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Home & Personal Care Ingredients & Formulations

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## SEPAWA® CONGRESS

Event Report

1/2 2021

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## disinfection

Disinfection Yesterday, Today and Tomorrow – Effective Chemistry in the Fight against a Global Viral Danger


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Consumer Care Solutions.
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OILY SKIN SENSATION.
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PLEASANT EFFICIENCY.
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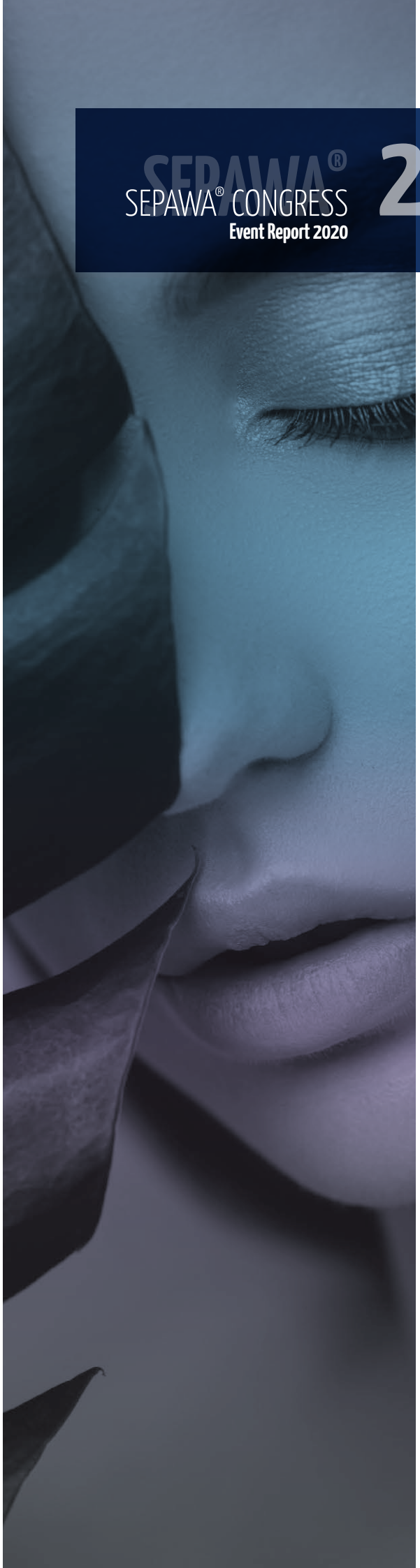



## event report



## home care



## personal care

28 – 30 OCTOBER 2020
SEPAWA® CONGRESS
AND EUROPEAN DETERGENTS CONFERENCE
ECC ESTREL CONGRESS CENTER BERLIN

# The 67th SEPAWA® CONGRESS VIRTUAL, the 16th European Detergents Conference and the Forum Cosmeticum 2020 as virtual events from 28 – 30 October 2020

The saying goes: "After the congress is before the congress." And after such a successful event in 2019, who would have had the slightest doubt about its success in 2020? Hardly anyone. With a considerable boost due to the growing popularity of the congress with about 3300 participants the board of SEPAWA® e.V. and the organizers together with the responsible persons in the Estrel Congress Center have been busy with the preparation of the congress 2020.

After evaluating the latest participant survey and taking into account the increasing demand for exhibition capacity, the promising concept for the Congress 2020 was drawn up. Things turned out differently – the corona pandemic forces us to rethink. A hygiene concept drawn up together with the Estrel Congress Center and confirmed by the Berlin Senate originally made the congress appear feasible in a modified format. A hybrid alternative was discussed, and finally the board of SEPAWA® e.V. together with the organizational team decided at the beginning of October to hold the SEPAWA® CONGRESS 2020 exclusively virtually. A concept with many innovations – "new territory" for all participants.

Conclusion: The 67th SEPAWA® CONGRESS took place virtually together with the 16th European Detergents Conference (EDC) and for the first time with the DGK's Forum Cosmeticum.

It is hard to imagine that the SEPAWA® CONGRESS together with the EDC as the most important meeting point of the detergents/cleaning agents, cosmetics and perfume industry in Europe could take place virtually. So no congress with parallel live lectures in different rooms, no exhibition with more than 300 exhibiting companies and more than two thousand interested visitors, no face to face discussions and no social togetherness on the fringe. And yet the virtual, web-based congress was the only option.

## SEPAWA® Award Ceremonies

An annual highlight is the honoring of special achievements which have been achieved in conformity with our association's goals. The chairman of SEPAWA® e.V., Dr. Hans Jürgen Scholz, presented the awards virtually. Rest assured, the sums of money tied to the SEPAWA® Young Researchers' Awards are real and were sent to the prize winners.

In keeping with tradition, the prizes were awarded before the keynote address. This year of course in a virtual ceremony by the chairman of SEPAWA® e.V. Dr. Hans Jürgen Scholz (see boxes on pages 3 and 4).

## Presentation of "Young Scientists' Award of the GDCh" and "Award of the GDCh Division of Detergent Chemistry"

The GDCh Division of Detgergent Chemistry awarded 3 young scientists for excellent scientific work with special relevance for the development of washing and cleaning agents. The award ceremony was presented by ***Prof. Dr. Birgit Glüsen***, TH Köln, University of Applied Sciences, President of the GDCh Division.

The prize for the best Bachelor thesis was awarded to Ms ***Janine Birnbach***, Hochschule Niederrhein. The topic of the thesis is: **"Effect of Additives on the Phase Behaviour of an EO/PO-block-copolymer"**. The investigations were carried out in close cooperation with Henkel AG&Co. KGaA.

Ms. *Janine Birnbach* presented her results in a lecture within the EDC lecture block.

Certain EO/PO-triblock polymers can form cubic liquid crystalline phases. These phases consist of densely packed spherical micelles of the polymer which are arranged in a cubic lattice. Usually these are highly elastic and inherently stable gels. Due to their ability to oscillate in the audio frequency range they are sometimes called "ringing gels". The presentation deals with the effect of various additives on the phase behavior of an EO/PO-triblock polymer, in particular on the existence range of the cubic phase. The effects were characterized and interpreted by means of rheology, zeta potential measurement, diffusion ordered spectroscopy (DOSY), SAXS and electron microscopy (SEM). The obtained results


were compared with literature and discussed regarding the sticky hard sphere model and the DLVO-theory. The influence of additives like different low molecular weight surfactants, solvents, electrolytes and saccharides were studied. It was found that some additives e.g. ionic surfactants decrease the existence range of the cubic phase, whereas others e.g. saccharides showed the reverse effect. The predominant mechanisms for these opposite effects might be different for various additives. However, certain regularities were identified probably due to three different and overlaying mechanisms. One mechanism is related to additives which can change the polymer-water interface, e.g. n-butanol. Other additives might change the hydration shell of the EO-PO-polymers, e.g. maltose. Furthermore, complexation processes could occur, e.g. in case of surfactants, which decrease the hydrophobicity of the PPO-part. This leads to the disintegration of the cubic phase because the formation of polymer micelles is suppressed.

The prize for the best master thesis was awarded to Ms. ***Frieda Nagler***, Friedrich-Schiller University Jena, with the title **"Synthesis of Hydrogels Based on Polydehydroalanine"**. *Ms. Nagler* addressed the results in her presentation as follows:

## SEPAWA® Innovation Award 2020

Innovation is crucial for growth and competitiveness on the world market and is the foundation of our economy. For the eighth time, this year's SEPAWA® Innovation Award in the fields of cosmetics and detergents was awarded to three prize winners. The prize is intended to give impulses for an active idea management in the member companies of SEPAWA® and to sensitise the public for the valued innovation.

A neutral, independent jury of 6 members of the scientific advisory board of SEPAWA® and the SEPAWA® e.V. board selected 3 prize winners from 17 submitted proposals. The prize consists of a certificate and a trophy showing the SEPAWA® wave in a stylised design.


Bernd Heinken received the first prize on behalf of ***Symrise AG*** for the work **"Crinipan® PMC *green* – Micro Activated next Generation Anti-dandruff"**.

The second prize went to Dr. Leonhard Hagen Urner from the ***University of Oxford*** for his work on **"Designer Detergents for Medical Research"**.

The third prize, which was accepted by Dr. Joachim Storsberg, went to the ***Fraunhofer Institute for Applied Polymer Research (IAP)*** for the innovative work on the subject of **"*In-Vitro* Method for Investigation and Proof of Performance of Potential Active Ingredients in Hair Growth"**.

## SEPAWA® Young Researchers' Award

The annual **SEPAWA® Young Researchers' Award** fulfills one of the most important goals of SEPAWA® to promote the training of the next generation of specialists. The prize is awarded to students for outstanding Bachelor, Master and doctoral theses. The jury selected 6 prize winners from the submitted works.

In the category "Outstanding university graduate with bachelor's degree" ***Nele Dallmann*** received the 1st prize for her work on **"Multi-parametric Characterization of Synthetic and Biodegradable Styling Polymers in Combination with Different Plasticizers"**.

***Marek Busch*** received the 2nd prize for his work **"Formulation of Microplastic-free Light Protection Agents – Influence on Skin Feel, Stability and Film Formation"**.

The 3rd prize was awarded to ***Franziska Schlüter*** for her work on **"'Green' All-purpose Cleaners: Development, Performance and Sustainability"**.

In the category "Outstanding university graduates with a master's degree" three works were awarded. The awards went to:

***Daniela Ivanov*** (1st prize) for her thesis on **"Establishment of a Measuring Method for the Determination of Radicals in Excised Pig Skin after UV Irradiation"**.

***Marc-Kevin Zinn*** (2nd prize) for his research on **"Microbial Odour Formation in Domestic Washing Machines – Technical and Sensory Analysis"**.

***Ghaith Kourbaj*** (3rd prize) for his work on **"Measurement of Dermal Water Content by Confocal RAMAN Spectroscopy to Investigate Intrinsic Aging and Photoaging of Human Skin *In Vivo*"**.

No prize was awarded this year in the category "Outstanding doctoral thesis".

Hydrogels are widely spread in everyday applications such as in superabsorbents, cosmetic products or wound dressings. Further, they are discussed as promising solutions for water treatment, drug delivery or controlled fertilizer release. Polydehydroalanine (PDha) is a zwitterionic polymer of high charge density promising high swelling ratios, or response to pH and salt when applied in hydrogels. In the context of this master thesis, a library of PDha-based hydrogels was synthesized applying bis-epoxide functionalized modifiers. The crosslinking agents included poly(ethylene glycol)diglycidylether (PEGDGE) of four different chain lengths. The influence of the molecular weight of the PDha as well as of the modifier on the swelling ratio was studied. The highest swelling ratio reached was 18,000%. In addition, poly(propylene glycol)diglycidylether (PPGDGE) as a similar, but more hydrophobic modifier was tested. The corresponding hydrogels also exhibited swelling in polar organic solvents such as MeOH and DMSO. Even more, the swelling ratio of selected hydrogels was shown to depend on pH and salinity, where the highest swelling ratios were determined in slightly basic environment. In KCl solutions, an "anti-polyelectrolyte" effect was observed. Hence, at low salt concentrations the cation shields intramolecular interactions and thus causes higher swelling ratios than in deionized water, which is an important property for superabsorbents. As another application, the adsorption of dyes by PDha-based hydrogels was studied. Methylene blue as a cationic dye was adsorbed in basic environment and desorbed by addition of acid. Vice versa, adsorption of an anionic perylene dye was observed in acidic environment and desorption at high pH. Due to these observations, hydrogels based on PDha are interesting candidates for catalysis, delivery purposes or water purification.

The prize for the best dissertation was awarded to ***Dr. Leonhard H. Urner***, University of Oxford & Freie Universität Berlin. The thesis is entitled: **"Glycerol Detergents Facilitate the Investigation of Drug Targets"**, results were presented in a lecture:

Membrane proteins are targets for more than 50% of current drugs. Understanding their structure and interactions with biomembranes is of great interest in drug discovery. Detergents traditionally enable the purification and analysis of membrane proteins. However, design guidelines which allow us to fine-tune their structure for individual applications are currently not available. To address this shortcoming, we here present a detergent family derived from a byproduct of the biofuel industry: glycerol. Using a modular-designed library of dendritic glycerol detergents, we can identify for the first time how changing the structure of detergents allows controlling membrane protein purification and protein-lipid interactions during purification. In addition to a range of bacterial membrane proteins, dendritic glycerol detergents enable the purification and analysis of a functional G-protein coupled receptor (GPCR). The GPCR family is currently intensively studied due to its substantial role in widespread diseases. Therefore, our results represent a significant advance for the investigation of pharmaceutical targets and outline how sustainable resources can offer great potential for improvements in human health.

At this point it should be noted that the findings from the work were simultaneously awarded the 2nd Innovation Prize of SEPAWA® e.V.

The prize of the "GDCh Division of Detergent Chemistry" was awarded to ***Prof. Dr. Heinz Rehage***, TU Dortmund University, for his many years of successful work in researching and answering colloidal-chemical questions. The title of his lectrue was: **"From Coagulated Surfactant Films to Microcapsules, Filled Vesicles and Self-propelling Colloidal Particles"**.

An excerpt from the presentation by *Prof. Rehage:* "The planned lecture gives a brief insight into current research

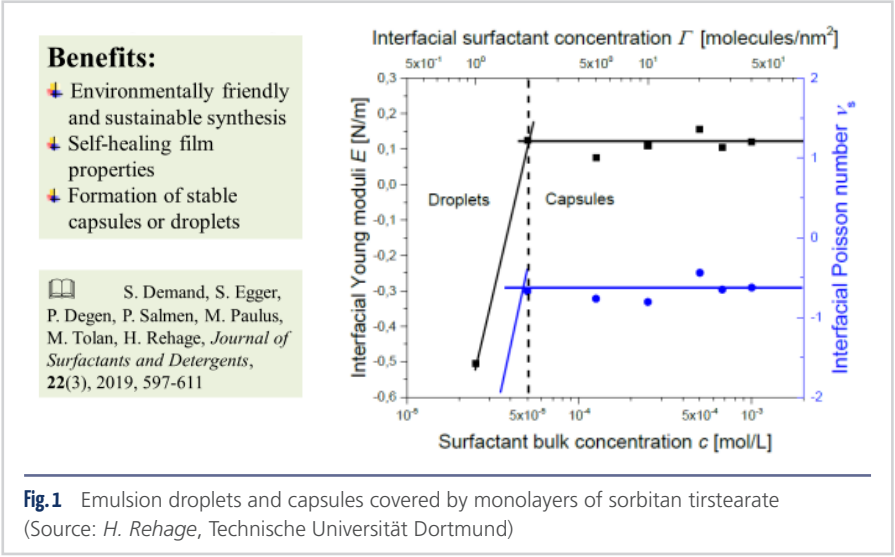



**Fig. 1** Emulsion droplets and capsules covered by monolayers of sorbitan tirstearate (Source: *H. Rehage*, Technische Universität Dortmund)

topics of our institute. We start by discussing the structure and dynamics of surfactant films and show that some detergents, such as sorbitan tristearate (Span® 65) form highly viscous and elastic layers at fluid interfaces. We observed similar properties in other composite systems in which cationic surfactants were combined with multivalent counterions or with water soluble alginates. We used the stabilized surfactant films to produce nano- and microcapsules, which we investigated in detail. The advantages of these particles lie in the simple and environmentally friendly synthesis, and they show interesting self-healing properties. In pharmacy and medicine, vesicles or liposomes are often used for processes of drug transport. In order to produce such filled aggregates in a defined manner, we developed a new phase-transfer method in which tiny water droplets, suspended in oil, were transported across a thin surfactant film into an underlying water phase. With this method, we could continuously produce larger quantities of filled vesicles. In contrast to natural vesicles, our aggregates still contained small traces of oil in their membranes. This leads to interesting properties which are known from water-in-water emulsions. The worldwide trend of miniaturization has gained great interest in the development of artificial nano- and microsystems which can carry out independent swimming movements (nanobots). Lenticular alginate capsules represent a simple model system for detailed investigations of new types of artificial locomotion. Polyethylene glycol or other spreading agents, that were stored in the core of the capsules, could escape through small membrane pores. Due to this simple spreading mechanism, the capsules showed rapid, circular movements near the water surface. After adding surfactants, we observed more complicated collective swimming processes due to Marangoni convection, and the microswimmers then formed pulsating rings or oscillating chains" (**Fig. 1**).

## The Virtual Lecture Event – A Compilation of Selected Focus Topics

Among other aspects, the lecture event reflects the scientific foundation of our detergent, cosmetics and perfume industry in an excellent way. Thus, 9 scientific lectures on the topic area of "Green Chemistry along the Value Chain" were held within the framework of the **European Detergents Conference**, which is conceived by the specialist group 'Chemistry of Washing' of the Gesellschaft Deutscher Chemiker. In four lectures, the award winners of the GDCh Division had the opportunity to present their award-winning work. During the SEPAWA® Scientific Conference, which thematically deals with the latest research results of our industries detergents/cleaners, cosmetics and perfumes including their regulatory framework, 21 lectures were presented. The lecture blocks in the Forum for Innovation are firmly established in the congress programme. This year, 65 speakers took the opportunity to present the latest in their developments. The lecture programme was complemented by a total of 14 poster presentations, submitted by young scientists from universities and academic institutes, as well as by employees from industrial research and institutional facilities in our sectors.

The 16th European Detergents Conference focused on novel substances, methods and processes that enable sustainable solutions for the future of detergents and cleaning agents. The research results presented lead to a deeper understanding of the underlying mechanisms with all aspects along the value chain. Among other things, we look at raw materials from biomass, address the challenge of sustainable product formulations and discuss the reduction of textile-based microplastics during washing.

European Detergents Conference

## A Selection from the Lecture Block of the 16th European Detergents Conference

### Novel Surfactant Based on Non-food Biomass: Value Chain Design Starting from 5-Hydroxymethylfurfural

*Prof. Dr. Regina Palkovits*
RWTH Aachen University

5-Hydroxymethylfurfural (HMF) presents a promising platform molecule available based on the carbohydrate fraction of lignocellulosic biomass avoiding a competition to food production. Oxidation of HMF allows accessing furan-2,5-dicarboxylic acid

which has been proposed as substitute of terephthalic acid in PET production. Via reduction of HMF, a versatile set of biomass-based diols becomes available suitable for the design of tailored value chains to customized products. In this contribution, the potential of HMF to access tailored surfactants providing high-performance will be discussed (**Fig. 2**).

The work evolved in the frame of HICAST, the Henkel Innovation Campus for Advanced Sustainable Technologies, a research cooperation between Henkel AG & Co. KGaA and RWTH University.

## Ionically Assembled Polyelectrolyte/Microemulsion Complexes (PEMECs) – Phase Behaviour, Thermodynamics and Structure

*Prof. Dr. Michael Gradzielski*
Technische Universität Berlin

The mixing of oppositely charged polyelectrolytes and oil-in-water (O/W) microemulsion droplets leads to the formation of polyelectrolyte/microemulsion complexes (PEMECs). Such systems were investigated by us for differently sized microemulsion droplets and for different types of polyelectrolytes ranging from flexible synthetic ones like polyacrylate (PAA) to rather stiff biopolymers like hyaluronate (HA) or carboxymethylcellulose (CMC). In the range of charge compensation, typically phase separation is observed while monophasic regions are present of excess of microemulsion or polyelectrolyte charge. The observed phase behaviour depends markedly on type and Mw of the polyelectrolyte employed, as well as on the charge density of the microemulsion droplets. In the case of using the mesoionic tetradecyldimethylamine oxide (TDMAO) as main surfactant the latter can be controlled by pH, which leads to systems strongly changing in the pH range from 5–8. The PEMEC structures were determined by a combination of static/dynamic light scattering (SLS, DLS), fluorescence correlation spectroscopy (FCS) and small-angle neutron scattering (SANS). They show that here elongated aggregates are formed in the polyelectrolyte-rich part of the phase diagram, where the size increases upon approaching the phase boundary of charge neutrality, and it correlates strongly with the stiffness of the polyelectrolyte employed (**Fig. 3**).

## Biosurfactants Made by Fermentation – Green, Mild and Powerful

*Dr. Joachim Venzmer*
Evonik Operations GmbH

Two biosurfactants, which have been known for decades, have recently been made available on commercial scale: sophorolipids and rhamnolipids. These microbial surfactants which occur in nature as natural metabolites of various yeasts and bacteria, are now industrially produced by fermentation. Numerous publications and test data already prove their excellent ecotox profile and mildness to skin. In this presentation we will demonstrate that they are not only "green" and mild, but also exhibit unique properties resulting in high performance for a broad range of applications. Their physico-chemical properties, both in bulk and at interfaces, will be discussed and related to their special "double-hydrophilic" molecular architecture and pH-dependent behavior. The results demonstrate a broad utility for solubilization, formulation of microemulsions, foaming performance, and pigment dispersion. These benefits will be explained

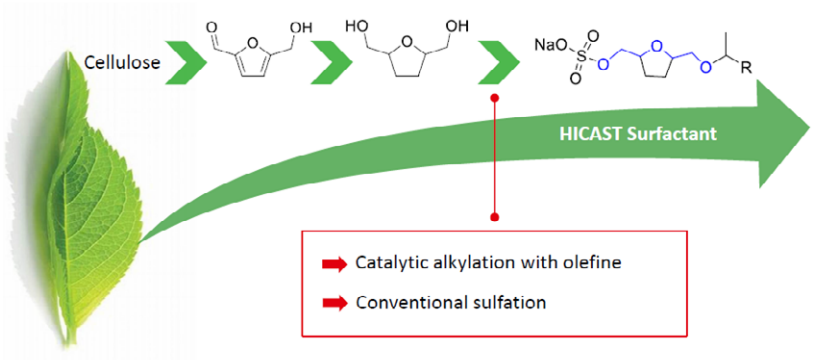
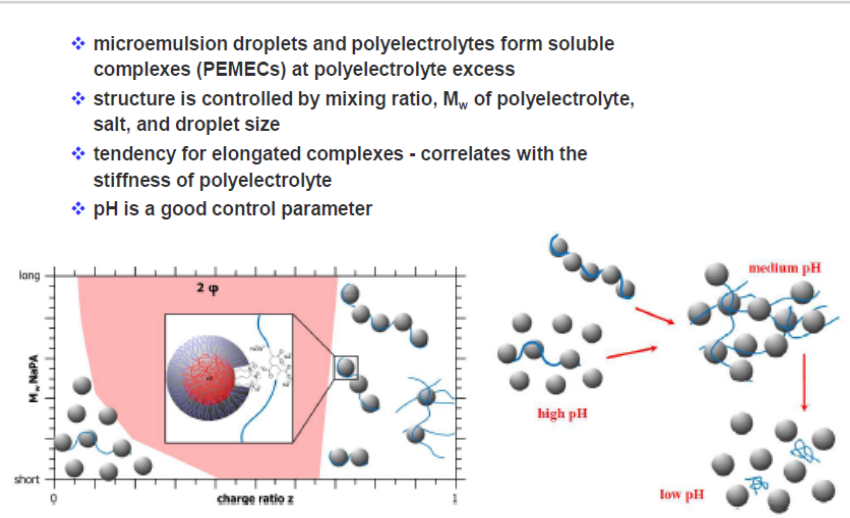



**Fig. 2** HICAST Surfactant based on non-food biomass (Source: *R. Palkovits*, RWTH Aachen University)




Source: "Structural Control of Polyelectrolyte/Microemulsion Droplet Complexes (PEMECs) with Different Polyacrylates", Miriam Simon, et.al. , Chem. Sci. 10, 385-397 (2019), DOI: 10.1039/C8SC04013C; Miriam Simon, "Formation and Characterization of Complexes of Oppositely Charged Oil-in-Water (O/W) Microemulsion Droplets and Polyelectrolytes", Dissertation, TU Berlin, 2020

**Fig. 3** PEMECs – Conclusions (Source: *M. Simon et al.*, Technische Universität Berlin)

based on ternary phase diagrams, and their interfacial behavior. In addition, a rationale for their stability against hard water will be presented (**Fig. 4**).

## From the Presentation Block Scientific Conference – Home Care

### No Plastic is not a Solution Either – Scenarios for a Sustainable De-fossilized Plastic Circular-economy

*Prof. Dr. Thomas Müller-Kirschbaum*
Henkel AG & Co. KGaA

No environmental issue is discussed as emotionally as plastic waste. Hereby, the focus is on plastic packaging. While developed countries mainly focus on optimizing collection and material recovery, developing and emerging economies lack adequate collection systems. At the same time, plastics have undisputed sustainable benefits. Plastics save enormous amounts of packaging material, they allow thin-walled packaging with low weight for efficient transportation, they are mechanically highly stable, chemically inert to aggressive ingredients and can be perfectly adapted to a variety of requirements. Current measures to prevent waste are the avoidance, reuse and recycling of packaging. An important pillar is the recycling of packaging. Manufacturers are asked to design packaging recyclable and to integrate as much recycled material as possible. At the same time, the waste management industry is asked to constantly further develop the collection, sorting and recycling infrastructure in developed countries and even establish it in developing and emerging countries. A great potential is seen in the synergy of mechanical recycling with innovative processes such as chemical recycling. In these developments, not only the quantity, but also the provision of high-quality recycled materials must be the focus. The endpoint is a climate-neutral circular economy, in which the responsible use of plastic is fully integrated (**Fig. 5**).

