.duellberg-konzentra.de**

DÜLLBERG
KONZENTRA

Freestyle eco

Unusual formulations for sustainability with a smile

The six product concepts in our 'Freaky' brand include a 'Natural Fruit-Energy Cream' with Pure Power Berries – and 100% lactose free raspberry combined with passionfruit and cranberry extracts.

For the fragrance, Düllberg Konzentra has created a fresh, fruity composition with a light sweet note: mandarin, lemon and orange in the top note, passion fruit and raspberries in the heart and a base of sandalwood and vanilla.

The key ingredients in the Super Natural Relaxing Cream are 100% caffeine-free lavender and eucalyptus. This lush cream hits the spot with an aromatic, herbal, oriental blend of bergamot, orange and coconut in the top note, lavender and eucalyptus in the heart and patchouli and vanilla in the base.

Elemental Force Cream, a "Natural Herb Bomb", brings 100% sugar-free rosemary and mint to the game, kicking off with lemon and a green accord, adding rosemary, th

Vytrus Biotech is Double Awarded for 2020 Best Ingredient Awards

The biotechnology company has been honoured with double Best ingredient of the world at In-cosmetics Global 2020 for its two new launches

Barcelona/Spain, October 6, 2020. Vytrus Biotech, the company specialised in plant stem cell-derived active ingredients for the cosmetic sector, has been double-awarded to the most innovative ingredients in the world in the category 'Best Ingredient Award 2020' at In-cosmetics global. This is an award that recognizes the high level of innovation in raw materials within the cosmetic industry worldwide.

The award-winning active ingredients are KANNABIA SENSE (Gold Award) and DEOBIOME NONI (Silver Award). These natural ingredients that address the microbiota field from different approaches, have been highly recognized by the cosmetic industry due to their innovative mechanism of action, the consumers' demand faced, and all the cosmetic science behind.

Òscar Expósito, CEO, CSO and co-founder of Vytrus Biotech, says emotionally: 'We are very excited and happy about this double recognition from the cosmetic industry! Behind Vytrus's family, we have a very talented team that, thanks to their enthusiasm, commitment, and illusion, makes it possible for us to continue growing, evolving, and facing new challenges. And the most important thing: improving as cosmetic professionals and human beings'.

Kannabia Sense is a prebiotic ingredient made from Cannabis plant stem cells that stimulates the production of oxytocin through the skin, activating the brain pleasure centres. This process, respectful with the skin microbiota, induces a better self-perception and positive emotional parameters, ending up in a healthier and prettier skin. A big step ahead in Neurocosmetics.

Deobiome Noni is a biological deodorant ingredient from plant stem cells that efficiently reduces body malodour while sustainably respecting the skin microbiota. It is based on a hybrid mechanism of action: plant stem cell culture and a prebiotic cocktail. The active is ready to be applied in body, axillary, foot, and scalp odour treatments (roll-on, sticks, creams…) and microbiota rebalancing formulations.

For the first time, the awards ceremony has been transmitted in streaming through the different social media channels of In-cosmetics Global. An afternoon, on 6th October, full of emotions, dreams, and an eagerness for innovation and illusion in the cosmetic industry.

www.vytrus.com

Marko Grozdanovic Appointed to Head of Personal Care Europe Business Unit at BASF

Ludwigshafen/Germany | October 27, 2020. BASF has appointed Dr. *Marko Grozdanovic* as head of the Personal Care Europe regional business unit and as the new Managing Director of BASF Personal Care and Nutrition GmbH, effective October 1, 2020. He succeeds Xavier Susterac who held these positions since 2017 and is leaving the company at his own request.

Prior to his current role, *Grozdanovic* was Managing Director of BASF's European sales organization BTC Europe GmbH, since 2016. The company is focused on specialty chemicals for small and medium-sized customers in various industries.

Grozdanovic holds a Ph.D. in Marketing from the University Mannheim. He started his career at BASF in 2006 as an internal management consultant. Having completed several strategy and optimization projects in Ludwigshafen, he transferred to BASF Corporation in the U.S. in 2009. He was responsible for a project to optimize and divest the styrene business and BASF's North America business for performance additives and later for coatings raw materials and pigments in the industrial coatings industry as well as in the automotive, furniture and plastics industries.

"I am very much looking forward to further developing BASF's Personal Care business and to continuing its successful course in these challenging times," says *Grozdanovic*. "Proximity to our customers and the development of innovative, sustainable solutions for the cosmetics industry remain at the core of our business strategy."

BASF's Personal Care business in Europe is headquartered in Monheim, Germany. Düsseldorf is home to BASF's third largest site in Europe and the world's largest and most important BASF site for the production and development of cosmetic ingredients.

www.care-chemicals.basf.com

Cargill to Acquire Floratech, Leading Specialty Beauty Ingredient Supplier

Minneapolis | October 20, 2020. In response to growing consumer preferences for nature-derived and sustainably sourced ingredients, Cargill has entered into an agreement to acquire Floratech, a leading global provider of innovative natural emollients and derivatives for beauty and personal care applications. Pending regulatory approval and closing conditions, the acquisition demonstrates Cargill's ambition to grow its Beauty business and would offer beauty and skincare customers around the world access to the broadest portfolio of sustainable, nature-derived ingredients.

