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Abstracts

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Review Article
Self-preserving cosmetics

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Preservatives are added to products for two reasons: first, to prevent microbial spoilage and therefore to prolong the shelf life of the product; second, to protect the consumer from a potential infection. Although chemical preservatives prevent microbial growth, their safety is questioned by a growing segment of consumers. Therefore, there is a considerable interest in the development of preservative-free or self-preserving cosmetics. In these formulations traditional/chemical preservatives have been replaced by other cosmetic ingredients with antimicrobial properties that are not legislated as preservatives according to the Annex VI of the Commission Directive 76/768/EEC and the amending directives (2003/15/EC, 2007/17/EC and 2007/22/EC). 'Hurdle Technology', a technology that has been used for the control of product safety in the food industry since 1970s, has also been applied for the production of self-preserving cosmetics. 'Hurdle Technology' is a term used to describe the intelligent combination of different preservation factors or hurdles to deteriorate the growth of microorganisms Adherence to current good manufacturing practice, appropriate packaging, careful choice of the form of the emulsion, low water activity and low or high pH values are significant variables for the control of microbial growth in cosmetic formulations. This paper describes the application of the basic principles of 'Hurdle Technology' in the production of self-preserving cosmetics. Multifunctional antimicrobial ingredients and plant-derived essential oils and extracts that are used as alternative or natural preservatives and are not listed in Annex VI of the Cosmetic Directive are also reported.

Design and application of a screening and training protocol for odour testers in the field of personal care products

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The assessment of odours and in particular of human axillary odour is an integral part of the research and development of deodorant and anti-perspirant products. One method to perform odour assessment is the odour evaluation that is carried out by experts, designated as odour testers or sniffers. Product development decisions are therefore based on human assessment. As for every scientific measurement, the influencing factors need to be standardized or regularly calibrated as effectively as possible for reasons of quality assurance. We therefore developed a screening and training concept aiming to

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examine the general suitability of odour testers by determining the individual odour sensitivity for relevant odours. This newly developed method is based on the national and international standards and guidelines EN 13725:2003, VDI 3882 sheet 1 and ASTM-1207. Suitable odour testers are subsequently trained to correlate their individual odour intensity perception with an intensity calibration scale in order to achieve reproducible results. Training sessions held on a regular basis help to achieve a greater homology in the response of an existing panel. Our established screening and training protocol has already been successfully put into practice and is also subject to permanent improvement with regard to practical requirements.

Qualification of a precise and easy-to-handle sweat casting imprint method for the prediction and quantification of anti-perspirant efficacy

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A time- and cost-effective sweat casting method using the forearm as test site to assess the efficacy of several anti-perspirant formulations with a low number of test subjects has been evaluated and qualified. The imprint sweat casting method is based on a 2-component silcone-imprint technique to measure the efficacy of more than eight products in parallel with the same test subject. In studies using aluminum chlorohydrate (ACH) formulations as test anti-perspirants, a clear-cut correlation could be demonstrated between sweat gland activities measured by the imprint method and gravimetric measurement of sweat gland activities. Concentration-dependent inhibition of sweat gland activity could be observed with the imprint technique up to an ACH concentration of 15%, and all formulations containing 2% ACH or above resulted in statistically significant reduction of sweat gland activity ($P < 0.001$) when compared with untreated control areas. Furthermore, the SDs of individual studies using the imprint technique were in a range of ±20% of sweat gland activity, which can be regarded rather low for in vivo measurements of a complex process like sweat secretion. A group-wise comparison between the measurements of anti-perspirant activity as determined by the imprint protocol and the Food and Drug Administration (FDA) Guideline compliant gravimetric hot-room protocol revealed that the test results for anti-perspirant activity obtained with the imprint protocol are similar to those obtained with the hot-room protocol. Moreover, the data generated with the imprint protocol have a high predictive value for the outcome of a later guideline-compliant hot-room test. As the imprint casting method tends to be a little more sensitive for formulations with low anti-perspirant activity, and seems to be associated with less interassay variability than the standard gravimetric hot-room test, the imprint casting method may select products which later fail to pass the standard gravimetric hot-room test. Meanwhile the imprint sweat casting has proven to be a robust method useful to support efficacy-oriented product development. Therefore, in later stages of utilization it might even evolve into an efficient claim substantiation tool.