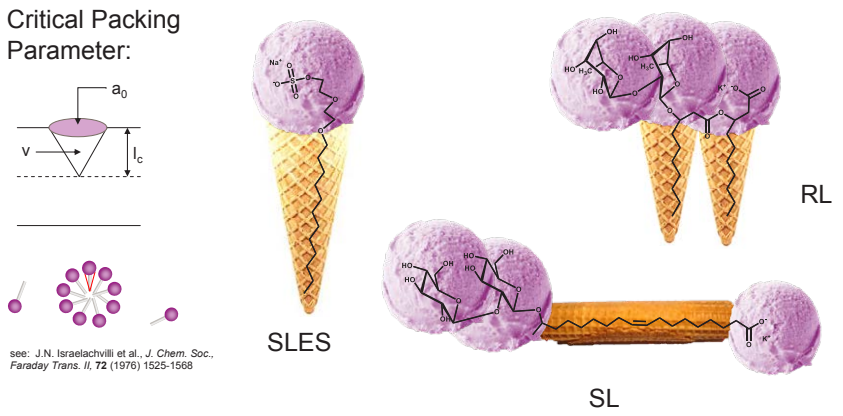



**Fig. 4** Aggregation of surfactants is determined by their molecular architecture (Source: *J. Venzmer,* Evonik Operations GmbH)

A Climate Saving Non Fossil-Based Circular Plastic Economy is Possible...

... in case the following preconditions are realized during this decade:

(1) Harmonized **EPR-schemes** (instead of plastic fees/taxes) with sufficient **incentives** for recycability and recycled/biobased plastic & a **$CO_2$-fee** on all fossil-based carbon → **regulators**

(2) Use „**circular plastic**" instead of „recycled plastic" (move to non fossil-based plastic, includes biobased plastic): One unified, global „Circular Plastic Label" → **all stakeholders**

(3) Fast and large **investments in mechanical AND chemical recycling AND biobased plastic** to ensure better **qualities, sufficient capacities and low $CO_2$-footprints** for circular plastic → **recyclers & chemical industry**

(4) Support neededd via **EU Green Deal & Recovery plan** (more research and subsidies) → **EU commission & governments**

(5) Only **short-term oncosts for circular plastic** not higher than 120 %(mechanical recycled) to 150% (chemical recycled/biobased) vs. fossil virgin, **mid-term same cost level as fossil virgin** material → **chemical industry**

(6) Commitment to **increase „circular plastic"** content in packaging → **manufacturers**

(7) Readiness to bear **higher cost for packaging → entire value chain including retail and consumer**

**Fig. 5** The Take Away (Source: *T. Müller-Kirschbaum,* Henkel AG & Co. KGaA)

### SPECIAL: Effective Lobbying Today – the Association TEGEWA e.V. and the European Chemicals Policy

*Dr. Alex Föller*
Association TEGEWA e.V.

The association TEGEWA e.V. coordinates and moderates the interests of some 100 member companies in the field of performance and process chemicals. Among their members approximately 40 companies produce surfactants and/or cosmetic ingredients for the cosmetic and the detergent industry. Since the 90ies the German Sector association TEGEWA is involved in European Law making processes, which have gained importance over the last 25 years. Today we can postulate that the major number of regulations which need be implemented by the German chemical manufacturers have been prepared and decided in Brussels resp. Strasbourg, whereas the first stimuli often have been triggered by single EU member states. How will a German-based association representing predominantly German companies be able to raise its voice in a European concert? In order to do so, several options are available, depending on the nature of course – it is thus key to choose the proper option. Nevertheless, which way ever to be chosen, they all have one basic principle in common: there is a need for allies to evolute impact, be it mutual advocacy in the format of strategic alliances or be it in a matching and work-sharing coordination with other organisations. On the basis of three upcoming regulations of relevance for the

TEGEWA member companies it will be demonstrated how European legislation in preparation can be monitored effectively by a German (or other National) sector association: 1,4-dioxane: The expected regulation will affect to a large extent the cosmetic and the detergent industry and their surfactant suppliers Polymers and REACH: Most likely REACH will be amended in order to consider a certain range of polymers for registration, which will affect huge parts oft he chemical industry „Green Deal": This topic will be a great challenge for the whole European Economy (**Fig. 6**).

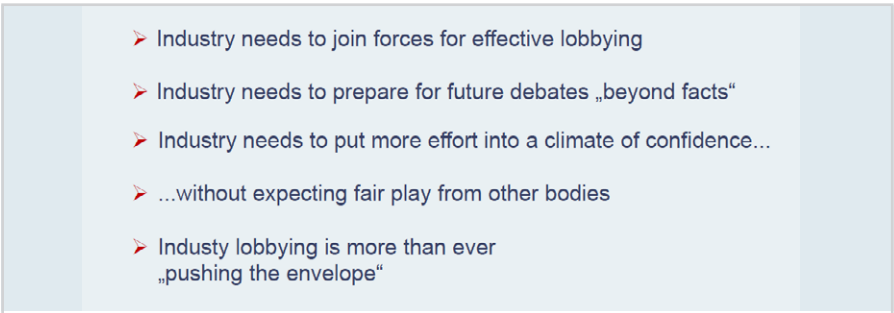



**Fig. 6** Take home messages (Source: *A. Föller,* Verband TEGEWA e.V.)

## Effective Cleaning through a Second Skin – Protein Layer Structure as Key for Successful Formulations

*Dr. Matthias Reihmann*
GELITA AG

The innovative *easy-to-clean* concept with hydrophilic protective layers, which are formed by functional collagen peptides on cleaned surfaces, enables the formulation environmentally friendly cleaning agents. Superior cleaning results, extended cleaning cycles, lower water consumption and simplified cleaning are documented. The surfactant-protein film interaction is key for successful formulations.
The surfactant influences the hydrophilicity of the protective layer. Depending on the collagen peptide concentration, cleaners have different surface affinities despite comparable surface tension. This drives the effectiveness of the cleaners.
Further studies examined whether the protein film may promote growth of microorganisms or inhibit it. The first results show that the protein film has no practical disadvantages. In addition, transport and fixation of active substances to cleaned surfaces is possible to temporarily protect against pathogens (**Fig. 7**).

## With or without Handshakes: Formulating Safe, Gentle and Effective Hand Disinfectants

*Esther Lansdaal*
Corbion

The coronavirus pandemic has brought renewed attention to the importance of hand hygiene. Health and governmental authorities worldwide stress the potential of conscientious hygienic practices, like those recommended by the World Health Organization, to slow the spread of COVID-19. Thorough handwashing is an essential practice, as are "social distancing" habits such as forgoing handshakes, kisses and other forms of greeting that involve physical contact. Disinfectant products providing a convenient means of sanitization when handwashing is not possible are also important. But given the need for frequent hand cleansing to avoid infection, many disinfecting hand rubs are too harsh and drying to the skin. There is a need in the market for solutions that deliver both antimicrobial efficacy and gentleness. Many disinfectant hand rubs and sprays use high levels (>70%) of alcohol in order to deliver disinfectant properties and rapid evaporation. These high levels of ethanol dry out the skin with frequent use. Ethanol content of 40% is generally suffi-


**Fig. 7** Outlook 2021 and beyond – Where will it take us from here? (Source: *M. Reihmann,* GELITA AG)


**Fig. 8** Antimicrobial formulation guidelines (Source: *E. Lansdaal,* Corbion)

cient to achieve quick evaporation, but too low to provide proper disinfection of the hands. However, when combined with lactic acid, 40% ethanol will eliminate germs, evaporate quickly and have a milder effect on the skin. Only eight different BPR type 1 products are registered today. Of those eight, only a few are safe, natural biocidal ingredients available for producing disinfectant hand soaps and gels, and even fewer are both effective and mild to the skin. Lactic acid is a natural, safe and effective PT1 registered biocide that enables the creation of lower-pH hand soaps and gels (pH 3 – 4.5) offering safety, mildness and antimicrobial efficacy without the use of aggressive biocides. This presentation looks at options for formulating products that help consumers protect their health without harshness to their skin (**Fig. 8**).

## From the Presentation Block Forum for Innovation – Home Care

### Innovation, Sustainability and Cost Trends in Detergent Formulations

*Dr. Roel Hermant*
Frames Formulation Intelligence B.V.

FRAMES is a Formulation Intelligence Platform that provides direct access to on-shelf detergent formulations and costs. A key functionality is the platforms ability to integrate all available public information and assign levels & costs, based on long-term expertise in product development and supply chain. FRAMES' smart-design database is uniquely positioned for competitor market research, to support innovations and optimize product cost-performance. FRAMES presents market trends for Home Care formulations in Europe and North America. Fast moving formulation developments are discussed in terms of innovative aspects and sustainability concepts. Focus will be given on surfactants, chelates, enzymes and polymers. The importance of detergent cost-performance optimization is highlighted by an ever-increasing margin pressure in Home Care and publicly available performance results of on-shelf products, which are compared on a cost-per-wash based on retail price. Several examples are given from branded & retail detergents that use different formulation and manufacturing tactics. The latter (manufacturing capacity, material sourcing-handling-processing, quality) appears to become more specific for format or for handling of e.g. green materials. This can lead to a more complex supply-chain or raw material sourcing (**Fig. 9**).

## From the Presentation Block Forum for Innovation – Personal Care

### Sustainable Actives Made of Microalgae – Protection and Repair Following the Archetype of Nature

*Dr. Sandra Christian*
GloryActives GmbH

Microalgae have existed on our planet for nearly 4 billion years and were the precondition for organic life. In order to survive under the extreme conditions on our planet at the beginning they have developed strategies to defend their cells against the harmful impacts of UV radiation and other environmental burden. In this lecture we would like to show how to use these strategies of the microalgae for the development of cosmetic actives. These actives adopt the mechanisms of microalgae to protect and repair our skin cells. Microalgae are the valuable feedstock for our actives, which are being produced with sustainable production techniques (**Fig. 10**).

### Baycusan® eco E 1001: the New Naturally-derived film Former for More Sustainable Makeup

*Astrid Wulfinghoff*
Covestro Deutschland AG

Today's consumers expect not only high-performance and new sensorial experiences from cosmetic products, they also desire to lower environmen-


**Fig. 9** Innovation – Sustainability (Source: *R. Hermant,* Frames Formulation Intelligence B.V.)

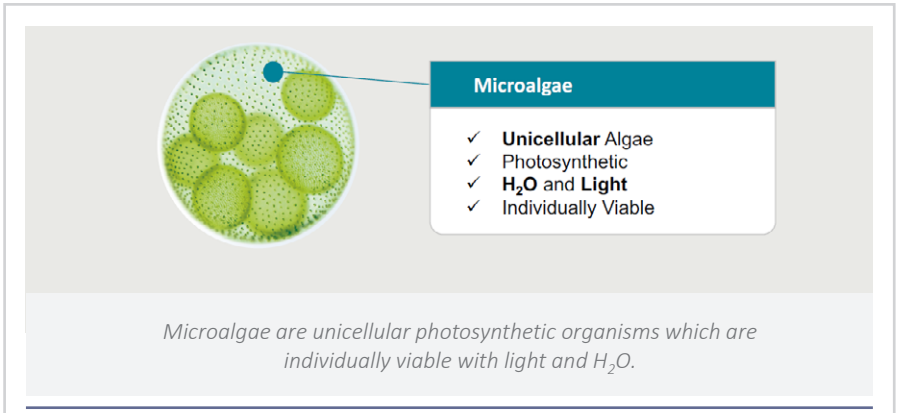



**Fig. 10** Microalgae Technology – Sustainable Cultivation (Source: *S. Christian,* GloryActives GmbH)

tal impact with their daily personal care routine. Until now, formulators had faced the challenge of needing to choose between high-performance synthetic and natural components. Too often, the use of 100% natural raw materials in formulations was connected with visible and tangible disadvantages. In the color cosmetics segment, there are clear opportunities for more sustainable formulations. New product development is still not meeting the requirement of consumers on greener and high-performing makeup products. Film formers are crucial ingredients for makeup formulations as they impart must-have, long-lasting properties. So by using the next generation of bio-based film formers, formulators can increase natural content of traditional high-performing makeup formulations and also improve the properties of natural makeup products. Covestro presents its second partially bio-based film former, Baycusan® eco E 1001, specially designed to tackle this color cosmetics challenge. The product consists of more than 50 percent renewable carbon and may be labeled as a naturally-derived ingredient in accordance with ISO Standard 16128. Baycusan® eco E 1001 achieves at least the same desired performance level as synthetic film formers – especially in formulations where long lasting and transfer resistance are important. Baycusan® eco E 1001 imparts waterproofness, water-, sweat-, rub-off and transfer resistance to color cosmetic formulas, such as foundation and mascara. The new film former is an excellent way of enhancing the naturalness of makeup formula without compromising on performance (**Fig. 11**).

## DEOBIOME NONI PRCF – Natural & Microbiome Friendly Deodorant

*Daniel Robustillo*
Vytrus Biotech

The active ingredient DEOBIOME NONI PRCF is an innovative biological deodorant that safely and permanently prevents the development of body odour. Conventional deodorant active ingredients usually pursue two strategies, by clogging sweat glands or by bactericidal action. DEOBIOME NONI PRCF is different and follows the concept of a biological deodorant. It allows the skin to continue its natural function and has been proven to be very well tolerated by microorganisms of the microbiom. The concept of the biological deodorant is based on two strategies. One is a biological strategy: plant quorum quenching molecules (QQ) prevent bacterial communication (as quorum sensing by signal molecules) and the formation of undesirable biofilms and are involved in the production of bad odours. On the other hand, a prebiotic strategy: DEOBIOME NONI PRCF represents an innovative prebiotic cocktail based on sugars that modifies the metabolism of commensal skin microbiota from lipids to polysaccharides and reduces the production of bad smelling molecules. Numerous tests prove the effectiveness of DEOBIOME NONI PRCF, we can prove the mechanism of action and the effectiveness on the user. We show the quorum quenching (QQ) activity and the reduction of the quormone synthesis (LUX-S/LUX-R). This causes the proven broad-band bacteriostatic effect (Gram+, Gram- & Fungi) and the prevention of biofilm formation. The active ingredient has also proven its microbiome compatibility and protects commensal bacteria from pathogenic germs. *In vivo* we determined the odour intensity by sniff test and by analysis with gas chromatography combined with mass spectroscopy (GC-MS). We tested in the armpit and on the foot, and we also determined the sweat rate in the armpit. We were thus able to prove that we have a highly effective and very well tolerated deodorant that meets the requirements of the modern market (aluminium-free, vegan, natural cosmetics, no preservatives) (**Fig. 12**).

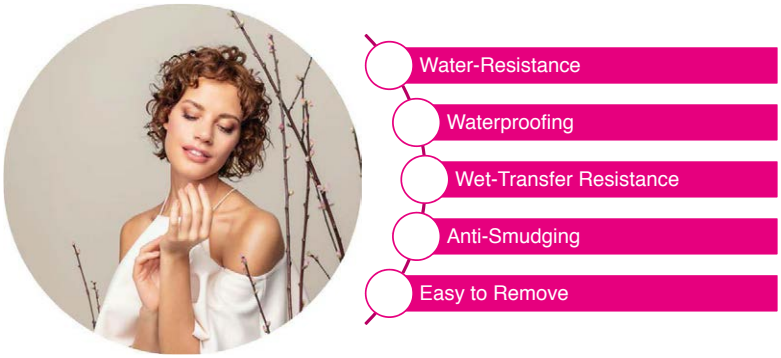



**Fig. 11** Key Benefits of Baycusan® eco E 1001 (Source: *A. Wulfinghoff,* Covestro Deutschland AG)

### Declarations

**Free from:** GMO, BSE, gluten, palm oil, cosmetic allergens, CMR ingredients, nanomaterials, VOC
**COSMOS** certified
**ISO 16128** Natural Origin Index: **99.5%**

### INCI

Glycerin, Morinda Citrifolia Callus Culture Lysate, Water (Aqua), Citric Acid, Maltodextrin
Preservative-free
China-listed INCI also available

### Dosage

Suggested use level: 0.5 - 2%

### Formulation

Water and ethanol dispersible
Incorporation during the cooling phase (<40ºC)
Temperatures of up to 60ºC for a short time do not affect the stability

**Fig. 12** Deobiome Noni PRCF – The Biological Deodorant – Technical information (Source: *D. Robustillo,* Vytrus Biotech)

## Can Emulsions and Alcohol-based Systems also be Thickened Naturally?

*Laura Ratz*
Nordmann, Rassmann GmbH

In most cosmetic products, consistency enhancers are indispensable. But is it possible to use natural ingredients? In this year's presentation, our team will show you a range of versatile and innovative raw materials that thicken and stabilize both emulsions and alcohol-based systems in a natural way. We'll introduce you to the newly launched Kelco-Care™ Diutan Gum, an innovative raw material which achieves a thickening effect in emulsions as well as in alcohol-based systems. Taking a natural hand sanitizer gel as an example, we'll demonstrate that Kelco-Care™ Diutan Gum can thicken alcoholic systems with 70% ethanol. Furthermore, we'll present a rich hand cream formulation in which Kelco-Care™ Diutan Gum proves that even emulsions can be thickened and stabilized effectively. Based on rice, corn or tapioca, natural NATIVACARE™ starches combine perfectly with Kelco-Care™ Diutan Gum to offer effective solutions for thickening emulsions. In addition to providing thickening properties, the starches also allow for the creation of different textures and sensory experiences. Additionally, the BENTONE HYDROCLAY™ range contains other natural options for building consistency. These products not only thicken the water phase and offer thixotropic properties but generate textures that are both pleasant and silky. Based on hectorite, BENTONE HYDROCLAY™ 2000 is one of the most efficient rheological additives and provides formulations with viscoelastic characteristics (**Fig. 13**).

## Efficient Foam Testing

*Dr. Martin Hoffmann*
SITA Messtechnik GmbH

Foam or the foaming of liquids plays a decisive role in almost all applications of cleaning and care products containing surfactants. Particularly in the case of personal care products, user perception is defined to a large extent by the foam. The relationships between the raw materials used, formulations, foam creation and the resulting foam are complex and represent a major challenge in the research and development of surfactant-containing products. Modern measurement technology therefore has the task of reflecting these relationships as efficiently as possible. On the one hand, this means that the measuring systems used can record the relevant properties of the foam with the necessary accuracy. On the other hand, application-oriented foam production with a high degree of reproducibility and a high degree of flexibility in varying the test conditions is essential. Subject of the presented investigations are two shampoo formulations on which with the help of the SITA FoamTester the influence of the test conditions on the resulting foam is discussed. In order to find the optimal test parameters to differentiate the different samples, varying the temperature, concentration or foaming strategy is used to generate specific foams and compare them to each other.

## Scientific Analysis of the Foaming Behaviour of Aerosol Based and Emulsion Pump Foams

*Dr. Andrew Mellor*
KRÜSS GmbH

Numerous cosmetic products are offered in packaging with integrated foam applicators. These are usually

| | BENTONE Hydroclay™ 2000 | BENTONE Hydroclay™ 1100 | BENTONE Hydroclay™ 900 |
|---|---|---|---|
| **INCI** | Hectorite | Magnesium Aluminum Silicate | Hectorite, Hydroxyethylcellulose |
| **Use Level** | 0.3–3% | 0.25–9% | 0.1–3% |
| **Properties** | - High viscosity<br>- Thixotropy and syneresis control<br>- Blurring/soft focus effect | - High viscosity<br>- Thixotropy for easy coverage<br>- Blurring/soft focus effect | - Less shear thinning<br>- Pseudoplastic flow |
| **ISO 16128 Natural Index** | 1 | 1 | 1 |
| **pH Range** | 6-11 | 6-11 | 3-11 |
| **Viscosity** | Good | Good | Excellent |
| **Suspension** | Excellent | Good | Excellent |

ECOCERT COSMOS APPROVED ECOCERT COSMOS APPROVED

**Fig. 13** BENTONE Hydoclay™ (Source: *L. Ratz,* Nordmann, Rassmann GmbH)

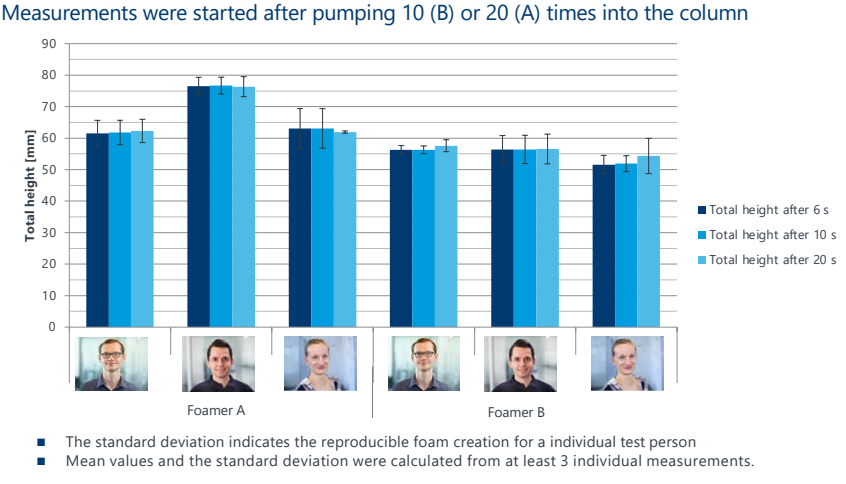



**Fig. 14** The amount of created foam is more independent of the test for foamer B than it is for foamer A (Source: *A. Mellor,* KRÜSS GmbH)

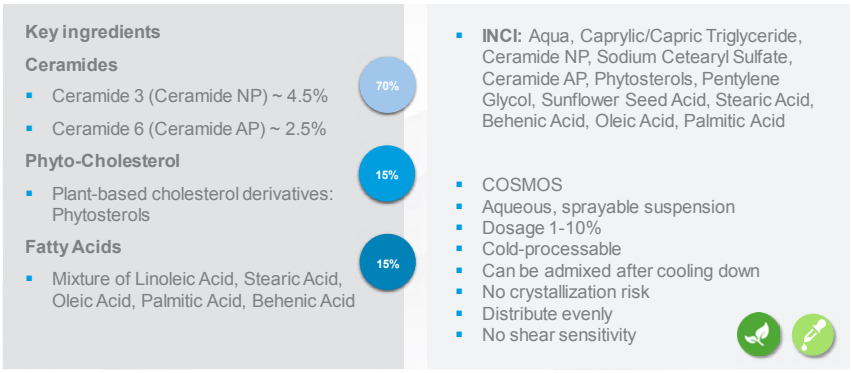



**Fig. 15** BergaCare SmartLipids Ceramide – Valuable actives for a strenghtened and healthy skin barrier (Source: *K. Köhler,* Berg + Schmidt GmbH & Co. KG)

aerosol-based foams that are produced directly from a container under gas pressure. Products in which the foam is generated manually by a pumping process are in vogue, as they meet higher requirements for sustainability and product safety. The development of emulsions which are foamable by manual pumping processes is technically challenging. Alternative, low viscosity formulations are necessary to produce foams by such pumping processes at all, and it must also be ensured that the so generated foams have a familiar appearance for the consumer and, above all, that they are comparable in each individual application. Currently, however, there is often a lack of suitable technical analysis facilities for these foams, as commercial foam analysis devices use a device-specific foam generation which does not correspond to the actual foam generation in the consumer's end product. Here we present an application test with the corresponding measuring method to reliably determine the foam structure (i.e. bubble size distribution) and its aging. In this test the foams are produced in the same way as in the actual application of the end product by the consumer. By testing with several test persons we can quantify the reproducibility of the different foam generation processes for different formulations in numbers. In addition, statements can be made about the moisture content and drying of the foams. As typical model systems, we have developed pump foamable cosmetic emulsions with different surfactants and subjected them to the application test. Here, a widely used surfactant, APG, and a polyglycerol ester were used as different tensides (**Fig. 14**).

## Small, but Smart – Your Submicron Bodyguards: Boosting the Skin Barrier with Ceramide Delivery Systems

*Kristin Köhler*
Berg + Schmidt GmbH & Co. KG

The skin barrier protects our skin from dehydration, prevents from external aggressors and ensures the functionality of the skin as our body's biggest organ. It is a real bodyguard. However, internal and external factors can harm the sensitive lipid layer and affect the protective functions possibly resulting in a decreased humidity level, hypersensitivity or premature skin aging. Besides cholesterol and different essential fatty acids, ceramides are the most essential building blocks of the skin barrier. The skin's natural regeneration process to restore the lipid layer is often reduced with stressed or damaged skin, which makes the dermal application of ceramide containing products necessary to rebuild the lipid layer. Specially developed for those requirements, BergaCare SmartLipids Ceramide offer lipid encapsulated skin-identical submicron molecules mimicking, repairing and enhancing the natural skin barrier. The SmartLipid technology offers additional advantages such as higher ceramide loading capacity, improved skin penetration of the active, reduced TEWL, stabilized system and easy incorporation (**Fig. 15**).

## 'Clean and Green' Ingredients

*Dr. Nora Schiemann*
IMCD Deutschland GmbH & Co. KG

Clean Beauty is a trend that meanwhile has been becoming a lifestyle. Undeceived customers have more and more specific questions, which reveal that Clean Beauty is being understood in different ways. For this reason, there is now more talk about Clean and Green, which addresses both the benefit for the consumer and the environmental impact in sourcing and use of a product. The focus is on terms such as ethical sourcing, natural compatibility and health. This applies to all areas of daily life and ultimately also to cosmetics. Examples of ingredients that reflect this trend illustrate how the cosmetics industry takes these customer needs seriously (**Fig. 16**).