"This acquisition will mark an important milestone in Cargill's effort to expand its Beauty business and will strengthen both companies' shared vision to unleash beauty sustainably," said *Colleen May*, president of Cargill Bioindustrial, which includes the Beauty business. "This partnership will accelerate our combined growth, maximize value for customers by building industry-leading capabilities focused on nature-derived solutions, and help those customers shift their portfolio from synthetic chemicals to more sustainable ingredients."

Based in Arizona, Floratech brings 45 years of market-leading expertise in natural emollients and jojoba derivatives. Their product development experience in specialty beauty ingredients aligns closely with Cargill's growth strategy and advances the capabilities of its global Beauty business.

"We are thrilled to join the Cargill team," said *Steve Brown*, President of Floratech. "This partnership will bring even more sustainable value to cosmetics and personal care formulations around the world. Floratech has a long history of developing plant-based sustainable ingredients at levels of quality and functionality superior to the synthetic products they replace. Cargill's long-established position as an agricultural powerhouse will not only sustain but accelerate that success."

Cargill has been producing ingredients for the beauty industry for more than 40 years, building a world-class global Beauty organization focused on delivering a broad portfolio of nature-derived ingredients. The addition of Floratech and its industry-leading capabilities in specialty emollients and derivatives will fit squarely within its portfolio.

"This is an exciting step for our Beauty business," said *Bente Korsgaard Andersen*, managing director for Cargill's Beauty business. "Floratech is a key player in the beauty industry, and their expertise in specialty beauty ingredients is particularly impressive. Our combined capabilities will be essential to delivering new and innovative beauty solutions to customers that want nature-derived, sustainable ingredients."

Rothschild & Co is serving as financial advisor and Eversheds Sutherland as legal counsel to Floratech on this transaction.

www.cargill.de

Nouryon and Atul Receive Environmental Clearance to Expand MCA Production in India

Rob Vancko and Sunil Lalbhai

Amsterdam, The Netherlands | October 21, 2020. Anaven, a 50-50 joint venture of Nouryon and Atul, has received environmental clearance from the Indian authorities for the annual production of 32,000 metric tons of monochloroacetic acid (MCA) at its new plant in Gujarat. The facility is expected to supply the first MCA to the Indian market by the end of the year.

Rob Vancko, Nouryon's Head of MCA and Chairman of Anaven, said: "Our partnership with Atul will ensure we can efficiently meet growing demand from customers in India, supporting Nouryon's ambition to grow in targeted end markets such as agriculture, cleaning, and personal care, particularly in emerging markets."

Sunil Lalbhai, Chairman and Managing Director of Atul said: "We are happy to receive the clearance to expand production of MCA, an essential ingredient for the growing Indian market. We are on track to complete construction and testing of the facility this year and expect to reach full production capacity in the first half of 2021."

The facility will become the largest MCA plant in India. It will use chlorine and hydrogen manufactured by Atul to produce up to 32,000 metric tons of MCA per year, with the possibility to expand this to 60,000 metric tons per year in the future. Atul will consume a portion of the MCA directly in its own production and the remainder will be supplied to the Indian market.

Nouryon is the leading global technology player in MCA and operates plants in the Netherlands, China, and Japan. Click here for more information about MCA and here for more information about Nouryon's growth investments.

www.nouryon.com

Azelis Enables Organic Growth through the Opening of Application and Training Center in Istanbul, Turkey

Antwerp/Belgium, Istanbul/Turkey | October 20, 2020. Azelis, a leading distributor of specialty chemicals and food ingredients, is excited to announce it has opened a new application and training center in Istanbul, Turkey. This center will service the Turkish food, personal care and pharma markets and will offer product advice, formulation development and technical research. Next to that, it will host customer meetings, interactive formulation workshops, supplier meetings and internal technical trainings.

Highlights & rationale

- The Azelis Turkey application and training center will be used for product advice, formulation development and technical research.
- It will also function as a knowledge center for workshops, meetings and internal trainings.
- This new application and training center fits Azelis' strategy to be an innovation service provider to the industry.

In December 2019 Azelis acquired *Ekin Kimya*, a leading supplier of high-quality chemicals to pharmaceutical, food, cosmetics, laboratory sectors in Turkey and surrounding countries. The combined team of experts will work together to create synergies across businesses, which sees the Azelis Turkey application and training center servicing no less than three Azelis market segments: Food & Health, Personal Care and Pharma.

In the Food & Health zone, the technical team will focus on textures and taste improvements for confectionary, dairy, bakery and meat products, thereby keeping a close eye on trends and innovating with clean label alternatives. The Personal Care zone of the center will be used for new formulation development and recipe optimization for hair care, skin care and color cosmetics products, using actives, mild surfactants, silicones and much more from Azelis' extensive product portfolio. In-house formulations include shampoos, bath and body care products, liquid soaps, emulsions, gels, serums and face, lip and eye make-up.