Antioxidant capacity of 3D human skin EpiDerm™ model: effects of skin moisturizers

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The objective of this study was to determine the effects of skin moisturizers on total antioxidant capacity (TAC) of human skin using EpiDerm™ model. Three different skin moisturizers containing antioxidant ingredients (samples 1–3) or aloe vera extract were topically applied to EpiDerm™ units and incubated for 2 and 24 h to determine acute and longer-term effects of applied samples on TAC and glutathione peroxidase activity in medium and/or homogenized skin tissues. Total antioxidant capacity in medium and skin homogenates was enhanced ($P < 0.0001$) by gel containing antioxidant ingredients (sample 2) after 2 and 24 h of incubation. Total antioxidant capacity in medium was also enhanced ($P < 0.001$) by cream containing antioxidant ingredients (sample 3) after 24 h of incubation. Overall, TAC in medium was greater ($P < 0.02$) after 24 h than 2 h of incubation. Skin moisturizer cream with high antioxidant levels determined by using oxygen radical absorbance capacity testing (sample 1) and aloe vera extract did not affect TAC. Glutathione peroxidase activity was enhanced ($P < 0.0001$) in medium and skin homogenates by sample 2 but not by any other sample. These data demonstrate high potential of gel and cream (samples 2 and 3) containing antioxidant ingredients in enhancing antioxidant capacity of EpiDerm™ which will likely contribute to overall skin health. Results of this experiment will help to better understand mechanisms of effects of skin moisturizers containing antioxidant ingredients on skin function at the tissue level and to establish effective strategies for skin protection and clinical treatments of skin disorders and possibly healing wounds.

Combined structural and biological activities for new polyunsaturated fatty derivatives obtained by biotechnological process

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The objective of this study is to demonstrate the use of new polyunsaturated fatty derivatives for cutaneous applications. These new compounds present an analogue structure of cutaneous lipid, stabilize the polyunsaturated fatty acids (face to oxidation) and demonstrate specific biological activities. Three molecules described are Omega 6 fatty acid stabilized compound (O6FASC), the O3FASC and the O9FASC. The derivatives are synthesized via the same biotechnological process. This work describes the choice of final structure, the design of the biotechnological process and the free solvent enzymatic synthesis used for the synthesis of these three cutaneous lipid analogues. The restructuring effect of such analogues has been demonstrated with an in vivo study on volunteers. The stabilization of the O3FASC and O6FASC, and the biological activities of these three compounds are presented. The O6FASC shows very good results in anti-inflammatory effects; the O3FASC has anti-stress activities, whereas the O9FASC presents interesting results in improving elasticity and firmness. All these activity tests are presented in this work.

The level of polyaromatic hydrocarbons in kajal and surma of major Indian brands

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Kajal and surma are eye cosmetics extensively used in Indian subcontinent. Kajal is prepared by burning of vegetable oil and butter oil while surma by grinding of the stones. High performance liquid chromatography and gas chromatography–mass spectrometry instruments were used for quantification and confirmation of 16 polyaromatic hydrocarbons (PAHs). Significant concentration of PAH was found in all the samples examined. The median concentration of PAH ranged from 0.14 (lowest, anthracene) to 31.18 $\mu g\ g^{-1}$ [dibenz(a,h)anthracene] in kajal sample and from not detectable concentration (naphthalene) to 197.47 $\mu g\ g^{-1}$ of benzo(a)pyrene in surma sample. Fifteen PAHs were detected in all the samples. Therefore the use of kajal and surma in eye should be strictly restricted.