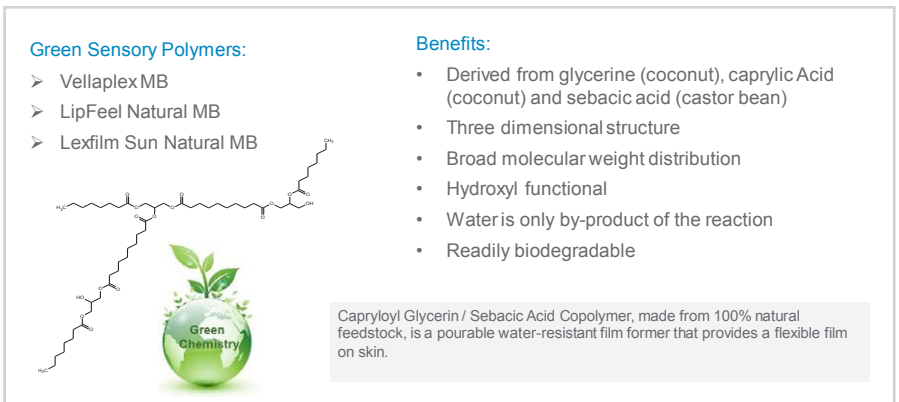



**Fig. 16** Focus Products – Green Sensory Polymers (Source: *N. Schiemann,* IMCD Deutschland GmbH & Co. KG)

## From the Presentation Block Scientific Conference – Sustainability by LUV

### EU-harmonised Poison Centre Notification (PCN); Obligations, and Deadlines; UFI-code, a New Label Feature

*Dr. Gertraud Scholz*
IPPM GmbH

The EU harmonized product notification is mandatory for new or modified consumer products and professional products with physical or harmful health hazard characteristics as of January 1st, 2021. For industrial products, a reduced notification obligation is required as of January 1st, 2024 plus 24h/7d call service. Cosmetic products are not affected for product notification, a PCN (Poison Center Notification) dossier with harmonized information is submitted under a unique recipe identifier – the UFI (Unique Formula Identifier) to the appointed body of the respective EEA state. The UFI is a 16-digit alphanumeric code consisting of numbers and letters, generated from VAT + individual recipe number and is part of the label or, for industrial products, to be mentioned on the SDS. The data file for registration in PCN format and UFI generator are available on the ECHA website. Each company that markets dangerous products in the EEA has an obligation, depending on its role as formulator, toll-formulator, importer, distributor, private label, re-brander and re-labeler. The distributor does not have to notify but must ensure that the product notification was done by the supplier in the relevant target countries. National product notifications are valid until December 31st, 2024 (**Fig. 18**).

## From the Presentation Block Forum for Innovation – Sustainability

### Solvay Sustainable Ethoxylated Surfactants

*Florence Bussod*
Solvay

As our market grows towards a more environmentally friendly future, today's consumers search for sustainable home care cleaning formulations with naturally derived, biodegradable ingredients that maintain excellent performance. Formulators rely on innovative, nature-based ingredients to deliver safety and reliability to consumers. Sustainable cleaning routines go beyond naturally derived ingredi-

## Keynote Address

### The Big Melt

*Prof. Dr. Dirk Notz*

Bitter cold, frozen oceans, gigantic glaciers: This prevailing image of the polar regions of our planet still captures the true look of these regions quite well. But possibly not for very much into the future: In the Arctic, sea ice on the Arctic Ocean disappears rapidly, temperatures rise two to three times as fast as the global average, and the glaciers slowly disappear.
We quote Prof. Dr. Dirk Notz: "In the presentation, I combine my own experiences from numerous expeditions into the polar regions with the scientific background of climate change. In doing so, we will explore climate change in the distant past, the rapid changes that we all experience today, and will examine how the future will possibly look like. And in doing so, we will be able to answer the overarching question of whether we can still stop the big melt." (**Fig. 17**).

- The climate of our planet is warming
- The changing climate will cause a climate state that humans have never experienced
- a maximum of about **400 billion tons of $CO_2$** may still be emitted to probably keep global warming below 1.5 °C.
- about **40 billion tons of $CO_2$** humans currently emit every year.
- To stop global warming, we must reduce net-$CO_2$-emissions to zero.
- This holds for every country, every region, every sector, every person.
- How can we achieve this goal?

**Fig. 17** The Big Melt – Summary (Source: *D. Notz*)

- Access your portfolio – which products are affected
- Use (consumer, professional, industrial) and deadlines
- Target member states (EEA), language
- New Transparency of supply chain via UFI; strategic planning e.g. private label
- UFI-Management; link Product identifier- formulation code-VAT (e.g. mother company), UFIs of suppliers, UFI of MIMs
- Option of limited submission
- Option of group submission
- Define a responsible person and contact point
- Organisation of submissions and updates
- Mapping your companies data and keep the data up-to-date, e.g. composition change, supplier change

**Fig. 18** EU-Harmonised Poison Centres Notification – Be Prepared (Source: *G. Scholz,* IPPM GmbH)

## Scientific Conference: Session German Association of Perfumers

DEUTSCHE GESELLSCHAFT DER PARFÜMEURE in der SEPAWA

Thursday morning was dedicated to a series of lectures with topics on scent and smelling.

The decision on the 2020 sponsorship award was already made at the beginning of the year. Out of all the very high quality applications, Ms ***Celina Louise Sharp*** emerged as the winner with her Master's thesis **"*In Vivo* Evaluation of Efficacy and Skin Compatibility of Hedione and Ambroxan Including Olfactory Assessment"**. This thesis, which was prepared at the University of Hamburg in cooperation with the company Frey&Lau, convinced the jury with its comprehensive scientific approach and the combination of objective efficacy measurements for a cosmetic preparation with the olfactory assessment by the test persons.

During the SEPAWA® CONGRESS VIRTUAL 2020 in October, *Ms Sharp* was formally honoured as the winner of the sponsorship award. In her presentation, she clarified that the investigated fragrances hedione, ambroxan and phenylethyl alcohol showed a positive effect on the skin. For this reason, future research should also investigate the potential of fragrances as active ingredients. Regarding the subjective assessment of the test emulsions, all preparations with the fragrances were rated better than the placebo without fragrance.

This was the ideal follow-up to another lecture at the SEPAWA® Fragrance morning on 29.10.2020: Ms ***Rita Ribau Domingues***, Olfasense, gave an excellent overview of today's instrumental possibilities in the evaluation of fragrances under the title **"What Smells Good Sells Better: Odour Testing in Personal and Home Care Products"**. The human nose still plays the decisive role. Special test equipment and a well-trained panel are required so that several testers can evaluate under exactly the same conditions.

The lecture by ***Professor Dr Thomas Hummel***, Technical University Dresden, on **"Taste and Smell Dysfunction, and Consequences of Olfactory Loss"** was also very informative. Prof. Hummel first introduced the physiology of smelling and showed that a loss of the sense of smell has far-reaching effects on a person's well-being. Due to a COVID-19 infection, many affected people temporarily lose the ability to smell, usually lasting 4–8 weeks. Fortunately, the olfactory brain is plastic: with regular olfactory training, the ability to smell returns more quickly!

Overall, the interest in the Fragrance lectures at the SEPAWA® CONGRESS VIRTUAL was high. Of course, we very much hope that we will be able to smell live again at the 2021 congress!

ents, however. Home care solutions that reduce overall water usage, prioritize renewable energy and limit the implementation of unnecessary plastic add value to sustainable cleaning routines. Solvay works through responsible sourcing to improve our environmental impact in our range of sustainable home care ingredients. In this framework, Solvay is innovating by finding a new way of manufacturing to reduce the carbon footprint of its ethoxylated surfactant by using ethylene oxide made from sugar cane instead of petrochemical feedstock. The Bio ethylene is produced by fermentation and oxidation of the sugar cane. For sustainable home care solutions, Solvay offers natural-based ethoxyated surfactants with 100% of natural origin carbon. Our Rhodasurf® 6 NAT and Rhodapex® ESB-70 NAT are sustainable, high renewable carbon index surfactants that combine excellent performance with eco-friendly sourcing. For instance, Rhodasurf® 6 NAT is a 100% bio-based Laureth-6 from Palm Kernel and Sugar Cane. Its performance is identical to petro-based options but having 100% of natural origin carbon. Using Rhodasurf® 6NAT will allow formulators to reduce the green house gas emission by 20% and the consumption of Nonrenewable resource by 30% by replacing all petrochemical feedstock with biobased product. Rhodapex® 6 NAT is used in applications such as laundry detergents as excellent emulsifiers with good detergency and wetting properties but with an outstanding sustainable profile.

## From the Presentation Block Forum for Innovation – Technology & Machinery

### Dust Free and Safe Handling of Powders in Home and Personal Care Production

*Dr.-Ing. Hans-Joachim Jacob*
ystral gmbh

In production of Cosmetics, Detergents and Cleaners many powders have to be mixed into liquids. Their dust is always hazardous if inhaled and often additionally combustible causing the risk of a dust explosion. Breathing fine dust is often harmful. Enzyme powders like Amylase or Protease for example cause sensitisation. Aluminiumchlorhydrate, SLS-powder and organic acids are extremely irritant. Other powders may cause lung disease if inhaled. Later in final liquid, gel

or cream they are completely safe. But during production they are critical. Other powders create combustible dust during transport and handling. Examples are organic thickeners, polymers, encapsulated fragrances, organically coated powders, waxes, starches etc. Starch or vitamin B3 for example, which is applied in many skin care formulations, is often used to demonstrate dust explosions. Ystral provides a Technology for dust free and safe induction of harmful and dust-ex powders under controlled conditions. Ystral TDS machines create an internal vacuum inside the liquid. This way the liquid itself inducts the powder dust and loss free directly from bags, drums or boxes. No filters nor dust extractions are required. Even powders with very low Minimum Ignition Energy (MIE) are inducted without risk. Ystral provides machines for installation in classified ex-zones. But in Home and Personal Care Production the area for handling these critical dust-ex powders is typically not classified as dust-ex zone. This is no problem. Ystral provides specially equipped and certified machines for the safe handling of dust-ex powders even in not ex classified zones. These machines have a special ATEX classification. Another topic is the induction into inflammable liquids like alcohols. A typical example is the induction of resins into ethanol in the production of hair lacquer. Severe accidents happened in the past. The Conti-TDS guarantees a safe process today (**Fig. 19**).

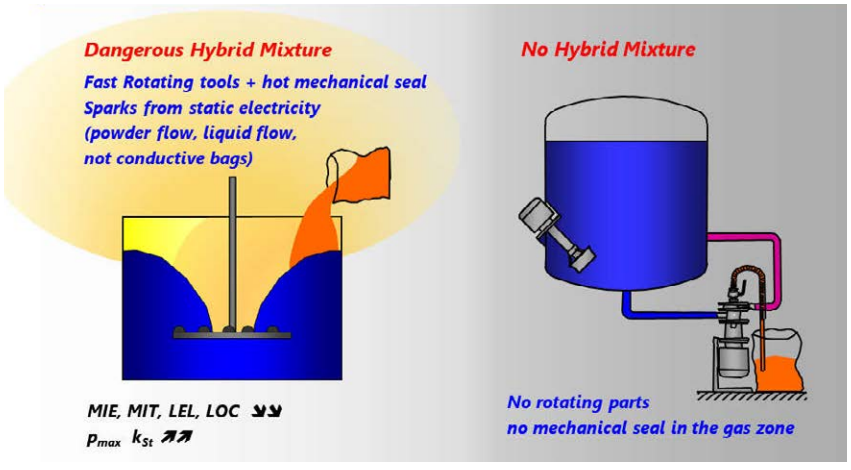



**Fig. 19** Explosions of Dangerous Hybrid Mixtures Vapout / Combustible Dust (Source: *H.-J. Jacob,* ystral gmbh)

## SPECIAL: What has COVID-19 Changed in People's Everyday Life and Conclusions with Regard to a 2nd Wave

*Prof. Dr. med. Axel Kramer*
University Medicine Greifswald

The following topics were discussed in detail: Hypothesis about the origin of SARS-CoV-2 and its pandemic spread; transmission and persistence of SARS-CoV-2; effectiveness and indications of hand and surface disinfection; role of social distancing and personnel protective equipment (PPE), wearing length of protective masks and possibilities of reprocessing; criteria for private-sector quarantine; the principle of the triage before hospitalization of patients; prevention of respiratory infections including COVID-19 by antiseptic gargling; keeping a health diary for health self-monitoring; importance of contact person tracking in different living and working areas; role of children for transmission of SARS-CoV-2 and consequences for daycare centers, kindergartens and elementary schools; what has COVID-19 changed in people's everyday life such as new prevention awareness, fewer children suffering from colds, zoom meetings instead of business trips, restriction of international travel and reduced $CO_2$ emission; relocation of production of PPE and drugs back to Germany; awareness of local products; eliminating hygiene deficiencies in the accommodation of foreign guest workers, and conclusions with regard to a 2nd wave.

Forum Cosmeticum 2020 28–29 October Estrel, Berlin

## Forum Cosmeticum 2020

Using synergies even in difficult times. The active contribution of many members of the German Society for Scientific and Applied Cosmetics (DGK e.V.), the Society of Swiss Cosmetic Chemists (Swiss SCC) and the Society of Austrian Cosmetic Chemists (GöCH) has a long-standing tradition at the SEPAWA® CONGRESS. Now the Forum Cosmeticum 2020 has taken place under the umbrella of the SEPAWA® CONGRESS as a one-and-a-half-day lecture event. Scientific cosmetics will thus be given an even higher status at the congress.

## EcoSun Pass: A Tool to Evaluate the Ecofriendliness of UV Filters Used in Sunscreen Products

*Dr. Sascha Pawlowski*
BASF SE

Cosmetic products are widely used around the globe and the demand for high quality and safe products is still rising. In recent time, the environmental impact of cosmetic ingredients gets increasingly into focus. UV light absorbing agents as part of sunscreen products are currently under scrutiny whether they might negatively impact the environment such as corals and coral reef community. Therefore, a scientific based tool entitled "EcoSun Pass" was developed which enables the evaluation of the ecofriendliness of UV filters used in sunscreen products. EcoSun Pass is the first tool which allows the combined assessments of both, environmental impact and efficiency of UV filters. As a first step, a hazard score of a UV-filter was identified using avail-

| | SPF 50 | SPF 50 | SPF 50 | SPF 50 |
|---|---|---|---|---|
| The BASF EcoSun Pass | 3,0% PBSA<br>1,0% EHT<br>10,0% OCR<br>4,0% BMDBM<br>5,0% EHS<br>3,0% BEMT | 3,0% PBSA<br>2,5% EHT<br>5,0% BMDBM<br>5,0% EHS<br>2,0% BEMT<br>4,0% MBBT | 2,0% PBSA<br>2,5% EHT<br>5,0% EHS<br>2,0% BEMT<br>4,0% MBBT<br>6,0% DHHB | 2,0% EHT<br>2,0% BEMT<br>4,0% MBBT<br>6,0% DHHB<br>3,0% TBPT |
| UV-Filters concentration | 26% | 23,5% | 21,5% | 17% |
| SPF calc. | 52 | 49,1 | 50,1 | 51,4 |
| UVA-PF calc. | 17,0 | 16,8 | 27,3 | 33,4 |
| The BASF EcoSun Pass | 0 | 175 | 216 | 263 |

**Improvement of environmental compatibility of UV-filter system is possible**

**Fig. 20** EcoSun Pass Calculation – Sun Care SPF 50 (Source: *S. Pawlowski,* BASF SE)

able physico-chemical, environmental fate and ecotoxicological data. At second, the hazard score of this substance was multiplied by its concentration in the product. For a certain composition of UV-filters, the sum of these results represents an ecotoxicological ranking value of the product, which is then related to the maximum achievable level. The resulting relative ranking value allows the optimization of the composition of sunscreen products with respect to most ecofriendly properties (**Fig. 20**).

## Sun Protection – New SPF-Methods Make UV-Protection Visible, Wavelength by Wavelength

*Uli Osterwalder*
SunProtectionFacilitator GmbH

The imminent break-through of new sun protection factor (SPF) test methods will open up a whole range of new understanding and new opportunities to improve sun protection further, e.g. towards uniform protection, aka spectral homeostasis. The SPF as defined by Franz Greiter 60 years ago measured protection against the natural sun. The current gold standard ISO 24444 uses solar simulated UV radiation with a bias towards UVB radiation and the complete lack of visible light. We can fill-in this blind spot by transmission measurement *in vitro* or calculation based on the absorption and scattering of the UV filters (*in silico*). Such alternative SPF methods have been under development for many decades, but none of them can be used as a complete surrogate of ISO 24444 so far. The hybrid diffuse reflectance method (HDRS) comes closest because it is also based on an *in vivo* data, while not generating an erythema. Replacing an established method by an improved, simpler, faster or more accurate method happens in many areas, especially in health care. To give all relevant alternative methods a fair chance to be evaluated, a group of stakeholders such as sunscreen manufacturers, UV filter suppliers, testing institutes, equipment suppliers, academia and other experts formed the Consortium ALT-SPF. The German Society of Scientific and Applied Cosmetics (DGK e.V.) has been actively involved in the test design. The statistical concept has been developed by Quodata GmbH, which specializes in interlaboratory testing, validation of measurement methods, experimental and sampling design. An alternative SPF method should fulfil the condition of commercial neutrality, i.e. the commercial bias (systematic bias for single products) is negligible in comparison to the reproducibility standard deviation according to ISO 5725. This paper presents the progress and first results of the Consortium ALT-SPF (**Fig. 21**).

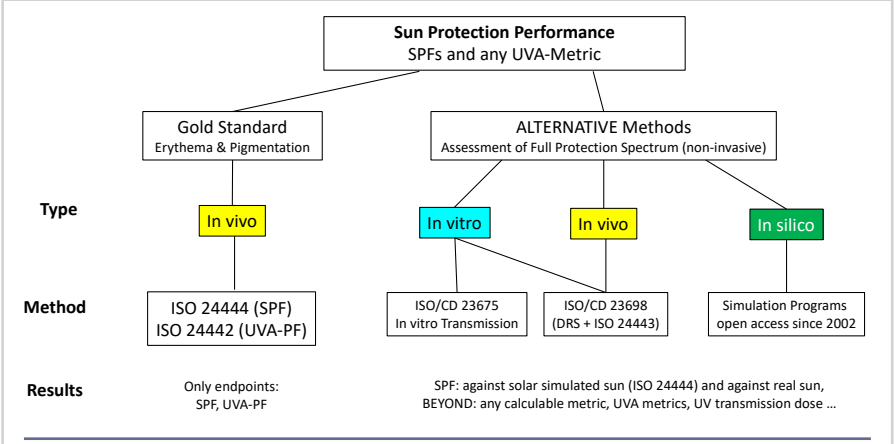



**Fig. 21** Overview Alternative Methods
(Source: *U. Osterwalder,* SunProtectionFacilitator GmbH)

## "Seeing is Believing" – What About Feeling? A Sensory-Driven Formulation Concept

*Petra Huber*
ZHAW Zurich University
of Applied Sciences

Also in "digital times" sensory benefits are known to materially affect consumers' choice not only for cosmetics. Formulations of (natural) cosmetics may need to be optimized or modified if they are prone to initial sensorial issues or if the critical requirements of consumers are not adequately addressed (e.g. biopolymers instead of "liquid plastics"). Or a formulation should be optimized by addition of sensory modifiers, the selection of emollients or rheological additives, and structureproviding raw materials. However, there is a large range of potential additives and hence product developers are keen to receive rapid, preferably real-time, time-saving and reproducible feedback on new formulations. After several years of investigations this presentation will propose a roundup about how

a sensorydriven process of formulation development can be made easier "visible" and observable and how the transferability of a predictive model enables the identification of suitable ingredient candidates (**Fig. 22**).

- **Sensory panel testing** remains the **gold standard for an all-over and broad objective characterization**.
- **Predictive models using instrumental measuring methods** which are broadly applicable in predicting sensory product characteristics have yet to be developed (**no general model**).
- However, the instrumental techniques described in these **studies can represent cost-effective techniques** for use in **product pre-screening tests** for **specific product categories and under certain conditions** (provided appropriate sensory profiling has been validated) for e.g. prescreening potential sensory additives or (bio-)polymers.
- **Frictiometric measurements** have a satisfactory correlations especially for the **"Afterfeel"** phase of emulsions (needs different amounts of emollients) (Study 1 and 2).
- Characterization by **oscillometric values** correlated best with the sensory **evaluation of the gels** (Study 3).

→ As **sensory data are recognized as a key to success in the market,** they provide the link between formulation, marketing and consumer expectation

→ There is **no acceptable substitute for the human fingertip**!

**Seeing and touching is believing!**

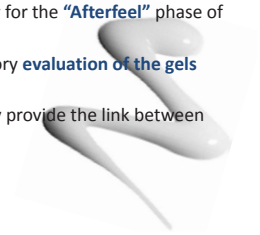


**Fig. 22** Outcomes & Conclusions (Source: *P. Huber,* ZHAW Zürcher Hochschule)

## Senolytics – Clearing Aging Skin of "Zombie Cells"

*Dr. Franziska Wandrey*
Mibelle AG

Cellular senescence is one of the hallmarks of aging and describes a state of cells that cease to divide. Senescence may occur as a consequence of DNA damage, for example induced by UV irradiation, or by reaching a maximum number of cell divisions for that particular cell type. These senescent cells are not fully alive, but they are far from dying: they secrete a plethora of factors, including pro-inflammatory molecules and are thus regarded as "zombie cells". In the skin, senescent fibroblasts accumulate with age and cause chronic inflammation reactions which further contribute to the aging process. A novel concept called senolytics helps to clear tissues of senescent cells in order to reduce inflammation and rejuvenate the tissue. Notably, healthy cells are not affected by senolytic agents as they specifically target senescent cells. To apply the concept of senolytics for the first time in cosmetics, an *in vitro* study was performed using fibroblasts in which senescence was induced by oxidative stress. An extract of alpine rose leaves was able to significantly reduce the number of senescent cells in culture while not affecting the number of non-senescent cells. In a randomized, double-blind placebo-controlled clinical study, the active ingredient significantly reduced redness and improved skin elasticity (**Fig. 23**).

- Zombie cells = senescent cells
- Senescent cells exacerbate the aging process
- Senolytics selectively eliminate senescent cells
- An Alpine Rose leaf extract showed senolytic efficacy

→ **Translation of a novel anti-aging topic for cosmetics**

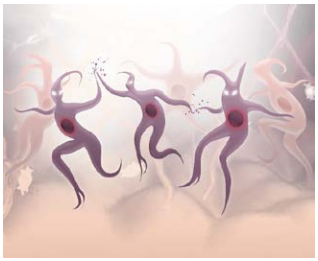


**Fig. 23** Senolytics – Summary (Source: *F. Wandrey,* Mibelle AG)

## Thanks, Conclusion and Outlook

The board of SEPAWA® e.V. would like to thank all those who contributed to the success of the 1st SEPAWA® CONGRESS VIRTUAL. In particular, these are the 116 lecturers who faced the extra effort of video recording and the 117 exhibitors who filled the virtual exhibition with professional content and also the 14 poster presenters. They are also the 935 congress participants (2270 accumulated congress participants during the 3 days) who actively participated in the chat or passively as spectators in the virtual auditorium. It is interesting to note that we recorded an increase of approx. 35% in the number of listeners at the lectures compared to the previous year. Of course, the number of virtual exhibitors has fallen by about two thirds. The international character of the event with participants from 42 countries remains. The virtual journey knows no obstacles.

As a conclusion it remains that SEPAWA® e.V. has succeeded in successfully carrying out the 67th SEPAWA® CONGRESS VIRTUAL under the restrictions of the Corona Pandemic. However, an honest stock-taking after the congress also shows that SEPAWA® e.V. has suffered considerable financial losses. We all know that an association of our kind also lives from personal contacts and discussions. A return to 'new normality' is our goal. Then nothing will stand in the way of a SEPAWA® CONGRESS 2021.

Special thanks go to the organising team of the congress at the office of SEPAWA® e.V. and the Verlag für Chemische Industrie. The preparation for the 68th SEPAWA® CONGRESS has already begun.

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# Disinfection Yesterday, Today and Tomorrow – Effective Chemistry in the Fight against a Global Viral Danger

M. Squire

## Introduction

The coronavirus (COVID-19) pandemic is an ever-growing source of concern and uncertainty for Governments and all of us. Its drastic impact on lives and economies is of great concern, and is likely to continue until a mass vaccination is carried out.
The increasing number of daily cases worldwide highlights the need for better protection and infection control procedures across all UK hospitals, health centres, care homes and now especially schools.
So how can we gain improved control against this virulent, highly infectious virus?

## Historical Virus Control

In centuries passed, various chemicals have been used for cleaning. For instance, in *The Odyssey,* Homer wrote that the protagonist, after defeating his rival, demanded that Sulphur be burned in the house to detoxify and purify the space. Mercury was also used for cleaning, and as a protectant for surfaces in many different cultures and eras. While these were all somewhat archaic and sometimes toxic methods of achieving clean spaces, so little was known back then about bacteria and other microorganisms, it was thought that if you could see the chemical working (through smoke, or a coating on a surface), then it was killing the causative agent of the disease. However, with Antonie Van Leuwenhook's discovery of microorganisms in 1675, and his discovery that vinegar killed some of these microorganisms in 1676, scientists started realizing that these previously unseen organisms could be capable of causing disease, and in turn, chemicals could potentially kill these organisms without a visible reaction to the eye. This discovery opened the door for unlimited research in the study of the use of chemicals to kill microorganism(s) on a variety of surfaces and settings.