Finally, in the Pharma zone, pharmaceutical and food supplement manufacturers will be offered seminars and workshops to support their optimization and product development efforts. Pharma seminars and workshops will cover subjects such as tablet pressing, tablet coating, tablet coloring; hardness, friability, granulation, oxidation and taste issues in solid oral forms; development of semi-solid oral dosage forms and formulation of modified release forms.

Sertaç Sürür, Managing Director Azelis Turkey, comments:

"With our highly qualified staff in this application and technical center, we will be able to further strengthen the technical support given to Azelis Turkey's and *Ekin Kimya*'s Food & Health, Personal Care and Pharma customers at a local and international level, starting from concept to applied products to formulation creation. In the near future, we will as well start servicing the home care market from this center. We're looking forward to bring our customers even more benefits through the formulation support and inspire them with workshops."

With more than 60 application labs across the world, each dedicated to a specific industry and a local market, Azelis provides technical support to its partners. Custom formulations, product testing, regulatory compliance and sales support are just some of the services the labs offer. Its expert teams anticipate market trends, and work proactively to offer innovative solutions to new needs.

www.azelis.com

Seppic Announces the Appointment of Frédéric Sanchez as Director of its Castres Site

Paris, France | October 28, 2020. After graduating in Chemistry, *Frédéric Sanchez* has developed his expertise over more than thirteen years, mainly within the Servier Group where he held various operational positions both in Research & Development and Manufacturing.

A major player in the south of the Tarn, this site is the largest of Seppic in terms of number of employees. It groups together manufacturing workshops, Research & Development laboratories, the European Customer Service Technical Center, as well as all the associated technical and administrative services. The site employs 370 employees, including nearly 110 researchers, on an 8-hectare site with 3,500 m^2 of synthesis, analysis and application laboratories.

www.seppic.com

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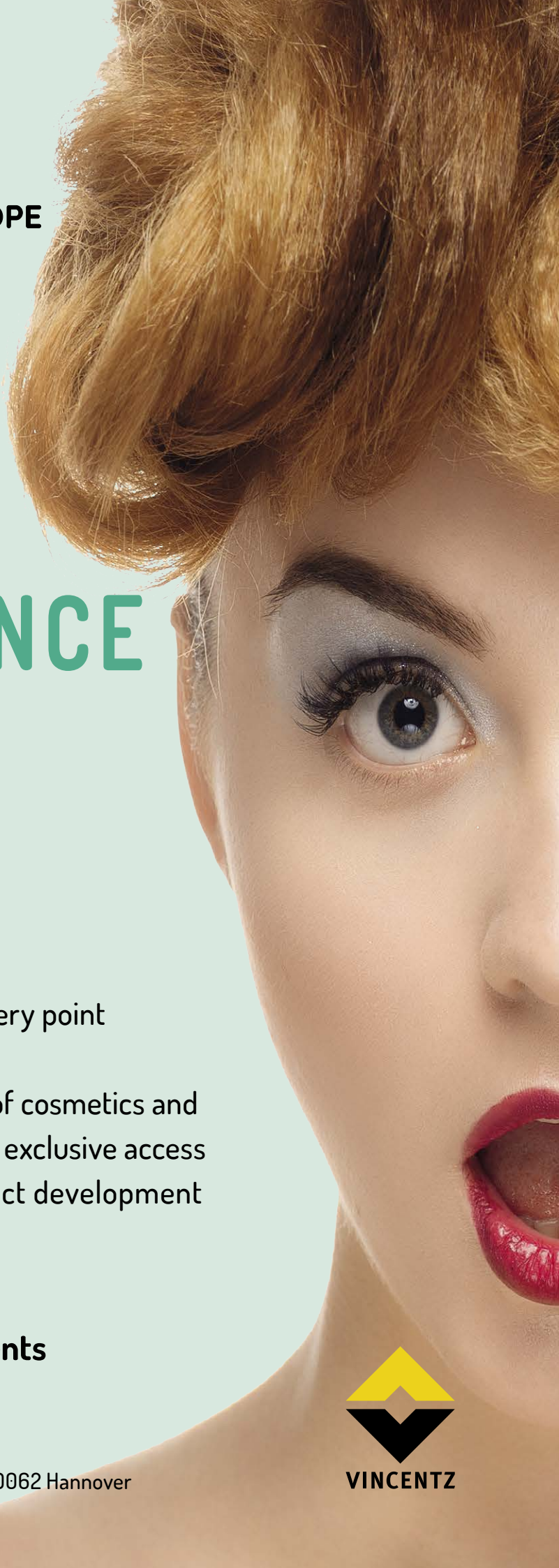

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VINCENTZ

PRODUCT LAUNCH

BASF Strengthens Detergent Enzyme Technology by Expanding its Lavergy® Enzyme Product Line

Ludwigshafen/Germany | October 27, 2020. With the latest expansion of its enzyme portfolio, BASF is stepping up its game as an innovation leader and provider of key ingredients for the home care and I&I industry. Enzymes are essential ingredients of modern detergent formulations. For effective removal of the stains resulting from life's little accidents and everyday spills, enzymes are indispensable – and help to meet consumer demand for products that are convenient to use and gentle on the environment.

