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Abstracts

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My First Year of Experience in the Cosmetic Field – Problems and Future Hopes

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Where do I begin to tell my adventures as a new research and development chemist? It has been a mixed bag of excitement, frustration, hope, pride in achievement and much potential. Before I take you through the obstacle course that I have been exposed to in the cosmetic industry let me give you background information on myself. I have always been inclined towards the sciences. I took up science subjects for my A-Level Cambridge exams, but surprised my father for a little while by registering for a BA in psychology. After two weeks I decided that was not for me and registered for a BSc in natural and environmental sciences with biochemistry and psychology as my majors with the notion that one day after my studies I would become a neuropsychologist. When I had to decide between taking my honors in psychology or biochemistry, I chose biochemistry mainly because I thought I had better prospects of finding a job soon after completing the degree, which would free my parents from the financial burden of paying for tuition through to a PhD in psychology (you have to be a doctor first before earning any real money in psychology, I had been told). Boy was I wrong! The carefree, self-assured graduate with the world at her feet slowly changed into a grasping-at-straws, 'I will do anything to pay the bills' nobody until nearly two years after graduation the advertisement for a junior R&D chemist magically appeared in my email! That opened up the floodgates for my childhood dreams of making people feel better by making them look better through makeup and fashion, my adult inclination towards psychology with a scientific twist. I felt this was the opportunity I had been waiting for but had not known it! Thus, my adventure began...

This essay won the 2007 Maison G. de Navarre Young Scientist Prize that is awarded for either the first or second paper in cosmetic science or a specially written essay on a topic selected by the 2006-2007 IFSCC President for an author of 35 years or younger. This Prize was awarded to Muchaneta G. Mutasa during the Openings Ceremony of the 2007 IFSCC Conference »Building on Water«, Amsterdam, The Netherlands on 24 September 2007. The purpose of the Maison G. de Navarre Young Scientist Prize is to stimulate young cosmetic scientists to write scientific papers/essays. The prize covers all expenses to attend the first IFSCC Congress or Conference that is held after the prize was awarded.

Skin Lipid Organization, Composition and Barrier Function

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The primary function of the skin is to act as a barrier against unwanted influences from the environment and to protect the body from water loss. The barrier function of the skin is located in the superficial layer of the skin, the stratum corneum. The stratum corneum consists of dead cells filled with keratin and water, the corneocytes, embedded in lipid regions. As the lipid regions are the only continuous structure in the stratum corneum, they are considered to be very important for the skin barrier function. The main lipid classes are ceramides, cholesterol and free fatty acids. In this paper the lipid organization in human stratum corneum is reviewed. In addition, the role the various lipid classes play in lipid organization is discussed using mixtures prepared from either native human ceramides or synthetic ceramides. Finally, a model is described which allows study of the relation between lipid composition, organization and barrier function. This model is referred to as the stratum corneum substitute.

* These abstracts appear as they were originally published. They have not been edited by the *Journal of Cosmetic Science.*

A New Decorin-like Tetrapeptide for Optimal Organization of Collagen Fibers

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Decorin interacts with collagen via its protein core and influences collagen fibrillogenesis, thus regulating excessive bundle-like aggregation of collagen. As skin ages, there is a lack of functional decorin which results in disrupted collagen fibers and a reduction in the tensile strength of the skin. Therefore, a substitute for decorin would make up for the non-functional decorin that is present as we age. Two tetrapeptide sequences were identified as the specific binding sites of decorin to collagen fibrils. These sequences were engineered in order to generate new tetrapeptides with improved affinity that would present a decorin-like activity. A focused library of several candidates was synthesized containing only tetrapeptides that mimicked the binding sequences of decorin. The candidates were screened with an in vitro collagen fibrillogenesis assay, and the tetrapeptide with the INCI name Tripeptide-10 Citrulline achieved the best results. Like decorin, this synthetic tetrapeptide proved in in vitro tests to regulate collagen fibrillogenesis and influence the diameter of collagen fibers, making them thinner and more uniform. Tripeptide-10 citrulline is a new cosmetic active to specifically target collagen fiber organization. Skin collagen quality is addressed rather than skin collagen quantity. Tripeptide-10 citrulline ensures uniformity of fibril diameter and increases skin suppleness due to a better cohesion of collagen fibers.

Winner of the Award for the best Podium Presentation at the IFSCC Conference 2007, Amsterdam, The Netherlands

Water Management of Human Hair

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Temperature dependent isotherms for the water ab- and desorption of human hair were determined (25-65°C) together with the related diffusion coefficients and hysteresis effects. Special care was taken to standardize the physical history of the samples. With increasing temperature, isotherms, while preserving their shape, shift to lower regains while the hysteresis effect decreases. This is in accordance with expectations derived from the Rosenbaum-model for water sorption. The differential heat of water sorption changes from dry to wet hair between 1020 and 50 J/g H_2O. Diffusion coefficients are of the order of 10^{-9} cm^2/s. The coefficients increase with temperature and show a pronounced maximum in the range of medium regains. The temperature dependence follows the Arrhenius equation and exhibits activation energies that change from dry to wet hair between 55 and 30 kJ/mol. The sorption performance of strongly bleached hair, with and without an additional treatment with cetyltrimethylammonium bromide, was investigated. No significant effects either of the cosmetic treatment or of the ingredient were found. It is concluded that human hair exhibits a rather robust static and dynamic water sorption performance that, against initial expectations, is not readily changed by cosmetic processes and ingredients.

Super Mild Oxidation Coloring: Preventing Hair Damage at the Molecular Level

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Hydrogen peroxide is widely used for oxidation hair coloring or bleaching. It displays a high redox potential and easily penetrates into the hair fiber. This renders hydrogen peroxide capable of non-specific interactions with cortex and cuticle proteins resulting in irreversible cleavage of cystine crosslinks. Various classes of antioxidants were screened for their anti-hair damage effect in a permanent hair dye formulation using NIR spectroscopy. In parallel, the effect on the coloring and lightening performance was studied to exclude unwanted side effects on primary product performance. The screening criteria were fulfilled by organic disulfides such as α-lipoic acid but interestingly not by powerful antioxidants such as tocoperol, dibutylhydroxytoluene, or beta-carotene. Alpha-lipoic acid significantly protected human hair during oxidation coloring as demonstrated by (i) amino acid and protein analysis, (ii) surface polarity measurement, (iii) lipid analysis, (iv) differential scanning calorimetry, and (v) combing work measurement. Our results show that radical scavenging properties alone do not render antioxidants suitable for hair protection during oxidative treatments. The presence of disulfide bonds appears to be very favorable and it is likely that the intramolecular cross-link within α-lipoic acid provides a kinetically controlled protection for cystine crosslinks during oxidation coloring.