### Phenolic Compounds

Phenol has been used as a hospital antiseptic and disinfectant since Joseph Lister used a phenol agent in his ground-breaking work on surgical antisepsis in the 1880's. He used carbolic acid as the agent of choice in his research of sterilizing surgical instruments and wound cleansing, becoming the first antiseptic widely used in the surgical setting. Nowadays, due to the toxicity of phenol, use of this active has been superseded by synthetic phenolic derivatives. Synthetic phenolics like Preventol® CMK or Preventol® O extra, from LANXESS, are effective against bacteria, mycobacteria, fungi and enveloped viruses, and are well accepted for disinfection use.

### Quaternary Ammonium Compounds

Early in the 20th century, a new agent known as quaternary ammonium salts were first reported by the Rockefeller Institute in 1916 as having bactericidal properties. However, the use of quaternary ammonium compounds (QACs) as a germicide/disinfectant wasn't formally recognized until 1935. The first QAC on the market was benzalkonium chloride (BZK), which was initially introduced as an alternative to carbolic acid for skin antisepsis and scrub in the surgical setting. BZK showed such a significant reduction in skin flora, leading QACs to be further explored as a potential surface disinfectant (which was extremely successful).
Unfortunately, QACS are usually low-level disinfectants unless they are combined with an adjuvant chemical or are a more advanced generation of quat. scientists began to combine disinfectants to see if there was any change in efficacy or the killing of the microorganisms. What they found was that when QACs were combined with alcohol, there was a synergistic change that allowed for a much faster kill of a broader spectrum of microorganisms, including *Mycobacterium tuberculosis.*
This allowed for the combination of QAC/alcohols to achieve intermediate-level disinfection status with the U.S. EPA and today, some hospitals prefer to use this QAC/alcohol combination, for its safety and efficacy attributes.

### Bleach

In 5000 BC, Bleach was used as an agent to whiten clothes and other linens by the Egyptians. In 1847, a bleach derivative was introduced as the hand disinfectant agent at the Vienna Medical Centre to help reduce the risk of postpartum women who developed "Childbed Fever", which had an 80% mortality rate. After introduction, the mortality rate plummeted by 90% in the first month.
Bleach works in a similar fashion to that of alcohol. It will irreversibly denature the proteins of a bacteria, or depending

on the pH of the bleach, penetrate the lipid membrane of the bacteria, causing it to lyse or "pop", and the bacteria to die. Thus, bleach is an extremely versatile disinfectant, especially in the healthcare setting – killing almost all pathogens, including spores. The U.S. Centre for Disease Prevention and Control (CDC) recommends that a dilution of 1:10 bleach water be used in disinfecting surfaces that have highly transmittable, hard to kill pathogens like *C. difficile* or *Norovirus*.
Today, there are many disinfectants that can be safely used in the healthcare setting. However, there is always a give and take when it comes to using surface disinfectants. A disinfectant may be extremely effective at achieving the ≥ 4.00 $\log_{10}$ reduction required (efficacy) and kill claims, but may be very harmful and degrading to surfaces. Every healthcare facility must decide what is best for their facility. With the variety of surfaces in mind, LANXESS offers a range of different EN- and EPA-registered surface disinfectants.

## Virucidal Efficacy Tests

In Europe, an example of the methodology employed for assessing medical use surface disinfectants is the EN 14476 virus suspension method, which requires a 4 log reduction.
In the USA, the EPA uses a hard surface carrier test method to evaluate the virucidal efficacy of biocidal products. This method comprise of inoculating a non-porous sample carrier, with a dried specimen of the target virus against which the disinfectant is to be tested. The log reduction rate achieved by the disinfectant is ascertained by calculating the $TCID_{50}$ (50% Tissue Culture Infective Dose) before, and then after the application of the disinfectant solution, when conducted under a fixed set of test conditions. For the disinfectant to be proven effective, complete inactivation of the target virus, to the limit of detection, or a ≥ 3.00 $\log_{10}$ reduction (99.9%) has to be achieved.
Normally, the presence of viruses before and after the product application is determined by studying the effects conferred by the presence of the infective agent to the mammalian host cells.
These effects on the cells are usually referred to as cytopathic effects (CPE), and from the degree of CPE observed in the study the level of virucidal activity may be subsequently assessed.
The level of CPE found in any given study will depend on a number of factors, with the type of virus and the cell line employed for growth both being considered as significant elements.
Growth of suitable cell line based virus cultures for use in the assessment of disinfectant activity is an intricate and detailed process, which requires a minimum concentration of the virus to be created. Otherwise, it is not possible to accurately assess the level of the virucidal effect conferred by the action of disinfectant activity. Typically, for the assessment of virucidal activity by modern techniques (European EN, or the US ASTM technique, as recommended for use by the EPA) an initial virus titre of 5 $\log_{10}$ – 6 $\log_{10}$ is necessary.


**Fig. 1** Rely+On™ Virkon™ is diluted for application and sprayed on hard surfaces and equipment. It can therefore help to reduce the risk of cross-contamination from surfaces, door handles, tables or chairs during disinfection measures at public transport terminals, airports, hospitals, clinics, shopping malls, etc. Rely+On™ Virkon™ high level disinfectant achieved rapid and complete inactivation of the SARS-CoV-2 virus at a 1:100 dilution rate in just 60 seconds.


**Fig. 2** LANXESS produces a wide range of scientifically based biocide technologies under the Virkon™ as well as Rely+On™ Virkon™ brand. Rely+On™ Virkon™ has been developed specifically for use in the Human Health market sector and, as such, has been tested and proven effective against disease-causing pathogens of specific concern to human health.



Viruses are essentially parasitic agents and are present in two different forms, enveloped (with a nucleocapsid, surounded by an outer lipid layer), and also non enveloped (non-lipid layer) forms. They may be in addition based on either a DNA, or an RNA genome.

Non-enveloped viruses generally show a much higher level of resistance in the face of environmental factors when present on surfaces, and also towards many chemical agents like disinfectants. Factors such as temperature & the prevailing pH, may in addition affect the level of persistence for any given virus entity.

Disinfection agents are considered to be fully virucidal, if they are able to demonstrate activity against both forms of the viruses.

## Disinfectants for Today and Tomorrow

In the real world, users need to be confident that the disinfectant used:

- kills the broadest range of bacteria and viruses and by mechanism of action will be effective against new strains and variants.
- is non-toxic to humans, and harmless to surface materials
- disinfect surfaces very rapidly and maintain disinfectant activity for a period of time
- is very simple to prepare and apply
- is cost effective to use on a routine basis.

The Rely+On™ Virkon™ range contains such broad spectrum disinfectants. For over 30 years, the Virkon™ and Rely+On™ disinfectants have been proven and trusted for the harshest of environments, e.g. in intensive animal farming and food production. In addition, the company has developed products that are geared to the requirements of public health institutions.

### Efficient and Versatile in Use

The Rely+On™ Virkon™ solution is activated by adding the powder to water. The disinfectant is a unique, synergised oxidising system based on potassium monopersulphate – it works via the physical destruction of pathogens. The potassium monopersulphate oxidises proteins in bacteria cell walls and viral structures. This is what disrupts the bacteria's or virus's physical structure and their viability as pathogens.

Rely+On™ Virkon™ is a high-performance, broad spectrum, multi-purpose disinfectant for use on hard surfaces in health care, laboratory, food production facilities and public environments.

The outstanding virucidal performance has been validated across different independent efficacy studies, for many types of such pathogens. Many of these tests have been undertaken with studies made at high profile research testing laboratories, and which are located across various parts of the globe.

Rely+On™ Virkon™ is effective at killing 99.999% of microorganisms in less than 10 minutes. The product is effective against all major pathogens known to man and a wide range of antibiotic-resistant strains.

- 300 strains/clinical isolates from 76 bacteria
- 47 strains/clinical isolates from 35 viruses
- 45 strains/clinical isolates from 17 fungi.

The recent pass achieved for Rely+On™ Virkon™ against the SARS-Cov-2 virus (COVID-19), at a 1:100 dilution, with a one minute contact time and in the presence of a high soil loading, using an EPA approved test method is yet one further piece of evidence of this rapid action, broad spectrum virucidal activity.

Rely+On™ Virkon™ disinfectant for hard surfaces in health care, laboratory, food production facilities, public environments and long-term care homes provides high efficacy where it is needed most. It is safe and simple to use – not classified as harmful to the user. The product has a low acute toxicity, does not cause skin corrosion and does not cause sensitisation.

Once placed in water, Rely+On™ Virkon™ becomes a pink solution, which is activated within 5 minutes. After activation, the solution remains active for up to 5 days. The solution can be applied to surfaces using a spray bottle, sponge, mop etc. Any items that need disinfecting (not medical devices) can be submerged in Rely+On™ Virkon™ solution and rinsed afterwards.

Further information can be found at https://relyondisinfection.com/.

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# Microbiological Risks Associated with the Use of Bars of Soap

## Considering the Need for a Preservation Efficacy Test in the Context of Safety Assessment

U. Eigener, L. Neumayr

## Introduction

Microbiological issues are playing a central role in the quality assurance of cosmetics. This requires appropriate microbiological expertise and know-how. On the homepage of the DGK (Deutsche Gesellschaft für Kosmetik) you can find two new documents from the DGK expert group "Microbiology and Industrial Hygiene", which provide valuable assistance regarding the microbiological safety of bars of soap (https://web.dgk-ev.de/publikationen-fg2/). One of the documents is a shortened version. Here are the details. If you have more questions, please do not hesitate to send them to Ms. Joelle Nussbaum (joelle.nussbaum@bav-institut.de). The topics will be discussed and answered by the working section of the DGK.

## 1. Key Aspects of Using Bars of Soap

- Bars of soap or syndets come into direct contact with the user
- are often used by various people
- the external layers of the bars are dissolved with water and rinsed off during the washing process
- after use, a damp layer (water with dissolved product) remains on the surface
- dripping liquid (water, soap/syndet, dirt) remains on the surface and in contact with the soap/syndet bar

## 2. Microbiological Basics

- Bars of soap (soap base, surfactant base) come onto the market as pressed and dried products.
- The product is not anhydrous (water content usually < 15%); the active water content ($a_w$-) value of unused bars is usually around 0.6.
- The $a_w$-value during use is less than 0.7 if general rules are observed (see below).
- In the case of soaps, the manufacturing process (temperature, lye) and the resulting high pH value also contribute to a significant reduction in germs. For syndets, the antimicrobial effect of highly concentrated surfactants must be taken into account.
- According to ISO 29621:2016 *"Guidelines for the risk assessment and identification of microbiologically low-risk products"*, bars of soap and corresponding surfactant-based products belong to the so-called "low-risk products".

## 3. Survival of Micro-organisms on Bars of Soap

- Due to the circumstances described above, germ multiplication in or on the product is not to be expected.
- The requirements for reduction of microorganism strains, as observed in the common challenge tests over periods of time (a few weeks), cannot be applied to bars of soap because of different applications in practice.
- Due to the use of soap and the rinsing processes, a high exposure to microorganisms is not expected, even if small amounts of microorganisms from user (transient as well as resident skin flora) remain on the surface.

## 4. Medical-hygienic Aspects

- Authors of various experimental studies argue that the transmission of microorganisms by bars of soap in the sense of disease transmission hardly plays a role (*Bannan and Judge 1965; Zoric and Heiss 1969; Heinze and Yankovich 1988; McBride 1984*).
- Opposing opinions can also be found (e.g. *Afolabi et al., 2007, Hedge et al., 2006, Kabara and Brady, 1984*).
- The general opinion is that bars of soap should not be used in medical areas (general hygiene rule) and that bars of soap should also not be used in public areas for hygienic reasons.
- A special feature is the dripping or drained liquid for which there are no microbicidal or reproduction-inhibiting conditions and which therefore represents a contamination risk. This potential danger could not be completely eliminated by the addition of antimicrobial substances.

## 5. Recommended Instructions for Use

In order to avoid risks during use as far as possible, the following information should be given regarding the scope of application and handling on the packaging:

- Not for use in medical and public areas
- Use does not provide adequate protection in the presence of infectious diseases
- Store pieces as dry as possible during use.
- Keep contact surfaces (bowls, underlays with studs, etc.) clean.

## Literature


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# Guidance on "Nature-orientated Cosmetics"

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## 1. Preamble

Cosmetic products contribute towards the wellbeing of consumers, and everyday life can no longer be imagined without them. During the past years, consumers have increasingly turned to natural cosmetics or nature-orientated cosmetics. However, natural cosmetics, nature-orientated cosmetics and conventional cosmetics cannot always be clearly differentiated from one another. Depending on their intended use, many products include more or less natural ingredients. Not all cosmetic products can be made from natural substances alone, such as certain sunscreens and decorative cosmetics or also certain hair dyes. As a matter of principle, all cosmetic products are subject to the comprehensive conditions imposed by the EU cosmetics legislation, and every product must undergo a detailed safety assessment.

As far as certified natural cosmetics are concerned, consumers can orient themselves today towards the different seals. The criteria of NATRUE and COSMOS, for instance, are transparently accessible on the internet. Here, the consumer finds answers to his questions, e.g. whether in accordingly certified natural cosmetics exclusively natural ingredients may be used or whether certain amounts of synthetic substances may be processed as well.

Today consumers expect transparency on all levels: regardless of whether ingredients, processing, packaging or sales are concerned. All these topics are gaining in relevance for the buying decision and hence mark the expectations of customers concerning a product. Consumers sometimes feel puzzled, more particularly, for products which refer to natural ingredients in their advertising but do not have any natural cosmetics seal.

After a thorough discussion about the topic within the framework of DIALOG KOSMETIK [1], all participants agreed that it would make sense to elaborate guidance which can first support manufacturers in positioning themselves authentically with their products on the market. The working group of representatives from public authorities, industry and consumer associations has now elaborated this guidance which is to contribute to a better structuring of the product diversity on the market. This means of course that there will also be more clarity for consumers who can orient themselves better when making purchases. This document is to be constantly amended and adjusted to the current developments on the market – with the goal of creating the best possible transparency for everybody.

## 2. Objective and Status

- This guidance is primarily addressed to manufacturers, distributors, the retail trade, and public authorities.
- The document is supposed to be an up-to-date practice-oriented guidance in support of an authentic communication with the avoidance of greenwashing* concerning the different interpretations of natural cosmetics.
- The focus is on the not clearly positioned intermediary group of "nature-orientated" brands/products.**
- The terms organic and natural cosmetics are sufficiently clearly defined in the publicly accessible guidelines of the established standards.

* We define greenwashing as "the use of visual elements and textual statements which are suitable – on their own or in aggregate – to simulate to the average knowledgeable consumer a certified or comparable natural cosmetic quality"; cf Chapter 4.

** We define "nature-orientated cosmetics" as conventional cosmetics with certain increased shares of organic, natural or derived natural substances.

## 3. Legal Foundations

### General legal framework

Conventional, nature-orientated and natural and/or organic cosmetics are equally cosmetic products within the meaning of the **EC Cosmetic Products Regulation** (Regulation [EU] No. 1223/2009) [2] and must meet the provisions of this Regulation in all cases. Binding provisions apply, amongst other things, to the composition of the products, i.e. the ingredients which may be used, the safety for the user, the information (mandatory labelling elements as well as claims) for the consumer as well as the making available of a product information file including a safety report for inspection by the competent market surveillance.

A complementary **"Claims Regulation"** (Regulation [EU] No. 655/2013 laying down common criteria for the justification of claims used in relation to cosmetic products) [3] states in more detail that the claims on cosmetic products must always be

- truthful
- supported by evidence
- honest and
- fair.

Depending on the target group, the consumer is to be provided with understandable information about the product that enables him to take a decision for or against purchasing. This Regulation is supplemented by a so-called **"Technical document on cosmetic claims"** [4]. This document was prepared by a working group including representatives from the member states. It is not legally binding and deliberately does not include any positions of the EU Commission. However, Annex I to this compilation of interpretations of the prohibition to make misleading claims includes concrete examples which illustrate the criteria laid down for claims on cosmetic products in an intelligible manner.

## Definition of organic and natural cosmetics

Natural cosmetics or organic cosmetics are defined within the framework of this document primarily as cosmetic products which meet the applicable conditions imposed by the guidelines on natural and organic cosmetics which are relevant in Germany (e.g. NATRUE [5], COSMOS [6] and others) and have been verified on the basis of these guidelines by an accredited certification body. These products may be advertised with the additional designation "natural cosmetics", "organic cosmetics" or with an equivalent claim, in line with the conditions imposed by the respective publisher of the seal. Organic cosmetics are basically also natural cosmetics; it is, however, necessary to meet additional requirements concerning the origin of the raw materials from controlled organic production. There is currently no legally binding definition for the term organic and/or natural cosmetics.

Based on the expectations of consumers concerning "genuine" natural cosmetics, certain fundamental requirements can be derived which must be met by natural cosmetic products to allow an informed purchasing decision for consumers. These requirements are derived from the private natural cosmetics standards which have been established in Europe for many years and are already perceived by the consumers as trustworthy guidance.

According to the established natural cosmetics standards, only natural substances recovered by physical methods may, as a matter of principle, be used for organic and natural cosmetic products. Moreover, a very limited list of nature-identical preservatives is generally allowed for preservation purposes. The use of nature-identical inorganic pigments, for instance, for decorative natural cosmetics or as UV filters, is, as a rule, likewise allowed. Whether mineral particles in their nano form are admitted for natural cosmetics is differently regulated in the various standards. For the production of natural cosmetics, it is, moreover, possible to use chemically modified raw materials which must, however, be made to the largest possible extent from natural substances. As a rule, certain types of reaction or intermediate stages such as ethoxylations or quaternary ammonium compounds, are excluded and/or there is a positive list of permitted processes such as hydrolysis, hydrogenation, and esterification. Bioengineering processes are likewise admissible. Some standards define explicit ceilings for the content of chemically modified raw materials.

The following 11 points, which are proposed, represent the smallest common denominator of the established natural cosmetic standards and the consumer expectations and should, therefore, be met by all products which create the impression of being natural cosmetics:

The following is excluded:

1. The use of NOT completely biodegradable surfactants (according to Regulation (EC) No. 648/2004).
2. The use of ingredients which according to Regulation (EC) No. 1829/2003 must be labelled as genetically modified organisms. This applies, by analogy, to ingredients which do not come within the sphere of application of this Regulation.
3. The use of ingredients recovered from dead vertebrates.
4. The treatment of vegetable and animal ingredients or the finished product with ionising radiation.
5. The use of halogenated as well as aromatic solvents.
6. The use of raw materials on a mineral oil basis such as polymers, except for Item 11.

The following are expressly admitted:

7. Natural ingredients (NATRUE: "natural"; COSMOS: "physically processed agro-ingredients"), recovered with physical and biotechnological methods of vegetable, inorganic-mineral or animal origin.
8. Derived natural ingredients (NATRUE: "derived natural"; COSMOS: "chemically processed agro-ingredients") as reaction products of natural substances.
9. The use of minerals, for instance for decorative natural cosmetics or as UV filters.
10. Exclusively natural aromatic substances according to ISO 9235 ("Aromatic natural raw materials – Vocabulary").
11. A very limited amount of nature-identical preservatives, which may also be produced from mineral oil, to secure a sufficient product safety (positive list according to the respective natural cosmetics standard).

In products designated as "natural cosmetics" without certification, a claim relating to "naturalness" by analogy to a certified natural cosmetic quality only makes sense and is truthful if the basic requirements which are defined in the relevant natural cosmetics standards in Europe, are met.

### Reference to ISO 16128

The two-part standard ISO 16128 [7] is an internationally co-ordinated technical guideline. It includes definitions for the subdivision of the raw materials into e.g. "natural" and "of natural origin" and it is, for instance, defined how the organic share of a product can be calculated. However, the ISO guideline does not provide any information as to when a product may be claimed to be an "organic cosmetic product" and when it is a "natural cosmetic product". The ISO standard is, therefore, not comparable to the established natural cosmetics seals. It may, however, serve as guidance for concrete claims in accordance with the common criteria of the Regulation (EU) No. 655/2013.

### Austrian Food Code – Code Chapter 33-1. "Natural Cosmetics"

This Code chapter [8] is to provide the basis for the production and marketing of natural cosmetics in Austria to ensure fair competition through transparency, control and traceability and protect consumers against misleading information.

### Decisions of German case law for orientation purposes

- According to a decision by the Higher Regional Court (OLG) Hamm [9] in 2012, the designation of **"organic oil"** for a cosmetic product gives consumers the impression that this cosmetic product is at least predominantly, i.e. 50% + X, composed of natural/vegetable ingredients. The court held that the designation is misleading if the cosmetic product includes as prevailing ingredients paraffinum liquidum (paraffin oil) of chemical-industrial origin as well as triisononanoin, cetearyl ethylhexanoate and isopropyl myristate. The court assumed, however, that the consumer expects that there may be a certain share of chemical substances in a cosmetic product, even if it carries the syllable "organic" in its name.
- The designation of a cosmetics series by using the terms ***"pure & natural"*** was considered to be misleading in a judgement of the Regional Court (LG) Hamburg [10] of 2012, if it is also produced by using chemical additives. In this case the court assumed that consumers expect, given the green design elements on the packaging with representations of plants, that the products designated as *"pure & natural"* are made from purely natural ingredients (unadulterated). According to the court, the claim *"pure & natural"* creates in this case even a higher expectation than in the event of a product claimed to be a "natural cosmetic product". Even an interrupter with the statement "95 % of natural origin" was considered here as insufficient to eliminate this misconception.

## 4. Guidance on "nature-orientated" claims of cosmetic products

1. **As a matter of principle, it should always be striven for a presentation and communication of the brand, the composition and performance of the product which are as authentic as possible to allow consumers an informed purchasing decision.**
2. In the event of so-called "nature-orientated" cosmetics a misleading **overall impression** can be created through the presentation of the product, its designation as well as claims on the product and in the advertising communication. Visual elements and textual statements which – alone or in aggregate – are suited to give an average informed consumer the illusion of a (certified) natural cosmetic quality or any other misconception of the properties of the product and the ingredients included therein, should, therefore, be avoided.
3. **The following information can help to position a product successfully and authentically with natural and/or nature-based ingredients on the market, without any alignment with natural cosmetics in a narrower sense:**
   - Product designations, illustrations or individual (invented) seals with a strong reference to "nature" and/or naturalness and/or certain plants (parts) should always be used in a considered manner.
   - Packaging design with prominent illustrations of plants, parts of plants and/or fruits may support a perception of the product as natural cosmetic product[1]. In this case an altogether transparent presentation of the actual properties and/or the real benefit of the highlighted component(s) needs to be given special consideration.
   - Product claims relating to the naturalness of the overall formulation or individual ingredients must in each individual case be critically checked. In this case the decisions from German case law [9,10] referred to in Chapter 3 can serve as guidance.
   - Especially for products with mainly conventional main ingredients and/or a conventional main active principle it must be taken into consideration that an excessive highlighting of natural and/or derived natural secondary ingredients can trigger a corresponding misconception concerning the naturalness of the overall product on the level of the consumer.
   - A qualitative and possibly also quantitative highlighting of plant ingredients or their organic quality can, as a matter of principle, be made in different ways. In particular if these substances are only included in low shares in the product, care should be taken to achieve a balanced and transparent overall presentation of the composition of the respective product.
   - When highlighting the overall share of ingredients of "natural origin" (in %), an explanation of the water share for products with a typically high water content is helpful to avoid possible misconceptions.
   - Any "green claims" should not be associated with the assumption that the product is "better or safer, because it is natural". More particularly, claims such as "free from ..." should not assume that a product is "better", safer or more natural because of the mere absence of certain ingredients than a comparable product containing the substances concerned.
   - General environmental claims and claims referring to sustainability and ethics such as

[1] It can, however, – just as a corresponding "with ..." claim – basically also trigger the expectation that the highlighted ingredients are contained as active ingredient(s) and the product has an effect possibly associated with it by the consumer. Depending on the individual case, such illustrations may also be understood as a mere reference to the fragrance of the product or support in the interplay with other corresponding information the assumption of natural properties of the product or individual ingredients.

– "ethical", "ecological" and/or sustainable raw material recovery and/or production

– Nature conservation (biodiversity, endangered species)

should be supplemented by more detailed explanations and/or concretised accordingly – e.g. by referring to more detailed information on the website of the producer to avoid any incorrect conceptions of the consumers.

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[2] Regulation (EC) No. 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products; https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009R1223.

[3] Regulation (EU) No. 655/2013 laying down common criteria for the justification of claims used in relation to cosmetic products; https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R0655.

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[8] Austrian Food Code – Code chapter 33-1. "Naturkosmetik"; https://www.verbrauchergesundheit.gv.at/lebensmittel/buch/codex/kapitel.html.

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[10] Regional Court – LG Hamburg, judgement of 21.12.2012, File ref.: 312 O 96/12.