Harnessing the combined power of enzyme technology with other ingredients to meet laundry challenges

Cellulase **Lavergy® C Bright 100 L** in tandem with other quality ingredients from the BASF Home Care und I&I portfolio harnesses the combined power of different technologies to give a sustainable, performance-differentiated solution.
Lavergy® C Bright 100 L interacts with other selected ingredients to keep fabrics from turning gray. Whether white or colored, cotton or synthetic fibers – clothes look like new even after multiple washes. What's more, **Lavergy® C Bright 100 L** meets the criteria for various ecolabeling systems including EU Ecolabel and Blue Angel. Excellent cleaning performance, suitability for use with many types of fabric and good environmental compatibility are the hallmarks of BASF's one-fits-all solution.

Lavergy® Pro grades with improved performance attributes

BASF has also improved its protease portfolio. The new enzyme **Lavergy® Pro 106 LS** contains no added preservatives. The product innovation **Lavergy® Pro 114 LS** enhances BASF's enzyme portfolio with a novel stabilizing protease with a non-boron stabilized system, making formulation development even more sustainable. Effective even at low temperatures, **Lavergy® Pro** grades are the high-performance alternatives to liquid detergents. These enzymes are especially good at lifting stubborn stains like egg, blood and milk.
"The combined strengths of the newly developed enzymes and our quality portfolio of performance products gives our clients the opportunity to develop tailored solutions for consumers who expect a lot from the detergents they buy," said Soeren Hildebrandt, Senior Vice President Home Care, I&I and Industrial Formulators Europe. "We want to strengthen the growing market for enzymes with our excellent innovation pipeline and high quality standards to advance the development of effective and sustainable solutions together with our customers."

www.care-chemicals.basf.com

Ashland Launches Phyteq™ Raspberry Multifunctional Preservative Booster

Ashland has launched **phyteq™ raspberry** a multifunctional preservative booster that acts as a preservative potentiator to protect cosmetics from spoilage. The globally approved, biodegradable, multifunctional additive is based on a compound occurring in different plants which has been used for centuries in traditional Chinese medicine and Ayurveda rituals. It is available in two variations, **Phyteq™ Raspberry N** (natural) and **Phyteq™ Raspberry I** (nature identical).

"**Phyteq™ Raspberry** furthers Ashland's innovations for plant inspired, clean beauty," said *Andrea Wingenfeld,* global marketing manager, Ashland. "The product will be popular in formulations because end consumers increasingly read labels that include products inspired by nature. Being readily biodegradable and globally compliant, this ingredient builds on its already well-known associated health benefits of raspberry."

Phyteq™ Raspberry is an excellent choice for skin care products, because it performs as a strong antioxidant and free radical scavenger that helps to protect the elasticity of the skin.

"**Phyteq™ Raspberry** fits perfectly for global skin care formulations as it helps to reduce levels of approved preservatives or antimicrobials, which can reduce unwanted effects." said *Karine Deruddre*, global skin care applications manager, Ashland. "A technology that combines antimicrobial boosting with skin benefits and has a favorable biodegradability profile, is a great solution for cosmetic formulators, especially when it does not require acidic conditions."

www.ashland.com/raspberry

PRODUCT LAUNCH

BASF
We create chemistry

PeptAlde™ 4.0 – A New Naturally Derived Active Ingredient from BASF that Protects Skin and Hair against Silent Inflammation

- Artificial Intelligence was used to discover peptides capable of preventing silent inflammation effects
- **PeptAlde™ 4.0** prevents sensitivity of skin and scalp, dryness or lack of skin firmness
- Derived from rice proteins, the active ingredient offers a nature-based and preventive solution for healthy looking hair and skin

Ludwigshafen/Germany | October 22, 2020. PeptAlde™ 4.0, a new active ingredient from BASF, offers a safe and nature-based remedy for hair and skin damage caused by silent inflammation. To develop this plant-based product, BASF researchers used the power of Artificial Intelligence: numerous peptides, short chains of amino-acids linked by peptide bonds, were screened for their ability to help prevent the release of inflammatory mediators such as TNFα. With the help of a controlled enzymatic hydrolysis process, these peptides were then unlocked from organic rice proteins (Oryza sativa). **PeptAlde 4.0** is scientifically proven to prevent dry skin, discomfort and loss of firmness, while soothing sensitive scalp prone to dandruff.

Tackling biochemical changes that damage the skin and scalp

Scientists have proven that unhealthy lifestyles disturb one of the body's most important defense systems: inflammation. On the one hand, acute inflammation helps the body to heal and fight off infection. On the other hand, however, silent inflammation fights against healthy cells, causes diseases, and accelerates the body's degeneration. The effects of this process are almost invisible in young people – but it gradually creates deep damage to the hair and skin.