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# The Renaissance of Heilmoor – A New Efficient and Sustainable Extract

S. Fellner

abstract

Wound healing factors, skin barrier integrity and resistance to inflammation are determinants factors for healthy skin. Additionally, a clean, pro-aged skin that is free from irritation and acne is cosmetically attractive. ALPIN HEILMOOR EXTRACT (AHE), a natural (organic) active ingredient (dark micronized powder) extracted from Austrian healing Moor (Heilmoor) deposits at 500m above sea level, was investigated for its efficacy in maintaining and enhancing these key-parameters of healthy and beautiful skin. A series of *in-vitro* tests involving HaCaT cells and reconstructed human epidermis (RHE) revealed that AHE improves wound healing, enhances membrane barrier integrity and supresses skin inflammation. An open, intra-individual *in-vivo* efficacy study confirmed the multiple beneficial effects of AHE: a pronounced pro-aging effect, remarkable cleansing/anti-pollution efficacy, both, an immediate and a preventive soothing effect, and a convincing anti-acne efficiency. Notably, AHE was generally very well tolerated and appreciated by study subjects.

## Introduction

Historically, peloid (muds and healing earths) has been indicated for the treatment of chronic rheumatic processes, degenerative osteoarthrosis, sequelae of osteo-articular injuries, fractures, dislocations, disorders following vasculopathies, dermatological diseases, etc. [1]. These therapeutic benefits were already hypothesized centuries ago, for example by Abbot Thomas von Lambach in 1364, and the finding of a medieval bathtub is considered the oldest evidence of a moor bathing facility. Even currently, mud therapy (considered as natural pelotherapy) is in practice, such as the popular mud packs and baths practiced at the Dead Sea, Palestina, and the Urumieh Lake, Iran, as well as mud packs and baths that are practiced in rehabilitation centres in Austria, Germany and Hungary.

Cosmetic peloids, on the other hand, have a positive impact on the maintenance of healthy and pro-aged skin. Our objective was to investigate and demonstrate the dermocosmetic properties of Alpin Heilmoor Extract (AHE). AHE is a micronized dark powder which concentrates the healing properties of medicinal peloid in a pure and potent form. It was sustainably extracted from a natural (organic) peloid of an accredited Austrian healing moor deposit (Heilmoor) at 500m above the sea level. We conducted a series of *in-vitro* studies to determine the effect of AHE on skin barrier enhancement, wound healing factors and anti-inflammatory efficacy as well as *in-vivo* clinical studies to ascertain pro-aging (elasticity, hydration, radiance under eye), soothing, and cleansing efficacy of cosmetic grades of Alpin Heilmoor Extract (AHE). AHE was also investigated for its skin acceptability and future use.

## Materials and Methods

A series of *in-vitro* studies with HaCaT cells and reconstructed human epidermis (RHE) to investigate wound healing, skin barrier enhancement and anti-inflammatory efficacy of AHE were conducted. To determine the expression and/or activation of certain molecular factors upon AHE-treatment of cells and *in vitro* skin models, we performed Western blot assays and MSD multiplexing analyses involving the U-Plex platform. An open, intra-individual *in-vivo* efficacy study was conducted to demonstrate the anti-irritant, anti-acne, cleansing/anti-pollutant, pro-aging and skin tolerability properties of AHE, as well as to determine AHE's applicability for future use.

## Results and Discussion

### Induction of Wound Healing Factors

In wound re-epithelialization, E-cadherin coordinates tractional forces promoting collective and directional migration of epithelial cells [2]. E-cadherin was found to be expressed

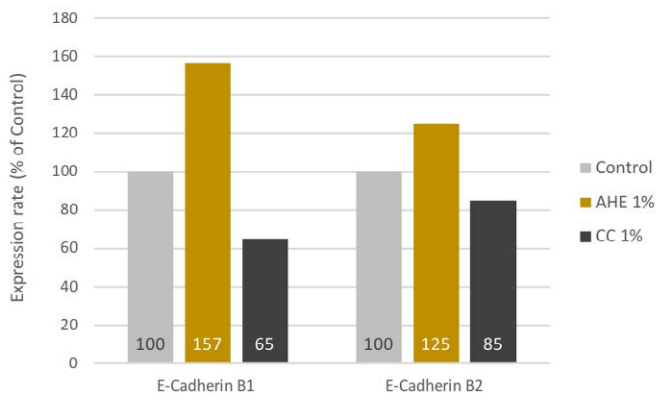


**Fig. 1** Expression rate of E-cadherin after 1% AHE treatment; 1,6-fold and 1,3-fold increase in expression of E-cadherin B1 and E-cadherin B2, respectively, compared to control, i.e. culture medium; (AHE – Alpin Heilmoor Extract, CC – activated charcoal).

in two isoforms of different molecular weight: E-cadherin B1 (120kDa) and E-cadherin B2 (90-100kDa). By participating in multiple signalling cascades and the formation of focal adhesions (FA), paxillin plays a critical role during cellular migration and thus, wound healing. 1% AHE induced a 1,6- and 1,3-fold increase of E-cadherin B1 and B2 expression on the injured skin model (**Fig. 1**). Treatment with 5% AHE resulted into 0,8-fold repression of E-cadherin B1 and complete repression of B2 on the injured skin model but 1.5-fold induction of B1 and 1,7-fold induction of B2 on the intact skin model. Paxillin, on the other hand, was 2,4-fold induced when cells were treated with 5% AHE. These results suggest that 1% and 5% AHE have a positive effect on wound healing by promoting E-cadherin and paxillin expression in human keratinocytes, respectively.

## Enhanced Skin Barrier Integrity

Cytokeratins 10 (CK10) and 16 (CK16) are essential for skin barrier integrity [3]. To understand the effect of AHE on membrane barrier integrity, we determined the expression pattern of CK10 and CK16 in HaCaT cells with and without AHE-treatment, respectively. Western blot analysis revealed an induction of CK10 in extracts obtained from HaCaT cells after treatment with AHE. Furthermore, this effect was reinforced when the cells were pre-stimulated with *C. acnes*.

## Repression of Pro-Inflammatory Cytokines

A continuous expression of cytokines following noxious stress causes chronic inflammation and skin damage which in turn leads to skin disease and (premature) aging [4]. Our *in-vitro*

irritation study demonstrated the anti-inflammatory activity of AHE by suppressing the induction of inflammatory markers, such as tumor necrosis factor α (TNF-α), interleukin-1β (IL-1β), interleukin-6 (IL-6), and interleukin-8 (IL-8) in peripheral blood mononuclear cells (PBMCs) and reconstructed human epidermis (RHE) after stimulation with *C. acnes*. These results suggest a role for AHE in the prevention of inflammatory skin diseases and premature aging by suppressing pro-inflammatory cytokines (**Fig. 2**).

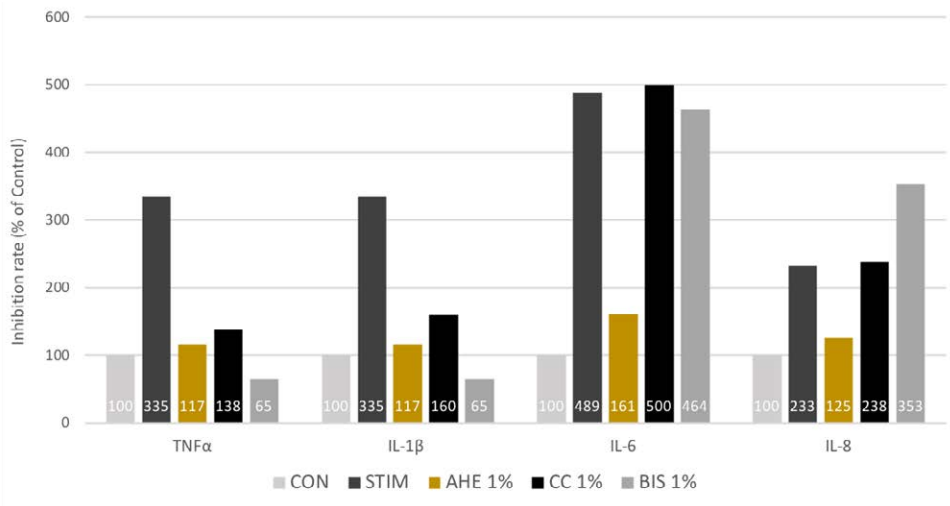


**Fig. 2** AHE-induced repression of inflammatory cytokines TNF-α, IL-1β, 1L-6, and IL-8 after stimulation of reconstructed human epidermis (RHE) with *C. acnes*. (control – non-stimulated, untreated RHE; STIM – stimulation with *C. acnes*, no treatment; AHE 1% – stimulation followed by treatment with 1% Alpin Heilmoor Extract, CC – stimulation followed by treatment with 1% charcoal; BIS – stimulation followed by treatment with 1% Bisabolol).

## Advanced Pro-Aging

A reduction in the levels of functional dermal components such as collagens results in the emergence of clinical aging features, such as wrinkles and reduced elasticity [5]. After 28 days of treatment with a 2.5% AHE-containing day cream, there was a significant improvement in skin firmness (tensing effect of product) by 4%, viscoelasticity (anti-aging action of prod.) by 11%, and plasticity by 12% in 43%, 67% and 48% of subjects, respectively. There was also a significant increase in the cutaneous hydration rate by 6% and radiance under the eyes by 17%, consistent with the moisturizing and radiant skin effect of the product, respectively (**Fig. 3, 4**).


**Fig. 3** Overview of changes in the skin after 28 days of treatment with 2.5% of AHE.

## Enhanced Cleansing Efficacy

1.5% AHE-enriched facial cleanser exhibited a strong efficacy (about 98%) in eliminating carbon microparticle deposit from skin. There was a significant improvement in the elimination index of the treated group compared to the control group ($p < 0{,}006$). Thus, AHE exerts a highly efficient cleansing/anti-pollution effect. Notably, no clinical signs of intolerance or feeling of discomfort whatsoever were reported by the study subjects.

## Immediate and Preventive Soothing Effect

Cutaneous irritation is a commonly known and widespread skin condition. AHE potently decreased the duration of lactic acid-induced stinging by 80% in 100% of subjects. What's more, AHE induced a significant decrease in the stinging intensity by 48%, 89% and 100% after 30 seconds, 5 and 15 minutes after AHE application, respectively, as has been reported by 86% to 100% of subjects. AHE also significantly reduced cutaneous reactivity score by approximate-

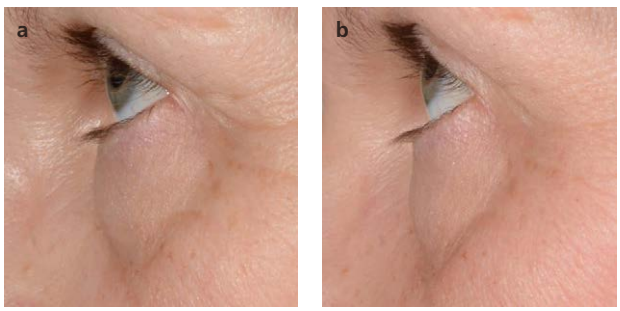


**Fig. 4** **a:** Pro-Aging Effect (Eyebag) of 2.5% AHE; D0;
**b:** Pro-Aging Effect (Eyebag) of 2.5% AHE; D28.

ly 67%, in 97% of subjects after 28 days of use (**Fig. 5, 6**). These results suggest that AHE is an anti-irritant with both immediate and preventive soothing effects.
Moreover, AHE induced a significant decrease of stinging intensity when applied to capsaicin-treated skin: an average 50% decrease was observed by 55% of subjects as soon as 30 seconds after administration, while 70% of subjects reported an average decrease of 70% of stinging intensity within 3 minutes after application of AHE. There was no difference in the decrease of stinging intensity reported after 6 and 9 minutes upon administration of 2.5% AHE, respectively (**Fig. 7**). A significant decrease by 69% in the duration of stinging was also observed in 90% of subjects. Furthermore, there was a significant improvement by 48% on average in cutaneous reactivity observed in 68% of subjects after 28 days.

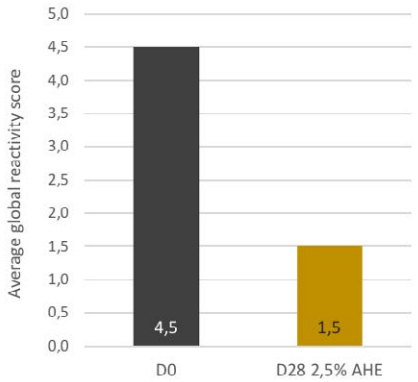


**Fig. 5** Preventive soothing efficacy of 2.5% AHE application for 28 days; decrease in global reactivity score of about 67% in 97% of subjects ($p < 0{,}001$); (D0 – day before treatment onset, D28 2.5% AHE – day 28 of treatment with 2.5% Alpin Heilmoor Extract).

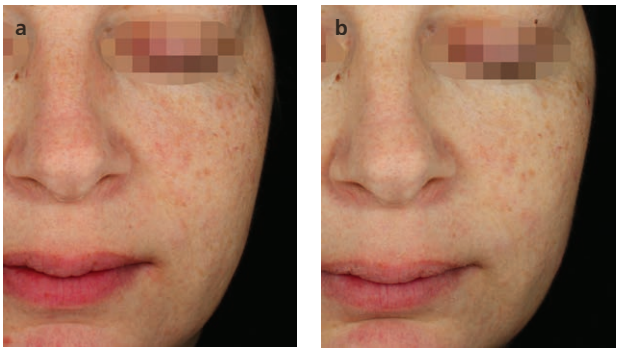


**Fig. 6** **a:** Preventive Soothing Effect of 2.5% AHE; D0;
**b:** Preventive Soothing Effect of 2.5% AHE; D28.

## Anti-Acne Efficacy and Cutaneous Tolerability

Activation of innate immunity via the expression of cytokines by keratinocytes, resulting in the hyperkeratinization of the pilosebaceous unit, plays an essential role in acne formation [6]. After 28 days of twice daily application, 1.5% AHE induced a statistically significant decrease in the number of microcyts, papules and pustules. Moreover, a significant decrease in the total number of lesions (global non-inflammatory and inflam-

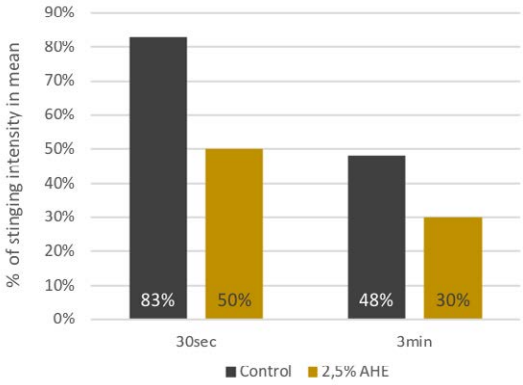


**Fig. 7** Immediate soothing effect induced by 2.5% AHE; statistically significant decrease in the mean of intensity of stinging score after 30 sec ($p < 0{,}001$) and 3 min ($p < 0{,}001$) in 55% and 70% of subjects, respectively.

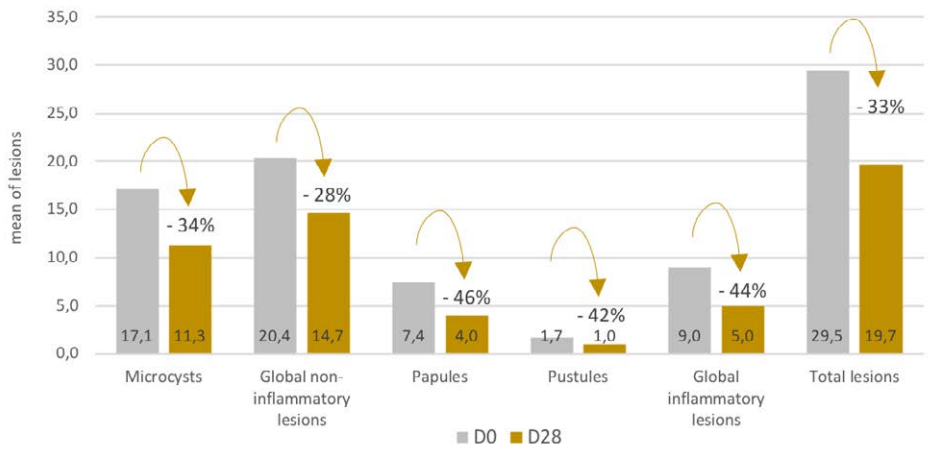


**Fig. 8** Anti-acne efficacy of 1.5% AHE application for 28 days; statistically significant decrease in the number of microcysts, global inflammatory lesions, global non-inflammatory lesions, papules and total lesions ($p < 0.0001$); (D0 – day before treatment onset, D28 – day 28 of treatment with 2.5%).

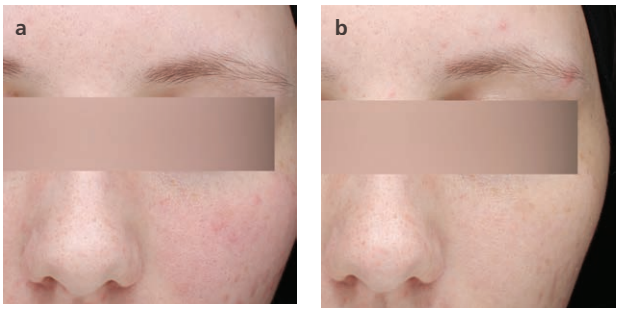


**Fig. 9** **a:** Anti-Acne efficacy of 1.5% AHE; D0; **b:** Anti-Acne efficacy of 1.5% AHE; D28.

matory) was observed (**Fig. 8, 9**). AHE also induced a decrease in porphyrin expression, which characterizes a reduction of susceptibility to acne lesions, though results were not statistically significant. AHE was very well tolerated and about 73% and 82% of subjects stated that the product prevents inflammatory acne if used regularly and reduces inflammatory acne, respectively.

## Conclusion

We found AHE to be implicated in the promotion of wound healing factors E-cadherin and paxillin, and the suppression of cytokines involved in inflammation. Furthermore, AHE was shown to enhance skin barrier integrity by inducing the expression of two different cytokeratines. AHE displays anti-irritant, anti-acne, anti-pollutant, and a pro-aging property when tested *in vivo*. AHE was also very well tolerated stressing its beneficial characteristics for future use in different application forms (rinse-off and leave-on).

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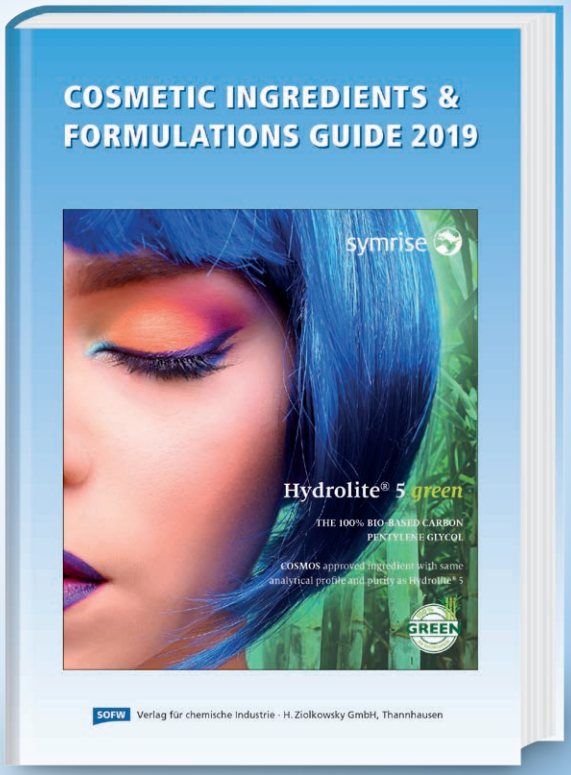


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# A New Approach to Deliver Sensory Benefits to Toothpaste

A. Druffner and S. Kamin

abstract

Foam is an important consideration in the development of toothpaste formulations. Although toothpastes are increasingly formulated to deliver a range of oral health benefits, foam remains an important attribute for consumer acceptability. Foam properties like speed, quantity, quality and longevity are key signal and sensory attributes for many personal care and hygiene cleansing products, including toothpaste [1]. In general, consumers perceive foam as an indication that the product is performing. It is well accepted that surfactants provide foam to toothpaste.

In this study, the foam characteristics of model aqueous toothpastes using sodium lauryl sulfate (SLS) and cocamidopropyl betaine (CAPB) were measured using a Kruss dynamic foam analyzer. Toothpaste foam properties and foam structure were continuously monitored through video image analysis. It was shown that the method can differentiate between the foam of the different toothpaste formulations and the measurements correlate with consumer perception. In additional studies, the impact of a nature-derived polymer, from sustainably sourced cellulose, on toothpaste foam quality was evaluated. The results show the polymer can modify the foam to provide more luxurious and creamy foam to afford consumers with enhanced sensory experience.

The toothpaste segment continues to see new product development in products with sensorial benefits as sensory experiences give life to brands and products deeper meaning to consumers [2]. A key sensorial aspect of toothpaste is the foam generated during brushing. The foam generated by a toothpaste is the result of the surfactant system. Based on a review of global toothpaste launches during the last three years, sodium lauryl sulfate (SLS) and cocamidopropyl betaine (CAPB) are the most used surfactants [3]. Sodium lauryl sulfate (SLS) remains the most common surfactant although there is increasing consumer interest in products that do not contain SLS.

In personal care products, such as body washes, hand soap and shave creams, it is well known that hydroxypropyl methylcellulose (HPMC) enhances the quality of foam in surfactant systems providing a more luxurious consumer experience and improving formulation mildness. HPMC associates with surfactant molecules at the air-water interface via van der Waal forces. Dynamic Light Scattering (DLS), a technique for measuring the size of particles typically in submicron region, has been used by the authors to demonstrate the interaction and association between HPMC and surfactants(results not shown here). These interactions are known to stabilize the bubble film by reducing drainage and slowing the rupture and decay of the bubble lamellar structure. An idealized chemical structure of HPMC is shown in **Fig. 1**.

In addition to improving foam quality, HPMC is known to reduce skin irritation potential of surfactant-based personal care formulations. The literature shows that zeta potential of surfactant micelles correlates directly with Zein solubility and surfactant-induced skin irritation potential of cleanser surfactants [4]. Internal studies have shown the addition of HPMC to surfactant blend lowers the zeta potential resulting in a reduction of skin irritation potential compared to a control. Reducing irritation on oral mucosa may be of interest to oral care formulators and future area for study. The purpose of this study was to show the impact of HPMC on the characteristics of toothpaste foam.

## Materials and Methods

### Nature-derived polymeric surfactant for foam enhancement

HPMC is a water soluble, non-ionic polymer, based on cellulose. It has a natural origin content of >80%, by ISO 16128, 2:2017, making it well suited for natural and sustainable formulations.

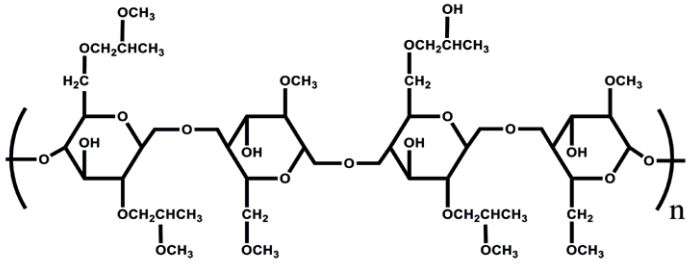



**Fig. 1** Hydroxypropyl methylcellulose exhibits surface activity

Supplied as a white to off-white powder, it is completely soluble in cold water and stable across a wide pH range (3-11). For these studies, a low molecular weight grade of HPMC was selected (**Tab. 1**).

## Toothpaste formulations and preparation

To demonstrate the impact of HPMC on the characteristics of toothpaste foam, aqueous toothpaste formulations, based on marketed products, with SLS and CAPB were selected (**Tab. 2** and **3**).

To make the toothpaste in the laboratory, HPMC was added to the Phase A ingredients and mixed at 800 rpm for 20 minutes until smooth (phase A). Phase B was prepared by mixing the ingredients with water until dissolved. Phase B was added to Phase A and mixed for 10 minutes at 600 rpm. The mixture was then transferred to a Ross mixer and the silica is added until particles are wetted. Vacuum was applied and mixing was continued for 15 to 20 minutes at 80 rpm. The remaining ingredients were added and mixed. The pH was adjusted with sodium hydroxide for multi-benefit toothpaste.