Artificial Intelligence – driving the new industrial revolution

With **PeptAlde 4.0**, BASF is now launching an innovative new cosmetic ingredient that is clinically proven to counteract the effects of silent inflammation – keeping skin and hair healthy. It is characterized by four multifunctional plant-based peptides and consisting of between 12 to 17 amino acids.

The discovery of these peptides was made possible by Artificial Intelligence (AI). This cutting-edge digital technology is accelerating the advance of modern research activities by exploring huge volumes of data to identify hidden connections faster and more accurately than traditional methods. Using in-silico predictions and a machine learning platform, it evaluated trillions of data entries to identify the plant-based peptides with the highest potential positive impact on silent inflammation.

Clinically proven benefits for skin and scalp

PeptAlde 4.0 has demonstrated positive effects on skin and hair during clinical studies. For skin, a leave-on body lotion was applied twice daily for 28 days by female subjects who had dry, itchy or uncomfortable skin on their legs. Moisturization increased by 33 percent after one week, and 92 percent of participants stated that their skin felt soothed, smooth and nourished after one month. In another study, female subjects applied a leave-on body lotion to their belly twice daily for 28 days. Skin firmness increased by 27 percent after two weeks. In addition, 79 percent of participants stated that their skin was more supple and 82 percent of them reported increased comfort after four weeks.

In clinical tests for the hair and scalp, male and female participants with sensitive or itchy scalps used a shampoo formulation three times a week for three weeks. Scalp redness decreased visibly by 9 percent and the pH level of the scalp was 0.4 units lower, which is equivalent to the difference between a sensitive and non-sensitive scalp. The shampoo was mild to the scalp, showing no disturbance of the level of sebum.

PeptAlde 4.0 is a new generation of plant-based anti-silent-inflammation peptide network that provides an answer to consumers' demand for safe skin repair products backed up by proven science.

www.care-chemicals.basf.com

PRODUCT LAUNCH

BASF Strengthens Detergent Enzyme Technology by Expanding its Lavergy® Enzyme Product Line

BASF
We create chemistry

- A new cellulase, **Lavergy® C Bright 100 L**, in combination with BASF Home Care and I&I ingredients promises dazzling results both for cotton and synthetic fabrics
- Further development of the existing **Lavergy® Pro** portfolio makes innovative, eco-friendly formulations possible
- Performance differentiation by combining enzymes with a quality product portfolio

Ludwigshafen, Germany | October 27, 2020. With the latest expansion of its enzyme portfolio, BASF is stepping up its game as an innovation leader and provider of key ingredients for the home care and I&I industry. Enzymes are essential ingredients of modern detergent formulations. For effective removal of the stains resulting from life's little accidents and everyday spills, enzymes are indispensable – and help to meet consumer demand for products that are convenient to use and gentle on the environment.

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www.basf.com

Gattefossé Presents Emulium® Dolcea MB, Its Latest Natural O/W Emulsifier

Lyon, France | October 6, 2020. Gattefossé has pushed the limits of its patented wax butter technology to develop the most advanced and robust O/W emulsifier of its natural range.

The composition of **Emulium® Dolcea MB** has been finely tuned to provide optimal performance alongside natural gelling agents and emollients. It builds exceptionally stable emulsions that present smooth white textures with immediate and long-lasting moisturizing power (up to 48 hours). Presented in an innovative form of hydrated pellet that can be added to the aqueous or oil phase, use in the lab and in manufacturing is facilitated. Formulations containing **Emulium® Dolcea MB** possess a strong sensory signature characterised by extreme softness.
COSMOS approved, **Emulium® Dolcea MB** can be used in organically certified, vegan and readily biodegradable formulations.

in-cosmetics® global
Innovation Zone
Best Ingredient
Award 2020

Gattefossé is thrilled to see Emulium® Dolcea MB win the Bronze Innovation Award in the Functional Ingredients category at in-cosmetics Global Awards 2020.

Natural formulation made easy

"The composition of **Emulium® Dolcea MB** has been designed to make it easy to use in all situations. Every component of this emulsifier plays a critical role to ensure stability.

In formulation, it immediately stabilises the oil-water interface but also deploys in the aqueous and oil phases to both bring support to the emulsion and give a recognisable sensory impact.

We have formulated many different kinds of products, from light fluid lotion to high oil-content rich butter, in conditions known to challenge stability. The robustness of **Emulium® Dolcea** is incredible, it really is particularly easy to use. We hope it will help natural formulators to gain time in their development projects." *Vincent Hubiche,* Global Applications Manager at Gattefossé

A matter of responsibility

"In cosmetics, we all know that naturalness and biodegradability are no longer just a trend, but a matter of responsibility. However, formulating fully natural emulsions is not that simple.

Emulium® Dolcea MB has been developed to make formulation of natural cosmetics effortless, with a composition carefully chosen to contribute towards biodegradability. The textures obtained are not only robust, they also surprise by their extreme softness and by a moisturizing capacity that is immediately perceptible to the user.

I am very proud of our ingredient for winning this award!" *Flora Bollon*, Product Leader at Gattefossé.

www.gattefosse.com

PRODUCT LAUNCH

Givaudan

Givaudan Active Beauty Introduces B-Lightyl™, a New Marine Ingredient with the Power to Correct Dark Spots on all Skin Complexion Types

Argenteuil, France | October 27, 2020. Givaudan Active Beauty unveils **B-Lightyl™**, the first gentle and powerful universal dark spot eraser crafted by Marine Biotechnology. Created from *Himanthalia elongata*, a brown macro-alga naturally sourced in Brittany, France, **B-Lightyl™** is a natural ingredient addressing hyperpigmentation disorders in a preventive and curative way.
On a daily basis, environmental stress such as UV exposure and pollution as well as chronological ageing generate a loss of control in the pigmentation process, which ends up in the appearance of brown and dark spots on the surface of the skin. According to our recent global online consumer study, algae extract is perceived as one of the most effective ingredients, with 45% of the Chinese beauty care users choosing it to reduce hyper pigmented spots, a prevailing skin concern that impacts over 70% of consumers worldwide.
Building on the consumers' strong interest in clean and safe ingredients, Givaudan's Marine Biotechnology and skin experts have designed **B-Lightyl™**: a unique and sustainable macro-alga extract which re-establishes the communication between fibroblasts and melanocytes, thereby reverting pigmentation disorders.
Anne Humeau, Marine Biotechnology Manager said: "*Himanthalia elongata* is a macro-algae growing close to the Pink Granite Coast of Brittany, France. It uses the power of sunlight and captures atmospheric CO_2 to produce its key constituents: marine polyphenols, and more specifically phlorotannins. We discovered that these powerful marine molecules can reactivate the expression of SDF-1, a key target in hyperpigmentation disorders. It makes this alga one of the most sustainable resources to develop a cosmetic ingredient able to gain control of the skin pigmentation process."
To evaluate the consumers' benefits of **B-Lightyl™** against dark spots and pigmentation disorders, three clinical tests were conducted in double blind versus placebo, on more than 100 volunteers from various ethnic skin types (Caucasian, Asian and African). **B-Lightyl™** induces a significant decrease of the melanin content in the dark spots of Caucasian volunteers (down to -12.6% in one month, more than twice better than placebo), a significant reduction of the number of visible spots on Asian skin (-156% in one month) and a significant decline of the melanin content in the hyperpigmentation spot (-327% in 2 months) on African skin. Active Beauty
B-Lightyl™ was formulated by our experts in an inspirational skin complexion boosting essence called S3D® Oceanist. This luxurious formula combines **B-Lightyl™** together with radiance booster, Eutectys™ Sea Fennel, and moisturising water rich in sea minerals sourced from Brittany (Eau de Source Marine).

Its "fat water" texture (a 2020 new skincare trend) gives the product a consistency between the essence and the serum, and its delicate smell makes S3D® Oceanist the perfect beauty product to smooth the skin, erase dark spots and even out complexion.

www.givaudan.com/activebeauty

PRODUCT LAUNCH

BIOTECHNOLOGIES
GREENTECH

Innovative Active Ingredients to Limit the Mask-related Skin Reactions

Saint-Beauzire, France | October 9, 2020. 2020: the Covid-19 pandemic has redefined our communication mode. From lockdown to social distancing, we had to adapt and change our social relationships, and the way we apprehend the world. Protect oneself became a prime concern, especially through wearing a mask, masking our emotions and our non-verbal communication, causing stress and fatigue.

Skin is not used to be mask-locked-down and reacts: redness, itching, dryness or maskne, seborrheic dermatitis, impetigo... the consequences vary.

GREENTECH innovative solutions

EXPOZEN

To relieve discomfort by targeting the bacterial strains that cause redness.
Natural active ingredient for sensitive and reactive skin, based on sulfated polysaccharides from Halymenia durvillei, a red alga living off the coast of Madagascar. **EXPOZEN®** rebalances microbiota of reactive & sensitive skin, especially reducing *C. kroppenstedtii* involved in inflammation and redness. It decreases neurogenic inflammation & sensitive skin symptoms: intensive soothing effect, reduction of redness, of heating and flushes sensations.

BIOTILYS®

To repair dry skin & boost skin innate immunity.
The skin carries out its protection against the hostile environment. Probiotics, by keeping the epidermal barrier intact, preserve the skin homeostasis. Acting as a short and long term global protector, **BIOTILYS®** increases skin innate immunity (antimicrobial peptides) and promotes cutaneous microbiotic balance, allows skin to withstand aggressions, and to keep a healthy and beautiful appearance. Skin barrier and moisturization are reinforced.