All toothpastes were opaque pastes with pH 6 to 7. To measure pH, a dispersion of 1:3 toothpaste to water was made. The viscosity of the multi-benefit toothpaste is 500,000 to 1,200,00 cP as measured by Brookfield RVT/Helipath viscometer using spindle T95 at 2 RPM for 1 minute. The viscosity of the anti-sensitivity, anti-cavity toothpaste (**Tab. 3**) is 260,000 to 300,000 cP using the same viscometer with a

| Phase | Ingredients (trade name \| INCI name) | SLS toothpaste (control) | SLS toothpaste with HPMC |
|---|---|---|---|
| A | Benecel™ E4M HPMC (Ashland) | 0.0 | 0.3 |
| | Xanthan Gum | 0.3 | 0.3 |
| | Carrageenan | 1.0 | 1.0 |
| | Water | 38.0 | 37.7 |
| | Sorbitol (70 % solution) | 30.0 | 30.0 |
| B | Sodium Gluconate | 1.0 | 1.0 |
| | Zinc Citrate | 0.3 | 0.3 |
| | Stannous Chloride | 0.3 | 0.3 |
| | Stannous Fluoride | 0.454 | 0.454 |
| | Sodium Saccharin | 0.2 | 0.2 |
| | Sucralose | 0.05 | 0.05 |
| C | Zeodent 115 Hydrated Silica (Evonik) | 20.0 | 20.0 |
| | Zeodent 165 Hydrated Silica (Evonik) | 5.0 | 5.0 |
| | Titanium Dioxide | 0.15 | 0.15 |
| D | Sodium Lauryl Sulfate (SLS) | 1.5 | 1.5 |
| | Flavor | 1.0 | 1.0 |
| E | Sodium Hydroxide (50 % solution) | 0.77 | 0.77 |
| **Total** | | **100.0** | **100.0** |

**Tab. 2** Multi-benefit toothpaste containing SLS.

| Phase | Ingredients (trade name \| INCI name) | CAPB toothpaste (control) | CAPB toothpaste with HPMC |
|---|---|---|---|
| A | Benecel™ E4M HPMC (Ashland) | 0.0 | 0.3 |
| | Xanthan Gum | 0.8 | 0.8 |
| | Glycerin | 20.0 | 20.0 |
| | Polyethylene Glycol (PEG) 400 | 5.0 | 5.0 |
| B | Water | 23.0 | 22.7 |
| | Sorbitol (70 % solution) | 20.0 | 20.0 |
| | Potassium Nitrate | 5.0 | 5.0 |
| | Sodium Fluoride | 0.243 | 0.243 |
| | Sodium Saccharin | 0.6 | 0.6 |
| C | Zeodent 115 Hydrated Silica (Evonik) | 20.0 | 20.0 |
| | Zeodent 153 Hydrated Silica (Evonik) | 2.0 | 2.0 |
| | Titanium Dioxide | 0.3 | 0.3 |
| D | Cocamidopropyl Betaine (CAPB) | 2.0 | 2.0 |
| | Flavor | 1.0 | 1.0 |
| E | Sodium Hydroxide (50 % solution) | 0.06 | 0.06 |
| **Total** | | **100.0** | **100.0** |

**Tab. 3** Anti-sensitivity, anti-cavity toothpaste containing CAPB.

| material studied | supplier | methoxyl content (%) | hydroxypropyl content (%) | typical weight average molecular weight | aqueous viscosity* 2 % solution (mPa.s) | grades available |
|---|---|---|---|---|---|---|
| Benecel™ E4M HPMC | Ashland | 28-30 | 7-12 | 400,000 | 2,700-5,040 | food, pharmaceutical and cosmetic |

*Brookfield viscometer, RVT at 20°C

**Tab. 1** Properties of Benecel™ E4M HPMC.

T94 spindle at 2 RPM for 1 minute. Viscosity is measured at 22+/-1°C.

### Characterization of toothpaste foam

A Kruss dynamic foam analyzer DFA 100 was used for evaluation of toothpaste foam. With the DFA100 dynamic foam analyzer the upper and lower foam boundaries (liquid/foam and foam/gas) are detected during and after foaming by the changes in the light intensity measured by the light transmission as a function of time [5]. The measurement is depicted in a height curve that captures the formation of the foam in the foaming phase and its subsequent decay.
The Foam Structure Module (FSM) enables parallel testing of the foam structure. The foam structure (bubble size and bubble count) and its change over the experimental duration is computed by video image analysis.
Toothpaste suspensions of 10g/L were prepared by dispersing one gram of toothpaste in 100 grams deionized water with magnetic stirrer until a uniform solution was obtained.
In the studies, 50 mL of toothpaste suspension was dispensed immediately after preparation in to DFA100 foam analyzer glass column with the help of a syringe. A stirrer module with a two-winged stirring blade was used to stir samples at 4000 rpm for 40 seconds. After 40 seconds of foaming, foam decay was recorded for 400 seconds. Average of three measurements were reported.
To confirm the method can distinguish between toothpastes, several commercial toothpastes were evaluated. The results were correlated to consumer panel test studies. Good agreement was found between the foam analyzer data and consumer perception.

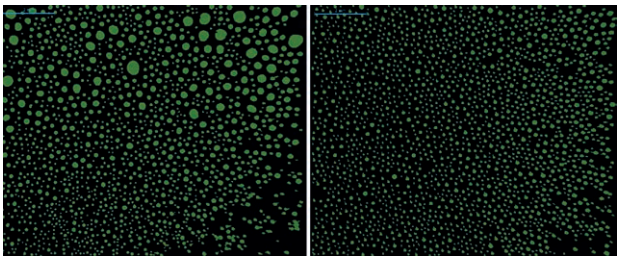
### Consumer evaluation of toothpaste

Twenty panelists were asked to brush with the SLS containing toothpastes with and without HPMC while 18 panelists brushed with the two CAPB containing toothpastes. The panelists wet the brush under tap water for 30 seconds and applied full length strip of toothpaste and brushed their teeth for one minute and rinsed their mouth with 30 mL tap water. The panelists were given one saltine to reset taste buds and wait for 5 minutes between toothpaste evaluations. The panelists were asked to select toothpaste with highest foam volume. Toothpastes were blinded and the order randomized.

## Results and Discussion

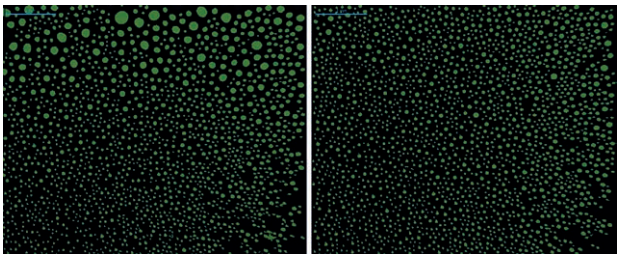
### Creamier foam with addition of HPMC

Fine-pored foam ensures that even areas that are difficult to access are reached more easily [5]. Fine-pored foam is defined as foam with more bubbles per unit volume. The time lapse images, after 200 seconds, of the SLS containing toothpastes show that the SLS containing toothpaste with HPMC (**Fig. 2**) shows the bubble size is smaller and the numbers of bubbles in a defined space is higher. This infers a creamier foam and that the foam can potentially reach between the teeth. The foam structure (**Fig. 3**) of the CAPB containing toothpaste with HPMC exhibits similar behavior. Thus, HPMC enhances foam structure with a variety of surfactants.



**Control Toothpaste (without HPMC)** **Toothpaste with HPMC**

**Fig. 2** Foam structure of SLS containing toothpaste with HPMC (right) shows more bubbles indicating a creamier foam compared to control.



**Control Toothpaste (without HPMC)** **Toothpaste with HPMC**

**Fig.3** Foam structure of CAPB containing toothpaste with HPMC (right) shows improved quality foam.

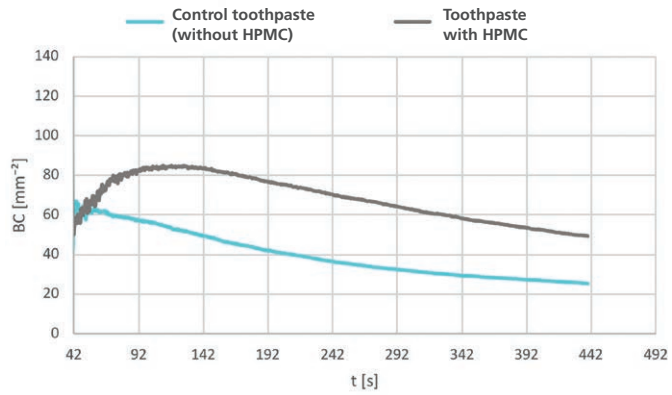



**Fig.4** The SLS containing toothpaste with HPMC shows a decay profile with increased bubble count maintained during the test period compared to the control.

### Longer lasting foam

In addition to evaluating the quality of the foam, it is important to consider foam stability over time or foam decay. The foam should be stable over time in order to aid in distribution of active ingredients for cleaning and good oral health. Foam stability is reported by measuring bubble count (BC) over time (t). The foam volume and the foam decay depend mostly on the surfactant system of the toothpaste formulation. Toothpaste with HPMC show greater initial foam and maintain higher foam volume over 400 seconds. **Fig. 4** shows the results for SLS containing toothpaste with and without HPMC. It is important to consider that foam is continuously generated during brushing, thus, the initial foam is important indication of foam.

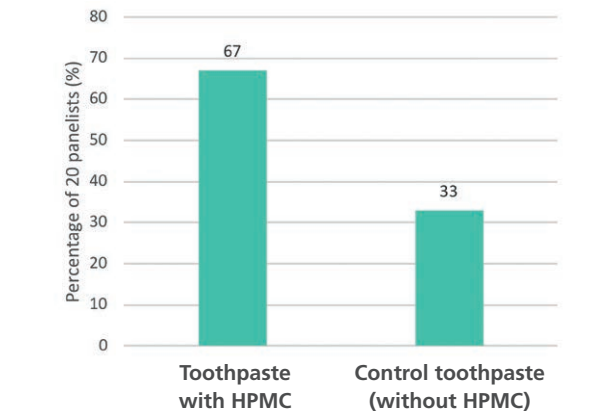



**Fig.5** Consumer evaluation of foam volume of SLS containing toothpastes with and without HPMC.

### Consumer perceivable foam differences

It is important that the consumer has a pleasant brushing experience., but also the consumer should be able to distinguish differences in the sensory experience. Panelist evaluation of the toothpastes show 2 out of 3 individuals identified the toothpaste with HPMC as having higher foam volume (**Fig. 5**). The results for CAPB containing toothpastes with and without HPMC showed similar results.

## Conclusions

Based on the toothpaste foam studies, HPMC increases foam volume and produces an increased amount of smaller bubbles increasing the creaminess of the toothpaste formulations containing SLS and CAPB surfactant systems. Consumers were able to notice a difference in the foam between the toothpastes with HPMC and control toothpastes without HPMC. Hence, HPMC should be considered by formulators looking to enhance the sensory experience of toothpaste.

### Acknowledgements

The authors would like to acknowledge *Dr. Hani Fares*, R&D director, oral and skin care applications and consumer science, *Dr. Germain Puccetti*, principal scientist, consumer science, personal care and household and *Lisa Wahidi*, scientist, oral care R&D for their support and contributions.

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# CLINICAL STUDY

## Effect of Coconut Oil Aroma on EEG Activity and Relaxation State in Healthy Human Beings

I. Tungekar, V. Kaushik, R.R. Ingle, S. Mhatre, R.N. Awale, S. Mhaskar, A. Kulkarni

In the following article we will show that the aroma of coconut oil significantly improves the stressed mental state. Edible coconut oil and a synergistic blend of edible coconut oil and essential oils (bergamot, rosemary and lavender oil) showed a significant improvement in the performance of the alpha wave frequency band, which means a relaxation benefit. We will go into detail about the conduct of the study and its results.

### Introduction

Aromas have the ability to alter a person's mood and behavior; and also provide medicinal benefits [1]. This practice, known as aromatherapy, is carried out since ages and continues even till today [2]. For aromatherapy, essential oils are used, whose fragrance intensity is highly concentrated, through the process of distillation. Although synthetic equivalent of these essential oils is commercially available, essential oils are considered superior to synthetic oils by herbal medicinal practitioner [3].

Aromas tend to evoke different emotions. Stimulating effect depicts increase in autonomic as well as cortical arousal. Sedating effect depicts decrease in autonomic as well as cortical arousal [4]. A Yale University's study evaluated aroma's sedative and stimulating effect in accordance to the changes in subject's heart rate and blood pressure [5]. Heart rate increment was detected when the subjects were exposed to the aroma of Lemon, Valeric acid, Jasmine, Peppermint aroma, Sweet Orange oil and Chiral fragrance. Stimulating effect (subjective alertness) was also observed when exposed to these oils. The decrease in heart rate was observed when the subjects were exposed to the aroma of Spiced Apple, Phenylmethyl, Lavender oil, Rose aroma, Sweet Fennel oil, Nutmeg oil. Sedative effect (relaxing effect) was also observed when exposed to these oils.

Coconut Oil is used in multifarious activity in Asian countries like India, Sri Lanka, Maldives, etc.; from consumption to cosmetics. Coconut Oil contains saturated fatty acid. Since it is a great source of medium chain triglycerides (MCT), it has several health benefits, like better immune system, weight maintenance, healing benefits, etc. [6] [7] along with improving skin, providing shiny hair, reducing dandruff, etc. [8] [9]. Coconut oil also have several mental benefits. Consumption of Coconut oil leads to reduction in epileptic seizures in child, enhancing memory for Alzheimer's patients [10]. One study on rodents found the coconut oil to be anti- depressant [11]. However, there are no studies stating relaxing benefits of coconut oil on human. In one of our internal study, consumers articulate that the smell of Coconut Oil makes them feel relaxed. This finding led us to study the quantitative effect of Coconut oil aroma on stress, in comparison with known aromatic oil with relaxation benefits, as stated above. We used the technique of brain wave mapping through Electroencephalography (EEG) to find the olfactive effect of Coconut Oil in comparison with Essential oil of Lavender, which is world-wide considered as a stress-buster oil [2].

### Electroencephalography

Electroencephalography (EEG) is the measure of the electrical signal of the brain when information is being transmitted between the brain's neurons. It gives information about the functioning of the brain. The brain waves are recorded from the scalp. Brain waves have very small amplitude (up to 100 µV); and its frequency ranges from 0.5Hz to 100Hz. Generally, brain waves are classified into four groups, as stated in **Tab. 1**.

| EEG WAVES | FREQUENCY RANGE (Hz) | INTERPRETATION |
|---|---|---|
| **Delta** | < 4 | Deep sleep, infant, serious organic brain disease. |
| **Theta** | 4-8 | Children (up to age of 13 years), emotional stress in some adults, drowsiness. |
| **Alpha** | 8-13 | Normal person when awake and relaxing |
| **Beta** | 13-30 | Dominant rhythm in subjects who are alert or anxious. Affected by mental activity. |
| **Gamma** | >30 | Associated with consciousness and perception. Occurred during hyper alertness. |

**Tab. 1** Different EEG waves with their frequency range and occurrence instances.

EEG-based experimental studies have been conducted to show the response of brain on olfaction [12-13] and the effects of essential oils on human olfaction [14] in various subjects such as animals [15], elderly women [16], students [17-19], and newborn babies [20].
The alpha wave activity was found to increase when the subjects were introduced to aroma of Lavender, Sandalwood, Cineol, Alpha-pinene, Sweet Orange oil [21], Orchid scent [22], etc. Similarly, the administration of Jasmin Oil, Citrus aroma [21], Rose Scent [22], Peppermint [23], etc. enhanced the beta waves.

## Material

### Subjects

50 participants were selected in the age group of 25-40, out of which, 24 were males and 26 females; belonging to different occupational background.
The subjects were recruited by the recruiting agency of Marico Ltd. Only right-handed subjects were selected for the experiment. Selected candidates did not have any physical or psychological diseases, they were not under any influence of medication, and they themselves willingly participated in the study.
They were instructed not to consume alcohol at least 48 hours before the experiment. They were also asked not to consume anything 2 hours prior to the start of the experiment. They were instructed not to apply any oil or fragrance on the day of the experiment.
The subjects were screened for their olfactive capability and emotional response to the aromas provided, before being selected for final EEG experiment.
Subjects were called 15 minutes prior to the start of the experiment. They were asked to rest for 15 minutes (outside the experiment room). After entering the experiment room, they were instructed about the whole experiment procedure. During this time, EEG cap was placed on the subject's head. They were then asked to sit idle for few more minutes in order to get acclimatized to the room environment. The recording was started after 15 minutes of entering the experiment room.

### Room

The experiment was carried out in a white painted room with controlled lighting, access, temperature and humidity. The cubicle desk was painted with white color (**Fig. 1a**). The dimension of the desk was 90 cm (L) x 60 cm (B) x 73 cm (H). White lights were used for the experiment. The temperature was kept at 26 °C (±1 °C), and the humidity was maintained at 60% (±5%). The subjects were instructed to sit, facing the cubicle.

### Odor

Four oil samples were used in the study, out of which one was aroma-less oil and three were aromatic oils. Aroma-less oil [hereby also referred as Oil Sample 1] was used as control. (weight = 21.49 gm). The three aromatic oils were Edible Coconut Oil, Essential Oil (Lavender Oil), and a synergistic blend of Edible Coconut Oil and Essential Oils (Bergamot, Rosemary and Lavender Oil).
Edible Coconut Oil [hereby also referred as Oil Sample 2] (weight = 21.42 gm) was used in its original form. Lavender Oil [hereby also referred as Oil Sample 3] is used in dilution form (weight of Lavender Oil = 2.171 gm). Lavender Oil is diluted in the same Aroma-less oil in the ratio 1:9. (Total weight of the oil = 22.213 gm). Synergistic blend of Essential Oils and Coconut Oil were prepared by adding the essential oils in coconut oil base in the ratio of 1:100. The quantity of all the oil samples was kept same, 25 ml.

### Odor Administration

The oil samples were administered in an amber colored beaker so that the sample color does not affect subject's perception. The beaker was kept near the nose of the subject, through a stand (**Fig. 1c**). The stand was used to remove the muscle activity that occurs during sniffing process; and also, to ensure constant distance between the nose and the beaker.

### EEG Mapping Device

Neuroelectric "ENOBIO 8" is the device used to record EEG of the subjects. The electrodes used were Ag/AgCl dry electrode (Drytrode). The electrodes were connected to 8 locations of the scalp, viz. P3, T7, F7, Cz, Pz, F8, T8, P4, in accordance as per the 10/20 International electrode placement. Electrode A2 was used as the reference electrode. It was placed behind the right earlobe.

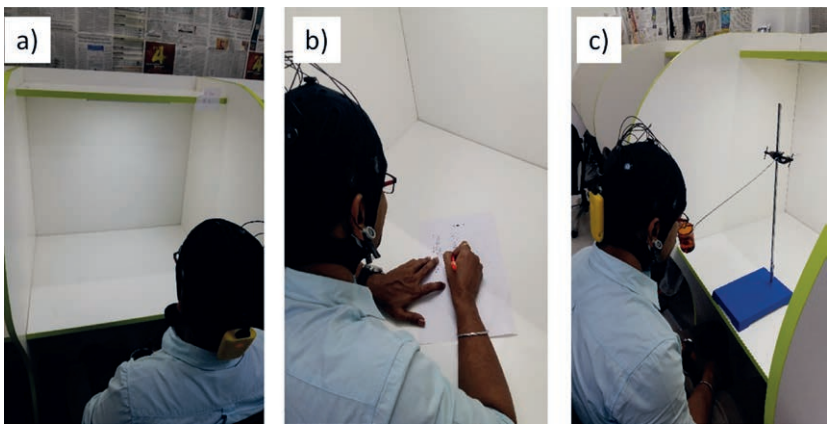


**Fig. 1** Test Room Infrastructure with Stress Test and Odor Administration (a): Subject while looking at cubicle during the rest cycle; (b): Subject solving mathematical quiz during the mental activity cycle; (c): Subject inhaling oil from the beaker, during the exposure cycle.

### Heart Rate measurement device

Scosche's 'RHYTHM+' heart rate monitoring band was used to record the physiological variation occurring because of olfaction of oils. Heart rate was measured, 8 seconds before and after being exposed to stimuli [17]. The device was used because of its continuous heart-rate monitoring capability; and compatibility with smart-phone devices through Bluetooth communication; where the heart rate data was stored.

## Methods

### EEG Recording

EEG was taken for a total duration of 28 minutes. The experiment is divided into 4 repetitive sessions. For the initial two minutes of EEG recording, the subjects were asked to rest, sitting in front of the white cubicle. After the two minutes, the subjects were introduced to stress by mean of a two-minute, time-bounded mathematical quiz (**Fig. 1b**). At the end of this activity, the subjects were exposed to oil sample, for another two minutes. A one-minute recording gap was kept before the start of the next cycle. All these sessions were repeated four times with 4 different oil samples. The entire protocol map is shown in **Fig. 2**. The samples were given in random order to all the subjects in order to negate any systematic effect of multiple aroma exposures to subjects. 50 participants were selected in the age group of 25-40 years, out of which, 24 were males and 26 females; belonging to different occupational background.

### Hedonic Evaluation

In order to record subject's emotional response to different aromas, a semantic differential scale was provided for oil intensity and likeability measurement, along with a Self-Report questionnaire. Self-Report questionnaire was created by including 20 descriptors which signifies various characteristics of the oils. This exercise was carried out after the EEG recording. Subjects were once again exposed to the oil samples for this activity, and the heart rate was measured simultaneously.

### Data Processing

#### Artifact Removal

EEG signals are always contaminated by noise such as high-frequency components, 50/60 Hz line noise, as well as ocular activity and muscle activity. It is easy to detect and remove high-frequency components and line noise with the help of bandpass/notch filters, but very difficult to remove ocular activity and muscle activity, since their frequency is same as that of EEG signal [24–25] which causes ocular signal and muscle signal to overlap onto EEG signal.

#### Independent Component Analysis

In our study, we used the method of EEG artifact removal through blind source separation using Independent Component Analysis (ICA).

ICA algorithm is the method of separating multi-source signal into a signal having mutually independent components; and is based on the assumption that:

- Potentials from different sources is linear, without any significant propagation delay.
- The variations of the bio-potential sources over time are independent.
- There are equal number of sources and sensors [26].

It is a fact that the recorded EEG signals constitute of brain waves as well as artifact signals (**Fig. 3a**). Since the volume conduction is considered to be linear as well as transitory,

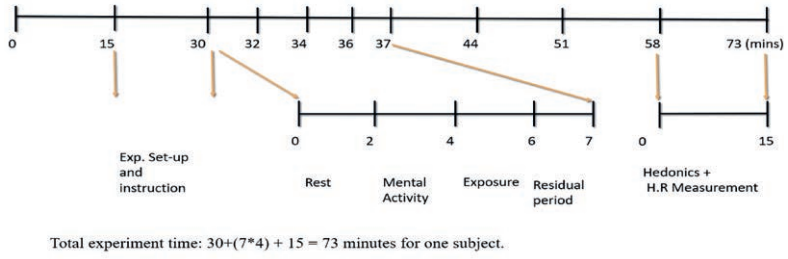


**Fig. 2** EEG Experimental Protocol Map.

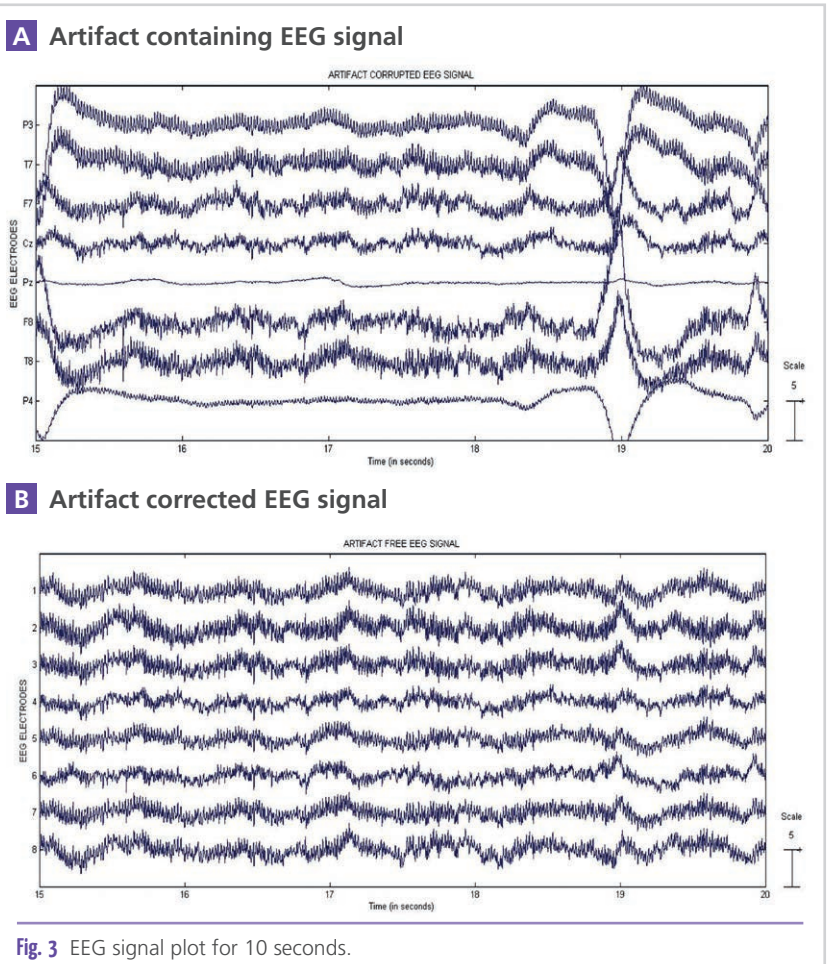


**Fig. 3** EEG signal plot for 10 seconds.

1st assumption is fulfilled. Different sources of biopotentials such as eye, muscles, cardiac signal along with line noise are mutually time-independent. Hence, assumption 2nd is also reasonable. Third assumption is somewhat unjustified since the actual amount of independent signal contributing to EEG is not known.

In order to detect and remove artifactual components, the main idea is to detect the event of stimulation of ICA components. This is achieved by multiplying the unmixing matrix (weight matrix) to the data matrix. The event of the stimulation of the ICA components is produced by the row of the output matrix. The corresponding projection strength of the specific components is obtained by the column of the inverse weight matrix, at each scalp location [27].

"Artifact-free" EEG signals (**Fig. 3b**) can then be acquired as , where is the activation waveforms' matrix, with rows depicting artifactual components assigned to zero.

### Wavelet Decomposition

Since Wavelet Transform has flexible time-frequency window, it is very well suited for EEG signal analysis [28 - 29]. A short summary of mathematical analysis of wavelet transforms through multi-resolution analysis (MRA) is mentioned in Appendix A.