ACNILYS®

To limit seborrhea & virulent bacterial strains linked to acne breakout.
Natural active ingredient based on a molecule named Rhodomyrtone (well known for its anti-inflammatory, antioxidant and anti-microbial properties), balancing acne-prone skin microbiota by acting on C. acnes phylotypes and on the more virulent strain Cutibacterium granulosum. **ACNILYS®** also reduces seborrhea and inflammation, visibly improving overall skin appearance: less papules and redness, increased skin hydration and radiance.

www.greentech.fr

Minasolve Launches Three Antimicrobial Solutions Developed with Bio-based Caprylyl Glycol

Louvain-la-Neuve, Belgium | October 6, 2020. Minasolve, a developer and supplier of premium and multifunctional green chemistry ingredients for the cosmetics industry, today announces the launch of three nature-based **E-Leen** blends developed using a new bio-based version of Caprylyl Glycol. These formulations offer advantages over conventional blends, including their suitability for cold and continuous processing.
Previously, Caprylyl Glycol, a well-established skin moisturizer and antimicrobial stabilizer for cosmetic applications, was only available from petrochemical sources. Minasolve is targeting EMEA and South American cosmetics producers with its bio-based alternatives, **E-Leen 8**, **E-Leen P8** and **E-Leen GC 8**, that will enable them to increase the natural origin index of their formulations.
According to Minasolve, green cosmetic producers currently find preservation solutions for natural cosmetics comparatively expensive or find that they require application at high concentration levels. These are dissuasive when aiming to address the mass market, leaving producers without a viable green alternative. Minasolve developed the new **E-Leen** product range with bio-based Caprylyl Glycol as a cost-effective solution for the protection of green cosmetics at low concentration levels.
"Minasolve's new ingredients, **E-Leen 8**, **P8** and **GC 8**, match market expectations. These new products are among the most versatile and cost-efficient solutions to

MINASOLVE
BIO-INGREDIENTS FOR YOUR APPLICATIONS

green solving attitude.

protect natural and eco-certified personal care formulations," *said Emmanuel Peulens*, managing director of Minasolve. "We have achieved another significant milestone with the development of bio-based Caprylyl Glycol; this follows the successful launch in 2014 of our bio-based Pentylene Glycol. We will continue to bring nature-derived innovations to a cosmetics industry that seeks greener, safer and more sustainable ingredients."

All three new **E-Leen** products are skin moisturizers and antimicrobial stabilizers, produced from 100% renewable, vegetal and GMO-free raw materials. They are easy to use liquids at ambient temperature. Each is COSMOS approved, a key criterion for natural cosmetics.

Since the new **E-Leen** products with bio-based Caprylyl Glycol are stabilized in liquid form, they offer advantages over conventional Caprylyl Glycol, an alkanediol which has been in use as a cosmetic ingredient for 30 years.

Conventional Caprylyl Glycol is a waxy solid produced from petrochemical raw materials. It requires melting before use, which can be time-consuming. In contrast, nature-based **E-Leen 8** is a ready-to-use liquid version. Even after storage in cold areas, simple warming to ambient temperature is sufficient. As no heating devices are required for handling, **E-Leen 8** is suitable for cold and continuous processing, saving time and energy during production.

E-Leen P8 is an advanced mixture of bio-based Caprylyl Glycol and bio-based Phenylpropanol, a natural aroma ingredient. It offers users a reliable solution for the protection of formulations at low use-levels, even at a high pH.

E-Leen GC 8 is a mild alternative for sensitive skin, formulated using bio-based Caprylyl Glycol and Glyceryl Caprylate/Caprate.

"The development of these new **E-Leen** products is a clear demonstration of Minasolve's strong R&D skills and capacity to transfer the renowned technology underpinning the multifunctional ingredient Caprylyl Glycol and applying it to the world of natural cosmetics. Thanks to their attractive price-performance ratio, these new ingredients represent a further step towards the democratization of natural cosmetics," *Peulens* added.

www.minasolve.com

CLR Introduces:

Regulating the Scalp Microbiota Cool 3 in 1 Scalp Serum Scalp Micellar Tonic

Berlin, Germany | October 26, 2020

Regulating the scalp microbiota

Scalp care is an incredibly strongly growing segment in the personal care market. Consumers put a large emphasis on the health of their skin, scalp and microbiome. They recognize that everything is intertwined. Healthy scalp means healthy hair. Healthy microbiome means healthy skin. The goal is to keep the balance. Therefore, consumers are actively searching for solutions that are natural and mild, highly effective, fast and trustworthy.

CutiBiome CLR™ was launched earlier this year to cater to these consumers. Next generation skin microbiota research succeeded in the development of a highly effective solution that supports the skin in regaining its natural and healthy balance with its microbiota. It is a synergistic complex of lipophilic extracts from Manuka, Black Pepper and Magnolia with the power of nature and ancient wisdom inspired by Maori, Traditional Chinese Medicine and Indian Ayurveda.

In our studies it showed to have potent effects on dandruff and acne and can be used in many skin and scalp care concepts. In our latest study we looked at the microbiota of dandruff scalp, with impressive results.

We were able to show that **CutiBiome CLR™** helps the skin microbiota to come back to a more normal and healthy state. In this study it even outperformed Piroctone Olamine, a well-known benchmark anti-dandruff ingredient. This is another great example of the power of nature. By making use of what nature can provide us with, we can come to convincing results and satisfy the needs of the modern consumer without the negative side effects of established benchmark products. **CutiBiome CLR™** is extremely efficacious, acts on both the skin and its microbiota, it is natural and, of course, safe.