Discrete wavelet transforms (DWT) used in the study provides useful information for analysis of the signal by splitting the original signal into raw approximation and detail information. Each stage consists of the combination of a 'low pass filter (LPF) and a down-sampler' and 'a high pass filter (HPF) and a down-sampler'. Low pass filtering is coupled with scaling function and the high pass filtering is coupled with wavelet function. Approximation coefficients are obtained by the LPF; whereas the detailed coefficients are obtained by the HPF. The multi-level decomposition is achieved by decomposing the approximation coefficient at each level, while the detailed coefficient is reconstructed to give different frequency bands (delta, theta, alpha, etc.) (**Fig. 4**)

In the current analysis, more specifically, Daubechies wavelet (db8) with 7 level decomposition is implemented. The first two level of decomposed signal consists of frequency more than EEG frequency range; hence they are omitted for the analysis. The low frequency of the range 0-1 Hz is also omitted since it contains noise. The final processed signal obtained after all the analysis is as shown in **Fig. 5**.

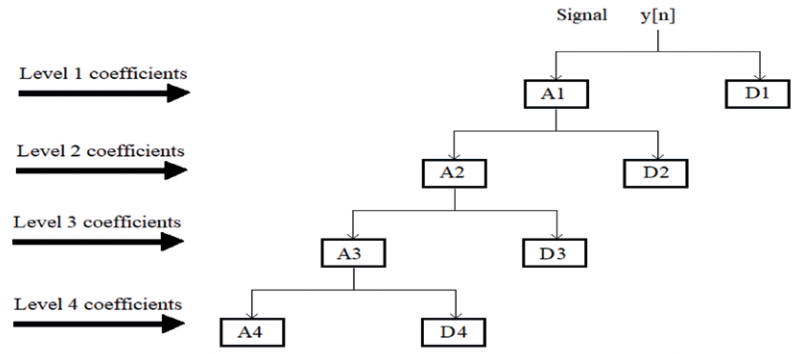


**Fig. 4** Multi-level decomposition of the signal y[n]. 'A' represents the approximation coefficient (low-pass filter with down-sampler of order 2) and 'D' represents the detail coefficients (high-pass filter with down-sampler of order 2).

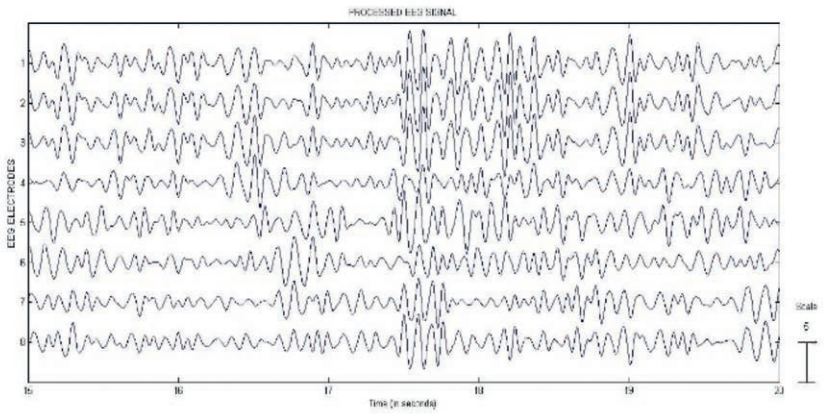

**Fig. 5** Processed EEG signal after Artifact removal and Wavelet Analysis, containing only up to Beta frequency band EEG signals

## Results and Discussions

### Spectrogram and Contour Plots

Spectrogram plot is a 3D plot of time, frequency and the amplitude of a signal. A 2D contour plot for time- frequency information of the signal is also shown.

Spectrogram and Contour plot for rest session (**Fig. 6** and **Fig. 7**) shows the presence dense alpha activity; whereas the spectrogram and contour plot for mental activity session shows the presence of dense beta activity, over the entire 10 seconds epoch. This result support the theory of the characteristics of EEG waves, as stated in **Tab. 1**.

The spectrogram plots and the contour plots for the inhalation of all the oils shows the presence of alpha activity and the absence of beta activity. Hence, it becomes inconclusive to differentiate between the aroma- less oil and the aromatic oils based on the qualitative observations. Therefore, we needed more quantitative measures to check for any differentiation.

### EEG Statistical Result

1. We compared the mean value of all the four trials of rest sessions amongst themselves and found out that the difference between them is statistically non-significant, with p≥0.341, (**Tab. 2**) indicating that the alpha value in the initial rest period and pre-stress period is statistically same.
2. Also, all the four trials of mental activity sessions were compared

| p-value | Rest 2 | Rest 3 | Rest 4 |
|---|---|---|---|
| Rest 1 | 0.422 | 0.341 | 0.532 |
| Rest 2 | | 0.442 | 0.858 |
| Rest 3 | | | 0.693 |

**Tab. 2** Statistical difference between mean alpha power for different rest sessions.

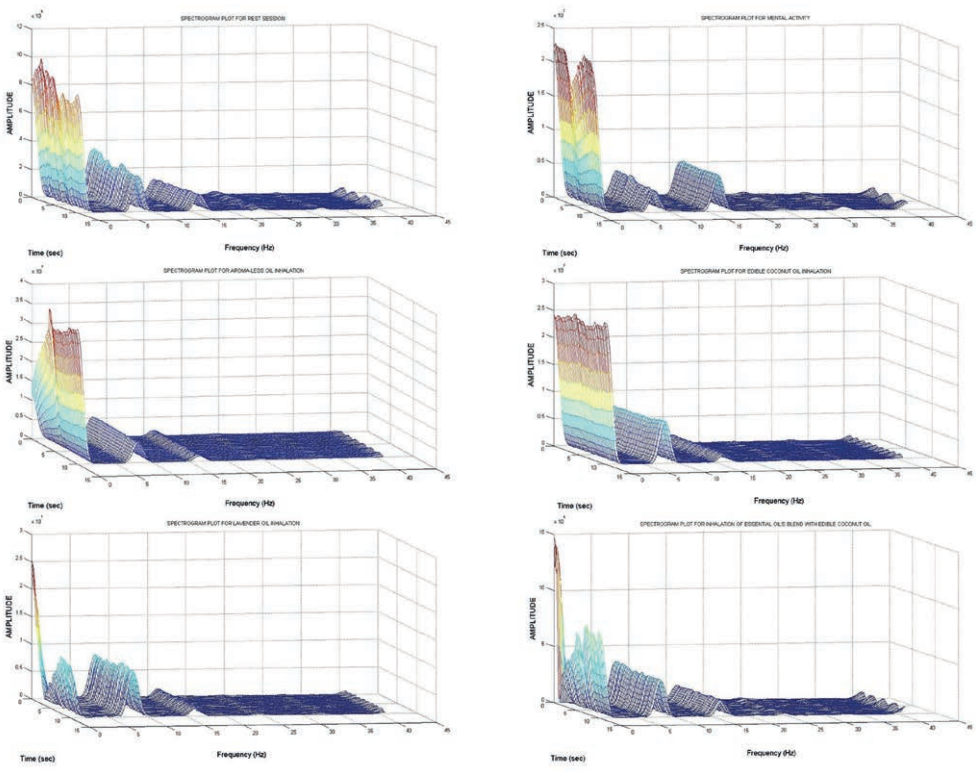


**Fig. 6** (from top to bottom and left to right) Spectrogram plot for rest session, mental activity session, aroma-less oil inhalation, edible oil inhalation, lavender oil inhalation, inhalation of edible oil's blend with essential oils.

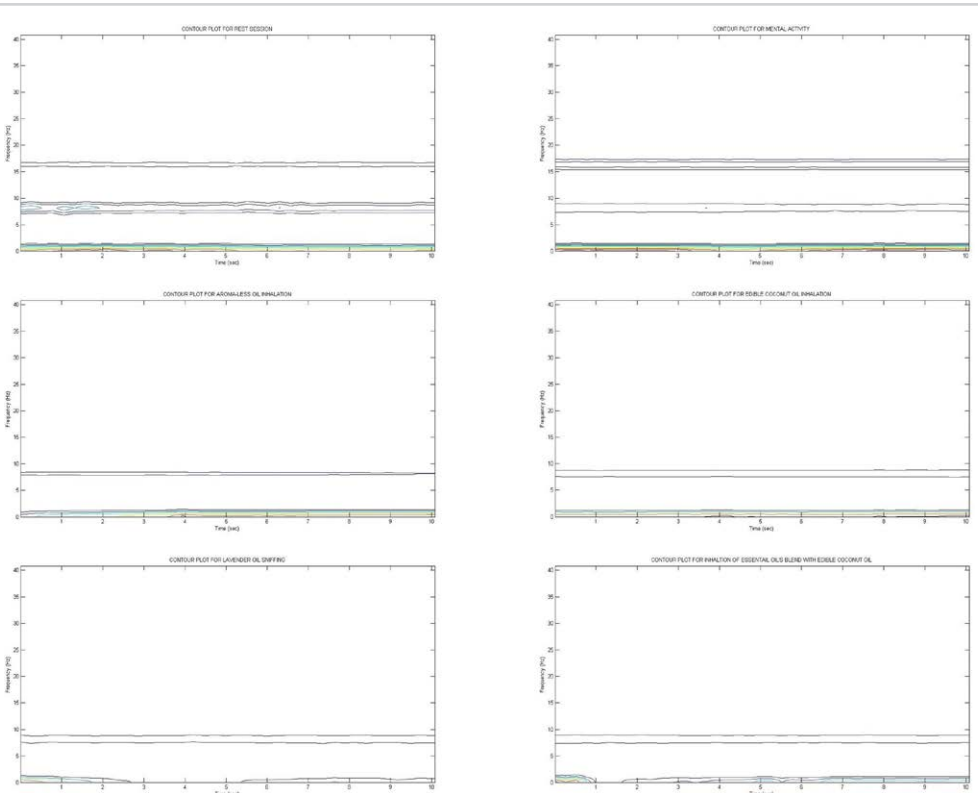


**Fig. 7** (from top to bottom and left to right) Contour plot for rest session, mental activity session, aroma-less oil inhalation, edible oil inhalation, lavender oil inhalation, inhalation of edible oil's blend with essential oils.

and were found out to be statistically same, with p≥0.340 (Tab. 3).

3. The difference in the mean value of the alpha wave of Rest session and the sniffing of aroma-less oil was found to be statistically significant (lower than the rest value), with p≤0.0064 (Tab. 4).
4. The difference in the mean value of the alpha wave of Rest session and the sniffing of all the aromatic oils was found to be statistically non-significant (with p≥0.728 for Oil Sample 2, p≥0.671 for Oil Sample 3, p≥0.164 for Oil Sample 4). This suggests the return to normalcy of the stress induced using exposure to aromatic oils (Tab. 4).
5. The difference in the mean value of the alpha wave for activity session and sniffing of aroma-less Oil was found to be statistically non-significant, with p≥0.119. This establishes that stress induced could not be alleviated via exposure to aroma-less oil (Tab. 5).
6. The difference in the alpha wave for activity and exposure of aromatic Oils was found to be statistically significant, with p≤0.000 for all the oil samples (Tab. 5).

| p-value | Mental Activity 2 | Mental Activity 3 | Mental Activity 4 |
|---|---|---|---|
| Mental Activity 1 | 0.365 | 0.896 | 0.463 |
| Mental Activity 2 | | 0.340 | 0.855 |
| Mental Activity 3 | | | 0.417 |

Tab. 3 Statistical difference between mean alpha power for different mental activity sessions.

| Samples | Estimation for paired difference | | Statistical difference |
|---|---|---|---|
| | Mean | Standard | p-value |
| Mental Activity | 0.000939 | 0.001034 | 0.000 |
| Oil Sample 1 | 0.000539 | 0.002009 | 0.0064 |
| Oil Sample 2 | 0.000074 | 0.001504 | 0.728 |
| Oil Sample 3 | 0.000102 | 0.001686 | 0.671 |
| Oil Sample 4 | 0.000358 | 0.001784 | 0.164 |

Tab. 4 Variation in power in alpha band frequency range, when exposed to stress condition and different oil samples, with respect to initial rest condition.

| Samples | Estimation for paired difference | | Statistical difference |
|---|---|---|---|
| | Mean | Standard deviation | p-values |
| Oil Sample 1 | 0.000399 | 0.001782 | 0.119 |
| Oil Sample 2 | 0.000864 | 0.001396 | 0.000 |
| Oil Sample 3 | 0.001041 | 0.001754 | 0.000 |
| Oil Sample 4 | 0.001297 | 0.001675 | 0.000 |

Tab. 5 Variation in power in alpha band frequency range, when exposed to different oil samples, with respect to mental activity.

| Samples | Estimation for paired difference | | Statistical difference |
|---|---|---|---|
| | Mean | Standard deviation | p-values |
| Oil Sample 2 | 0.000465 | 0.002198 | 0.041 |
| Oil Sample 3 | 0.000641 | 0.002118 | 0.037 |
| Oil Sample 4 | 0.000897 | 0.002340 | 0.009 |

**Tab. 6** Variation in power in alpha band frequency range, when exposed to different aroma oil samples, with respect to non-aroma oil.

| p-value | Oil Sample 3 | Oil Sample 4 |
|---|---|---|
| Oil Sample 2 | 0.520 | 0.131 |
| Oil Sample 3 | | 0.376 |
| Rest 3 | | |

**Tab. 7** Statistical difference between mean alpha power for different oil samples in testing phase.

7. The difference in the power in alpha wave for aroma less oil and aromatic oil, is found to be statistically significant with p=0.041 for Edible Coconut oil, p=0.037 for Lavender Essential oil and p=0.009 for blend of Coconut oil and Essential Oils (**Tab. 6**). This indicates that aromatic oils alter the brain wave activity as compared to aroma-less oil.
8. We also compared alpha wave power among all the aromatic oils and, interestingly, found out that the statistical difference between Coconut oil and Lavender oil, and their blend, is insignificant. (**Tab. 7**).

Considering the power in the alpha wave frequency band in the rest session as the baseline (**Fig. 8**), the study exhibited development of stress levels during the mental activity session; alpha wave frequency band power decreased by 3.7%. This decrease in alpha wave of mental activity indicates the development of stress once the subject is exposed to scenario of time bound mathematical quiz.

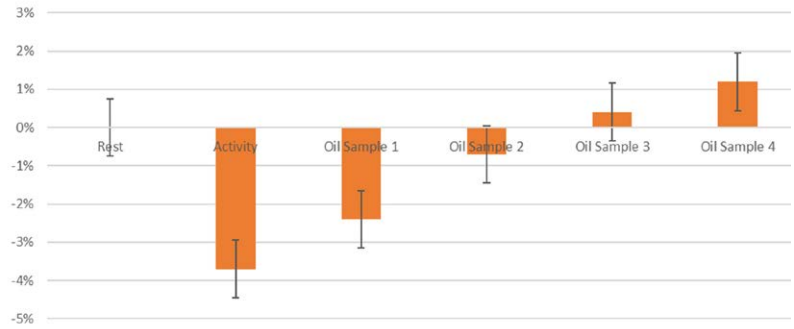


**Fig. 8** Percentage variation in the power in alpha wave for each session, with respect to initial rest session. Y-axis depicts the percentage of the mean power in alpha frequency band.

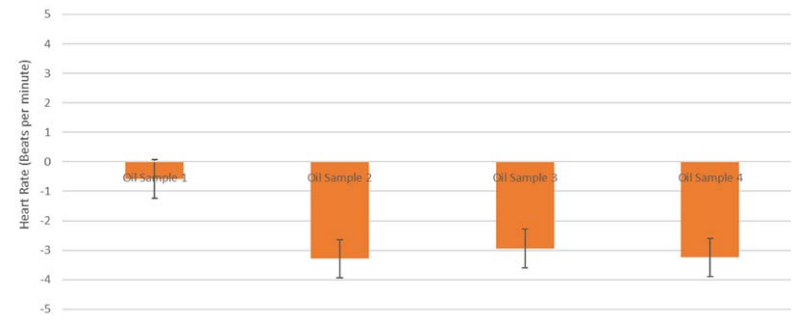


**Fig. 9** Average reduction in heart beats when exposed to different oils.

The average alpha value during sniffing of non-Aromatic Oil was found to be 2.4 % less than the baseline. This difference is statistically significant with baseline, which is statistically insignificant than the Mental Activity phase. This suggests that mere activity of smelling and time lapsed (2-minute duration) does not lead to any significant improvement in the stressed state of mind.

The average alpha value during sniffing session of Coconut Oil was found to be only 0.7 % less than the baseline. And this difference was statistically insignificant with respect to baseline (rest phase) but statistically significant with respect to activity phase. This confirms the fact that coconut oil has substantial effect on the stressed state of mind and it brings the mental stress level at par with initial rest level.

The average alpha value during sniffing of Lavender Essential Oil and the synergistic blend of Essential Oils with Coconut Oil was found to be 0.4% and 1.2% higher than the alpha value in the rest session, respectively. This increase with respect to baseline was found to be statistically non-significant. This data suggests that essential oil alone alleviate the stressed state of mind and statistically is similar to coconut oil improvement. It also points to the fact that synergistic blend of coconut and essential oils perform the best in terms of stress relaxation benefit.

## Heart Rate Statistical Result

The reduction in heart rate was calculated by subtracting the mean of the 8-seconds Heart Rate data before oil inhalation, with the mean of 8-seconds data after oil inhalation [17]. The average reduction in the heart rate, for all the 50 subjects taken into consideration, when exposed to an aroma-less oil, was just 0.6 beats/seconds. The difference in the heart rate, before and after sniffing aroma-less oil was found to be statistically insignificant. The average reduction in the heart rate of all the subjects, when exposed to all the aromatic oils, was about 3 beats/seconds (**Fig. 9**). The difference in the heart rate, before and after sniffing aroma oils, was found to be statistically significant. This further supports the hypothesis of coconut oil aroma leading to stress

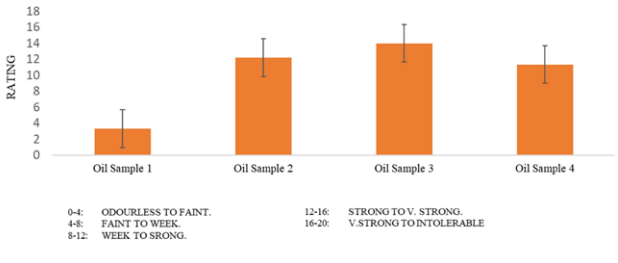


**Fig. 10** Intensity rating for all the oils used in the study.

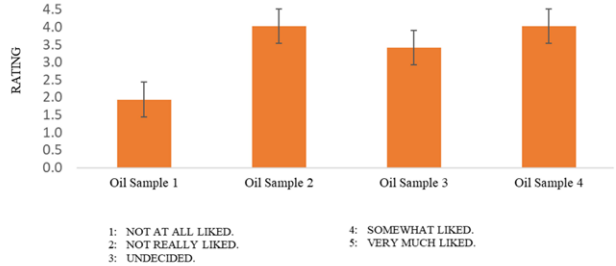


**Fig. 11** Likeability rating for all the Oil Samples used in the study.

relaxation. However, the heart rate marker was unable to distinguish between the oils with aroma and hence the sensitivity of this marker is low to subtle changes in aroma.

### Semantic Differential rating of Intensity and Likeability

Based on the rating of all the subjects, Aroma-less oil was rated to be least intense and it was not liked by the respondents. On the other hand, the aroma of Edible Coconut Oil and the Essential oils blend in Edible Coconut Oil was liked the most. The Lavender Oil was rated next to Edible Coconut Oil and Essential oils blend in Edible Coconut Oil in terms of likeability. Intensity ratings of all the oils have been captured as **Fig. 10**. Similarly, the likeability of oils was rated on a scale of 1 to 5 (with 1 being Not at all Liked and 5 being Very much liked). The likeability ratings captured are represented as **Fig. 11**.

### Emotional Descriptors expressing Odors for Self-Report Evaluation of Oil Fragrance

For the analysis of self-report questionnaire, 5 positive descriptors of human emotions, such as "Calm", "Relief", "Relaxing", "Nourishing", "Pleasant"; was selected.
Oil Sample 4 was rated by most of the people to have all the 5 positive descriptors that are stated above. It was rated to be relaxing by most of the subjects, followed by Oil Sample 2 and the Oil Sample 3. Oil Sample 3 scored lesser than Oil Sample 2 and Oil Sample 4, in all the 5 positive descriptors; which could be the reason why subjects did not like Oil Sample 3 as much as the other two aroma oils, as found in **Fig. 12**. It is interesting to observe that the Oil Sample 2 was rated to be the most nourishing oil by many subjects.
On comparison of the "Relaxing" descriptor frequency with the EEG data for the oils, we can see similar pattern. Even though Lavender Oil is described relaxing by fewer subjects than Edible Coconut Oil, it was observed that Lavender Oil has better effect on enhancing alpha wave activity. Thus, we can see the slight gap between how the subjects actually felt and what they verbalized.

## Conclusion

The study conducted confirms the coconut oil users' belief that it causes relaxation when applied on their hair & scalp. As a part of the study, we developed a unique protocol using

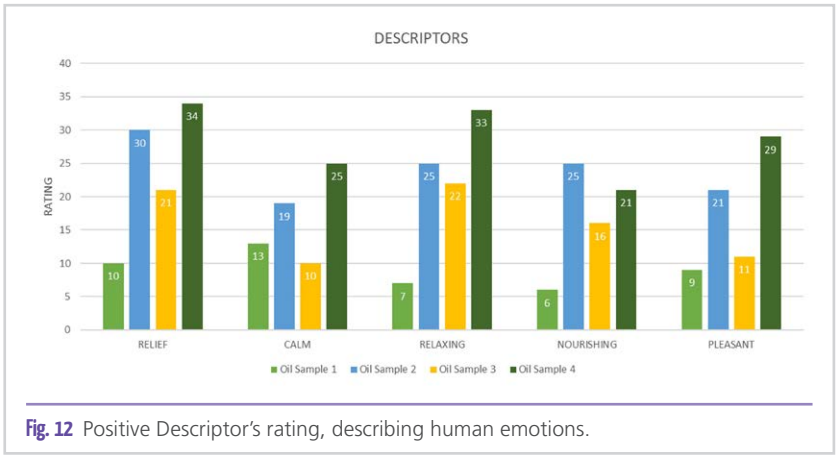


**Fig. 12** Positive Descriptor's rating, describing human emotions.

which we exhibited the induction of stress in a repeatable, robust manner. Time bound Mental Activity caused the decrease in power of Alpha wave from its baseline and hence is a potent way of inducing stress in subjects. We were able to establish that sniffing of Aromatic Oils (Edible Coconut Oil, Lavender Oil, blend of Essential oils and Edible Coconut Oil) led to increase in power in the alpha wave frequency band, whereas sniffing of Aroma-less oil does not change alpha wave significantly.
Statistical analysis revealed that difference in power of alpha wave, for the exposure of Aroma-less oil and the two renditions of Coconut Oils, was found to be statistically significant. Thus, coconut oil aroma does lead to stress relaxation in subjects with induced stress. Two-minute inhalation of coconut oil aroma brings the alpha waves to original level.

The methodology proposed can be used to quantitatively define the stress level in subjects and study the impact of different olfactive stimuli on stress levels. The impact of olfactive stimulus on subjects with different inherent stress levels can be a future work and could serve as inclusion criteria for subjects in the study. We can also study the subject's response based on their lifestage (teen, adult, elderly) and lifestyle to see if further categorization can be observed.

## Acknowledgement

This work is supported and sponsored by the Marico Ltd. The work is carried out partly in the Marico Ltd R&D Centre, Mumbai, India; and in the Biomedical Engineering Research Laboratory of Veermata Jijabai Technological Institute, Mumbai, India.

## Appendix A Mathematical Analysis of wavelet through multi-resolution analysis

Multi Resolution Analysis (MRA) comprises $\{V_u\}_{u\in K}$ of $L^2(R)$ a series of successive approximation spaces of with the following characteristics [30]:

a. $V_u \subset V_{u+1}$

b. $\lim_{u\to\infty} V_u = \bigcup_{u\in K} V_u$ is dense in $L^2(R)$,

c. $\bigcap_{u\in K} V_u = \{0\}$,

d. $F(x) \in V_u \Leftrightarrow F(2x) \in V_{u+1}$,

e. $F(x) \in V_u \Leftrightarrow F(x+2^{-u}v) \in V_u, \forall v \in K$,

There occurs a function so $\phi \in V_0$ that $\{\phi(x-u)\}_{u\in K}$ is an orthonormal basis of $V_0$.
$\phi$ is labelled as scaling function that produce a MRA with the above characteristics. A Riesz basis $\{\phi_{u,v}(x)\}_{v\in K}$ is derived as a result of translation and dilation of $\phi$, for the subspace $V_u \subset L^2(R)$ by the characteristics (d) (e), where

$$\phi_{u,v}(x) = 2^{\frac{u}{2}}\phi(2^u x - v), \qquad u, v \in K \qquad (i)$$

Since $V_0 \subset V_1$, there is an array of coefficients $\{a_u \phi\}_{u\in K}$, so $\phi$ that satisfies the binary-scale equation or refinement equation

$$\phi(x) = \sum_v a_v \phi(2x-v) \qquad (ii)$$

For every $v \in K$ we delineate $W_u$ to be the orthonormal complement of $V_u$ in $V_{u+1}$, we then have

$$V_{u+1} = V_u \oplus W_u \qquad (iii)$$

and

$$W_u \perp W_{u'} \text{ if } u \neq u'. \qquad (iv)$$

It follows that, for $u > U$

$$V_u = V_U \oplus (\bigoplus_{v=0}^{U-u+1} W_{U-v}). \qquad (v)$$

By virtue of *(b)* and *(c)* above, this implies

$$L^2(R) = \bigoplus_{u\in K} W_u \qquad (vi)$$

which is a dissolution of $L^2(R)$ into mutually orthogonal subspaces. The basis for $W_0$ can be achieved by dilating and translating a single function $\Psi(x)$ called mother wavelet which is represented by the wavelet equation

$$\psi(x) = \sum_v b_v \phi(2x-v) \qquad (vii)$$

where $b_v = (-1)^v a_{-v+1}$.