Hydra Balance Hand Cream Bar

This multifunctional scalp serum with a slight cooling effect leaves your scalp deeply purified, soothed and refreshed. The highly effective combination of **CutiBiome CLR™**, **AnnonaSense CLR™** and **MultiMoist CLR™** provides the scalp with a healthy balance. While **MultiMoist CLR™** provides instant hydration, **AnnonaSense CLR™** makes scalp less sensitive and **CutiBiome CLR™** potently reduces dandruff and supports the scalp microbiota to return to its normal healthy state.

Stay Cool 3 in 1 Scalp Serum

This Scalp Tonic effectively fights dandruff, reduces irritation and hydrates in one simple step. Using micellar technology, it leaves scalp deeply purified.

MultiMoist CLR™ provides an osmotic balance moisturizing scalp and hair. **CutiBiome CLR™** reduces scalp oiliness, sensitivity and itch and highly effective fights dandruff while supporting the scalp microbiota to return to its normal healthy state. Your scalp will be nourished and well balanced for an all-day long feeling of comfort and beautiful hair.

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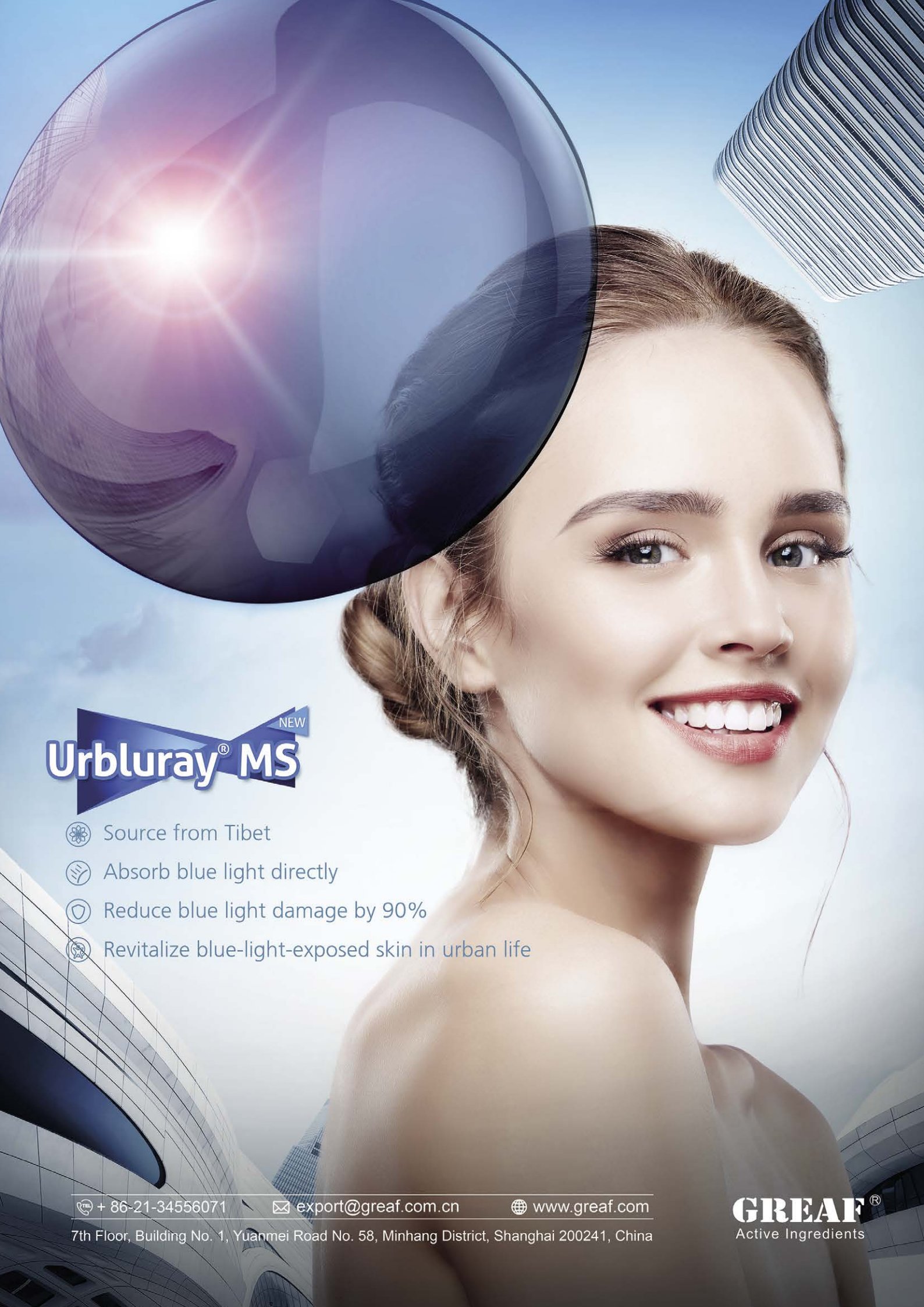
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