In fact, $\{\psi_{u,v}(x) = 2^{\frac{u}{2}}\psi(2^u x - v)\}_{v\in K}$ forms an orthogonal basis for $W_u$.

Let $D_u$, $E_u$ indicate the orthogonal projection $L^2 \to V_u$, $L^2 \to W_u$ respectively. Then,

$$D_u F(x) = \sum_v A_{u,v}\phi_{u,v}(x), \qquad (viii)$$

$$E_u F(x) = \sum_v B_{u,v}\phi_{u,v}(x), \qquad (ix)$$

where $A_{u,v}$, $B_{u,v}$ the coefficients, are obtained by the scalar product:

$$A_{u,v} = <F, \phi_{u,v}> = \int_{-\infty}^{\infty} F(x)\phi_{u,v}(x)dx \qquad (x)$$

$$B_{u,v} = <F, \psi_{u,v}> = \int_{-\infty}^{\infty} F(x)\psi_{u,v}(x)dx \qquad (xi)$$

$D_uF$ coincide to $F$ in $L^2$ norm which is the best approximation of $F$ in $V_u$.
By applying the decomposition $V_u = V_{u-1} \oplus W_{u-1}$ we have

$$D_u F(x) = \sum_v A_{u,k}\phi_{u,v}(x), \quad = \sum_v A_{u-1,v}\phi_{u-1,v}(x) + \sum_v B_{u-1,v}\psi_{u-1,v}(x). \qquad (xii)$$

By multiplying $\phi_{u-1,v}$ to either sides of *(xii)* and integrating, and assigning binary-scale relation and orthogonality of the scaling and wavelet functions we obtain that, for a fixed $u$ and $v$,

$$A_{u-1,v} = \sum_l A_{u,l} \int_{-\infty}^{\infty} \phi_{u-1,v}(x)\phi_{u,l}(x)dx$$

$$= \frac{1}{\sqrt{2}} \sum_{l,n} A_{u,l}a_n \int_{-\infty}^{\infty} \phi_{u,l}(x)\phi_{u,2v+n}(x)dx$$

$$= \frac{1}{\sqrt{2}} \sum_l a_{l-2v}A_{u,l} \qquad (xiii)$$

and likewise

$$B_{u-1,v} = \frac{1}{\sqrt{2}} \sum_l b_{l-2v}A_{u,v}. \qquad (xiv)$$

By applying *(xiii)*, *(xiv)* to the right-hand side of *(ii)*, *(xii)*, we can achieve the following reconstruction algorithm:

$$A_{u,v} = \frac{1}{\sqrt{2}} \sum_l a_{v-2l}A_{u-1,l} + b_{v-2l}B_{u-1,v}. \qquad (xv)$$

The relations of the equation *(xiii)* – *(xv)* are termed as Mallat's transform.
Wavelet transform of a signal is fundamentally achieved by taking scalar product of wavelet and the given signal.
Considering $\Psi_{r,s}$ as the wavelet function, $\phi_{r,s}$ as the scaling function; the discrete wavelet transform of signal $y[n]$ can be expressed as:

$$\psi_{r,s} = y[n]\phi_{r,s}[n] \qquad (xvi)$$

Where $r$ is the dilation or scale, $s$ is the translation, and $\phi_{r,s}$ describe the discrete wavelet which is given as

$$\phi_{r,s} = 2^{\frac{s}{2}}\phi[2n - s] \qquad (xvii)$$

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# Gentle Repair Hand Cream
## with LIPOID P 75-3 | LK_FFO_011720

Lipoid Kosmetik

| Phase | Ingredient | INCI | Function | Supplier | % w/w |
|---|---|---|---|---|---|
| A | Deionized Water | Aqua (Water) | | | ad 100 |
| | **LIPOID P 75-3** | Hydrogenated Lecithin | Emulsifier | Lipoid Kosmetik | 2.00 |
| | Glycerin 86.5 % | Glycerin, Aqua (Water) | Humectant | | 2.00 |
| | Cosphaderm® X 34 | Xanthan Gum | Thickener | Cosphatec | 0.40 |
| | Amigum SM-2 | Sclerotium Gum | Thickener | Alban Muller | 0.50 |
| | dermosoft® OMP | Methylpropanediol, Caprylyl Glycol, Phenylpropanol | Preservative | Evonik Dr. Straetmans | 4.00 |
| B | Sunflower Oil | Helianthus Annuus (Sunflower) Seed Oil | Emollient | | 10.00 |
| | MCT | Caprylic/Capric Triglycerid | Emollient | | 10.00 |
| | Berry Wax | Rhus Verniciflua Peel Cera | Emollient | | 1.00 |
| | Cocoa Butter | Theobroma Cacao (Cocoa) Seed Butter | Emollient | | 5.00 |
| | Sunflower Wax | Helianthus Annuus (Sunflower) Seed Wax | Consistency enhancer | Koster Keunen | 1.00 |
| C | TAPIOCA PURE | Tapioca Starch | Skin texture modifier | Nouryon | 3.00 |
| D | Aloe Flower P0240537 | Parfum (Fragrance) | Fragrance | Frey & Lau | 0.20 |
| | NaOH | Sodium Hydroxide | Neutralizing agent | | q.s. |

**Procedure:**
1. Mix components of A at 70°C
2. Mix components of B to 75°C
3. Add B to A and homogenize intensively
4. Cool down while stirring
5. Add components of C and D below 40°C
6. Adjust pH to 6.5
7. Homogenize again shortly

**Technical Data:**
- Appearance: light yellow cream
- pH value: approx. 6.5

**Formulation Stability:**
Successfully passed internal stress test
(6 weeks at 45°C and 5 freeze-thaw cycles – 18/+45°C)

**Microbiological Stability:**
Successfully passed microbial challenge test (Ph. Eur. 5.1.3/current version)

# Multisurface Glass Cleaner with Antistat | HC/HS/22

CRODA

Effective and demonstrable antistatic performance on glass can be achieved via the inclusion of Crodastat™ 400 into this type of preparation. The inclusion of Crodasinic™ LS30 NT ensures the effective wetting and cleaning of various surfaces.

| Product | Functionality | % w/w |
|---|---|---|
| Water | Solvent | 89.44 |
| Isopropyl alcohol | Solvent | 7.50 |
| Dowanol DPM | Solvent | 2.50 |
| **Crodasinic LS30 NT** | Detergency, wetting | 0.20 |
| **Crodastat 400** | Antistatic additive | 0.30 |
| Sodium hydroxide solution (50%) | Base, pH adjuster | 0.06 |
| Preservative, perfume, dye | | As required |

**Procedure:**
1. Blend isopropyl alcohol, Dowanol DPM and water.
2. Dissolve Crodasinic LS30 NT and Crodastat 400 and finally add sodium hydroxide solution, whilst stirring with a propeller stirrer.

# Gentle Hand Wash | #500-10022

A mild, clear, pear-colored cleanser formulated without sulfates[1]. Containing many nature-derived ingredients designed to condition and balance the skin, this gentle hand cleanser has a pleasant foam, feel and fragrance.

| Phase | Ingredients (Trade Name) | Ingredients (INCI) | supplier | % w/w |
|---|---|---|---|---|
| A | Purified Water | Water/Aqua | Local | qs.100 |
| | Bioterge* AS-40 HA | Water/Aqua (and) Sodium C14-16 Olefin Sulfonate | Stepan Chemical | 25.00 |
| | Mackam* C37HP | Water/Aqua (and) Cocamidopropyl Betaine | Solvay/Rhodia | 10.00 |
| | Plantaren* 2000 N | Water/Aqua (and) Decyl Glucoside | BASF | 2.00 |
| | Cocoglucoside | Water/Aqua (and) Cocoglucoside (and) Decyl Glucoside | New Directions Aromatics | 2.00 |
| | SurfThix* DOE | PEG-120 Methyl Glucose Dioleate (and) Methyl Gluceth-10 (and) Water | Lotion Crafter | 1.00 |
| | **optiphen™ BSB-N preservative** | Benzyl Alcohol (and) Benzoic Acid (and) Sorbic Acid (and) Glycerin | Ashland | 1.00 |
| | **ceraphyl™ 41 ester** | C12-15 Alkyl Lactate | Ashland | 0.25 |
| | **aquaCat™ PF618 clear cationic solution** | Guar Hydroxypropyltrimonium Chloride | Ashland | 5.00 |
| | **lipigenine™ biofunctional** | Water/Aqua (and) Glycerin (and) Linum Usitatissimum (Lindseed) Seed Extract | Ashland | 1.00 |
| | Glycerin | Glycerin | Local | 2.00 |
| | PF PearBlossom R18-6233 | Fragrance/Parfum | Robertet | 0.50 |
| | **puraloe™ 100x aloe vera** | Aloe Barbadensis Leaf Juice Powder | Ashland | 0.10 |
| B | CitricAcid | Citric Acid | Local | qs. pH~5 |
| Total | | | | 100.00 |

**Procedure:**
1. In the main beaker, at RT, add ingredients of phase A one at a time, in order, with mixing. Wait for uniformity before adding the next.
2. When phase A is uniform, adjust pH to ~5.0 using citric acid.
3. Stop once the pH is adjusted

**Properties:**
- description: clear yellow liquid
- pH: 4.8–5.2
- viscosity (D0): 3 000–6 000 cps (Brookfield RVT, Spindle 5, 10 RPM, 1 minute, 25°C)

Zeta potential studies were conducted indicating AquaCat™ clear cationic solution improves formulation mildness.

This formula has passed 3-month accelerated lab stabilities and a 28-day challenge efficacy test (preservative system has not been optimized to its lowest effective level).

**Claims:**
- gentle, clear hand cleanser formulated without sulfates[1]
- formulated with skin conditioning ingredients
- contains field-to-market, nature-derived[2] pure aloe
- contains a nature-derived[2] flax seed extract designed to help skin barrier function

[1] surfactants 'without sulfates' defined as containing no alcohol sulfate or alcohol ether sulfate, per INCI nomenclature
[2] according to ISO 16128-2:2017

# Recommendation of the DGK Expert Group "Microbiology and Industrial Hygiene" on how to Deal with Risks of *Pluralibacter gergoviae* in Cosmetic Products

U. Eigener, A. Keck-Wilhelm, J. Nussbaum, R. Simmering, N. Staub

The opinion of the BfR ("skin creams, make-up and shampoos should be free from *Pluralibacter gergoviae*". Opinion No. 038/2020 of 7 September 2020) has led to some uncertainty in the cosmetic industry as to whether new procedural requirements might have to be derived from it. The DGK's expert group would therefore like to summarize its position and pass it on as a recommendation.

The BfR statement is not a new specification or a new "legal regulation". Rather, the BfR hereby presents its expert opinion on the assessment of the health risk posed by *P. gergoviae* – a bacterium which has been of importance in several cases of microbial contamination of cosmetics.

The importance of *P. gergoviae* as a contaminant of cosmetic products has been known for a long time in microbiological expert circles of the cosmetic industry and the supervisory authorities and is also communicated in training events e.g. of IKW and DGK and in publications. Correspondingly, the microbiological tests, controls and resulting measures classified as necessary up to now can continue to be used to achieve specified microbiological quality and safety objectives.

This also includes ensuring that, in the event of positive microbiological findings, product damage or even a health hazard for the consumer due to the microorganisms present in the product can be ruled out. Therefore, a risk assessment must be carried out concerning the identified microorganism species and appropriate necessary measures must be taken according to the risk.

This is the starting point for the new BfR opinion. The BfR concludes that *P. gergoviae* may pose a health risk. Thus, a health risk cannot be excluded for the use of cosmetic products contaminated with this bacterium, although no data are available on the frequency of such infections and it is not possible to quantify the current risk. This classification should of course be taken into account for the own risk assessment. In case of detected contamination, this BfR assessment is also the basis for the assessment of the type of risk used by the official authorities.

Thus, if the presence of *P. gergoviae* is detected in microbiological controls, the responsible person must carry out a case-specific risk assessment, which must lead to appropriate follow-up measures. In such cases, the assessment takes into account the exposure conditions and thus the product type, the areas of application of the product and, in particular, the level of bacterial count in the product. Concerning the bacterial count level, it should in any case be noted that the number of bacteria in the product may increase. Particularly in the case of *P. gergoviae*, which is also known in connection with adaptation processes, the possibility of an increase in the bacterial count is given. Results of suitable challenge tests and sufficient control tests (number of product samples, time grading) have to be included in the evaluation. Since a critical bacterial count limit cannot be generally defined, even low bacterial count findings should be evaluated on a case-by-case basis as a possible health hazard.

Of course, it is to be demanded that, in addition to appropriate assessments and measures in case of detected contamination with *P. gergoviae*, future product contamination by this bacterium is excluded by preventive measures.

This includes in particular that *P. gergoviae* is also used as a further microorganism in the protocol of the challenge test. Contamination via raw materials must also be excluded by effective controls and the presence of this bacterium in the operational environment must be prevented by appropriate hygiene measures and hygiene controls. Finally, after *P. gergoviae* has to be classified as potentially hazardous to health – it makes sense to follow the target to ensure the absence in 1 g or ml of the product (requirements for specified microorganisms) for this bacterium in the product-related microbiological specification. Thus, it is possible to detect contamination with *P. gergoviae* in time by sufficient and suitable tests/controls and to take countermeasures to exclude the risk. This procedure should be implemented at least for those products for which a risk of contamination with *P. gergoviae* can be assumed based on historical knowledge (test results, practical situations). Experience has shown that certain microorganisms are always found as contaminants due to the properties of product formulation, packaging and application.

Thus a professional risk assessment and preventive measures are required to the same extent as this is generally the case with other potentially pathogenic microorganisms.

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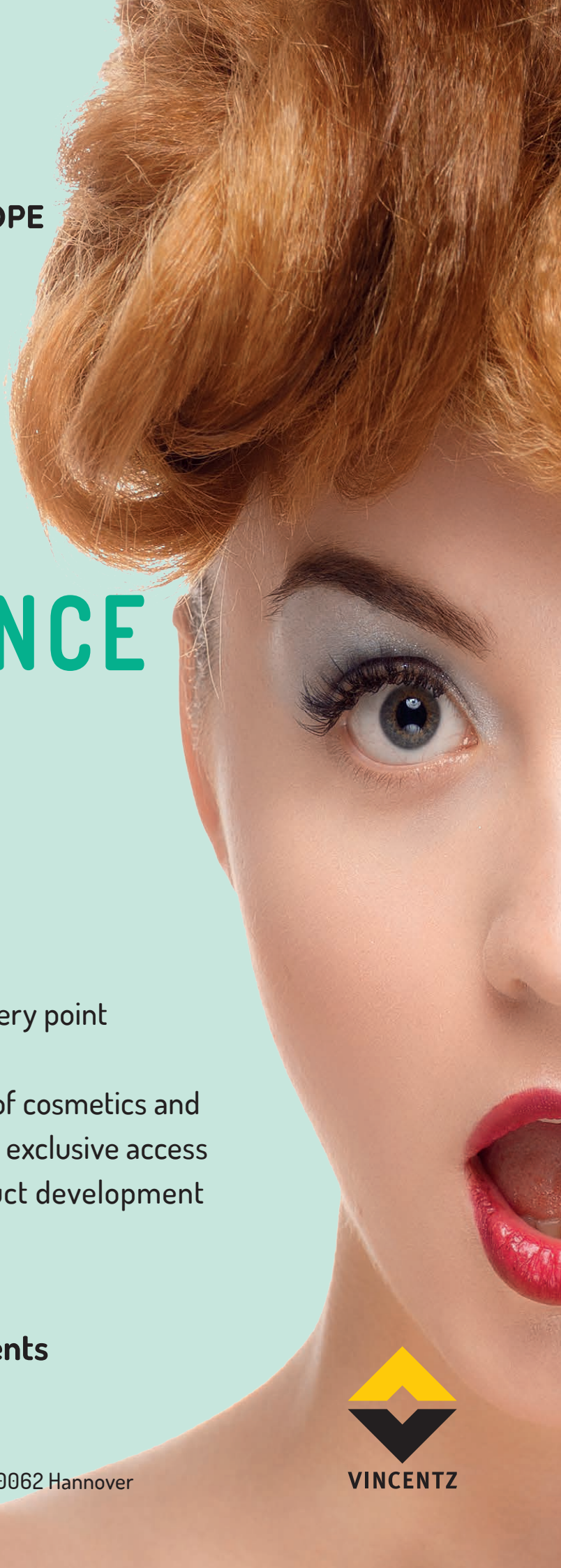

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# Virucidal Activity of Jungbunzlauer L(+)-Lactic Acid

## Interview with Alina Matt, Technical Service Manager, Jungbunzlauer International AG

Alina Matt

**You recently published a Press Release titled "Virucidal activity of Jungbunzlauer L(+)-lactic acid". Please share some details with us.**

This is very exciting for us. The pandemic has brought a lot of attention to hygiene and disinfection, a segment in which we have already been promoting our L(+)-lactic acid. Bacteria was always in the spotlight. Recently, we also successfully tested the antiviral power of our L(+)-lactic acid by performing a "proof of principle" testing. Our L(+)-lactic acid passed the test with a concentration of 0.90% in water at a contact time of one minute and a concentration of 0.45% at a contact time of five minutes.

**Based on your results, does your lactic acid show an effect on the corona virus?**

Yes, our L(+)-lactic acid is effective against the corona virus. The corona virus belongs to the virus type "enveloped virus". Reliable test protocols have been established to assess the susceptibility of enveloped viruses towards disinfectants, while non-enveloped viruses are harder to inactivate.

**So, how is the testing conducted?**

We conducted an external official testing, the European standard test method EN 14476. The Robert Koch Institute (RKI) and the Biocidal Product Regulation (BPR) 528/2012 propose this test protocol as one official method. The test virus is a modified vaccinia virus Ankara (MVA), which acts as representative for all enveloped viruses. The test criterion is a $\geq 4$ $\log_{10}$ reduction ($\geq$ 99.99% inactivation) of the MVA titre within the recommended exposure period. We conducted the tests in a challenging environment ("dirty conditions"), to better mimic an organic load in real life. Passing the test allows to declare antiviral activity against all enveloped viruses, incl. the corona virus.

**What are your next planned steps?**

The journey in this test series has just begun. It is important to share the first "proof of principle" with our customers. At the same time, we already launched additional tests under more challenging conditions and with final formulations.

Of course, we appreciate the role in supporting our customers in the development of final formulations. In addition to L(+)-lactic acid as active substance, lactates as moisturisers are worth mentioning. Formulating a disinfectant with lactic acid results in an effective and gentle product, while disinfectants with a high alcohol content may lead to dry skin. Jungbunzlauer also produces xanthan gum, a fermentation derived biodegradable hydrocolloid.

Xanthan gum can be used as a thickener in hand disinfectant gels with lower alcohol content, also together with L(+)-lactic acid. We expect to share the next supportive test results in Q1 2021.

**In summary, why is Jungbunzlauer L(+)-lactic acid a valuable biocide?**

Our L(+)-lactic acid is a natural, sustainable and less hazardous ingredient in the formulation of surface and hand disinfectants. It is derived from renewable raw materials via fermentation and is readily biodegradable.

L(+)-lactic acid has dual power: it is active against viruses and bacteria. Test results obtained for antiviral (EN14476) and antibacterial (EN1040, EN1276 and EN13697) disinfection applications are available on request and on our homepage www.jungbunzlauer.com. Particularly important is the regulatory status: Jungbunzlauer L(+)-lactic acid conforms to the BPR 528/2012 and can be used as active substance for product types (PT) 1, 2, 3 and 4. Jungbunzlauer is an Article 95 listed supplier.

**Do you have a message for our readers?**

Lactic acid is a very versatile acid in countless applications and we are glad that we can now deliver the proof on the virucidal activity, so lactic acid can help with an important feature in a very challenging time. Please do not hesitate to contact us, we are happy to hear from you. Stay safe and healthy.

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# BASF Signs a Global, Exclusive Supply Agreement with Caregen for Synthetic Peptides

**Hong Kong, Seoul, Korea | January 22, 2021.** BASF has signed a global, exclusive supply agreement with Caregen, for four cosmetic peptides. With this expansion in its portfolio, BASF plans to launch four peptides with anti-aging and anti-pigmentation properties, for prone-atopic and prone-acneic skins, in the course of 2021.

"There is robust growth in the dermocosmetics sector globally and especially in Asia, as more consumers desire targeted functionality from cosmetics, in line with the personalization trend. By using cosmetic products formulated with these peptides as active ingredients, consumers can have a choice of products with proven efficacy," said *Jeff Huh,* Head of Marketing Personal Care Solutions at BASF Asia Pacific.

"Peptides are widely used as biological actives in different markets. Selecting the most promising peptides from Caregen's huge portfolio and adapting them to the standards of the cosmetic industry has been a great achievement of our team," said *David Hérault,* Head of Global Product Development Bio-actives at BASF Care Chemicals.

"Building on Caregen's functional peptides with high technical and commercial competitiveness and BASF's expertise in solutions and ingredients which are offered to the global cosmetics market, this agreement has both companies well set up for a long-term cooperation. With the ongoing functional health, food and pharmaceutical product development, Caregen aims to soon become a leading peptide platform company, recognized by global customers," said *Dr. Chung Yong-Ji,* CEO, Caregen.

Caregen's highly potent synthetic peptides will be a complementary technology to the bioactives and other cosmetic solutions and ingredients offered by BASF's personal care portfolio.

**www.basf.com | www.caregen.com**

Picture © ra2 studio – stock.adobe.com

# Croda Launches "Three Steps to Happy Hands" Campaign

**Snaith, Goole, East Yorkshire, UK | January 7, 2021.** Global speciality chemical company Croda, is delighted to launch 'Croda's Three Steps to Happy Hands', a new campaign around the topic of hand hygiene and skin care.

2020 was a tough year for hands and moving into 2021, this is unlikely to change! Frequent hand washing and sanitisation have highlighted just how important hand hygiene is as a key weapon against COVID-19. This has resulted in an increased need to not just keep hands clean, but also to care for them.

Croda's Three Steps to Happy Hands is the theme for the latest Beauty Undefined campaign, an ongoing series that showcases Croda's formulation expertise and brings together Croda's novel ingredients, natural botanical ingredients from Crodarom, and bioactive ingredients from Sederma's range of actives. Instead of showcasing just one formulation, our Three Steps to Happy Hands introduces three innovative formulations that represent each of the 'steps' required to achieving happy hands! It also includes a formulation kit and a video that shouldn't be missed!

Alongside Beauty Undefined – Croda's Three Steps to Happy Hands, is also a Power Hour webinar that explores how the hand care market has reacted to 2020. The webinar also presents unique concepts for hand care formats and introduces Croda's three easy steps to clean, care for and treat skin on the hands.

For more information, visit www.crodapersonalcare.com/en-gb/discovery-zone/trends/beauty-undefined/three-steps-to-happy-hands.

**www.croda.com**

PRODUCT LAUNCH


**Wilmington, Del., USA | January 14, 2021.** Ashland has launched **Antaron™ ECo gel**, a new ingredient format that provides the easy incorporation of nature-derived water resistance into sunscreens and offers a lighter feel ideal for gel, lotion, milk, or spray formulas.

**Antaron™ ECo gel** starts with a globally compliant film former that is based on sustainably sourced wood-derived cellulose. This unique ethylcellulose film former provides excellent water resistance and light formula aesthetics. To make it easier for formulators to take full advantage of the benefits, this ethylcellulose was incorporated into a biodegradable sun care solvent. The resulting gel can easily be incorporated into a formula, saving energy for formulators during production. "Consumers increasingly want planet friendly sun care solutions that also provide safe and easy-to-apply sun protection," said *Jennifer O'Hara,* global marketing manager. "Ashland continues to fulfill this demand and provide more biodegradable solutions such as new **Antaron™ ECo gel**. This vegan friendly, translucent, smooth gel can be used globally by formulators to achieve water and sweat resistance in sun care formulas."

"We also wanted **Antaron™ ECo** gel to be an ingredient that formulators could work with easily. **Antaron™ ECo gel** allows for shorter processing time as it's easier to incorporate than a solid format. This translucent gel can then be mixed into formulations without fuss – to achieve a soft, light, non-tacky feel. Oil soluble, it can be used in any kind of format, from emulsions to clear anhydrous formulations and is compatible with wet skin products."

For more information visit www.ashland.com/ecogel



**www.ashland.com**


# SOFW eVENTS Presents „The Future of Cleaning"

**Thannhausen / Burg, Germany | January 28, 2021.** We are delighted to announce our first digital **SOFW eVENT** to take place on March 25th. With its focus on **home care** the event highlights **the future of the washing and cleaning** industry.

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