J. Cosmet. Sci., 57, 174–176 (March/April 2006)

Abstracts

IFSCC Magazine
Vol. 9, No. 1, 2006*

Ethnic Skin Types: Are there Differences in Skin Structure and Function?

Author: Anthony V. Rawlings

AVR Consulting Ltd., Kingsmead, Northwich, Cheshire CW9 8FH, UK

People with skin of color comprise the majority of the world's population and Asian subjects comprise more than half of the total population of the earth. Even so, the literature on the characteristics of subjects with skin of color is limited. Several groups over the past decades have attempted to decipher the underlying differences in skin structure and function in different ethnic skin types. However, most of these studies have been of small scale and in some studies interindividual differences in skin quality overwhelm any racial differences. There has been a recent call for more studies to address genetic together with phenotypic differences among different racial groups and in this respect several large scale studies have been conducted recently. The most obvious ethnic skin difference relates to skin color, which is dominated by the presence of melanin. The photoprotection derived from this polymer influences the rate of the skin aging changes among the different racial groups. However, all racial groups are eventually subjected to the photoaging process. Generally, Caucasians have an earlier onset of and greater skin wrinkling and sagging signs than other skin types, and in general increased pigmentary problems are seen in subjects with skin of color although one large study reported that East Asians living in the USA had the least pigment spots. Induction of a hyperpigmentary response is thought to be through signaling by the protease-activated receptor-2, which together with its activating protease is increased in the epidermis of subjects with skin of color. Changes in skin biophysical properties with age demonstrate that the more darkly pigmented subjects retain younger skin properties compared with the more lightly pigmented groups. However, despite having a more compact stratum corneum there are conflicting reports on barrier function in these subjects. Nevertheless, upon a chemical or mechanical challenge the stratum corneum (SC) barrier function is reported to be stronger in subjects with darker skin despite having the reported lowest ceramide levels. One has to remember that barrier function relates to the total architecture of the SC and not just its lipid levels. Asian skin is reported to possess a similar basal transepidermal water loss (TEWL) to that of Caucasian skin and similar ceramide levels but upon mechanical challenge it has the weakest barrier function. Differences in intercellular cohesion are obviously apparent. In contrast, reduced stratum corneum natural moisturizing factor (NMF) levels have been reported compared with Caucasian and African American skin. These differences will contribute to differences in desquamation but very little data is available. One recent study has shown reduced epidermal cathepsin L2 levels in darker skin types which if it also occurs in the SC could contribute to the known skin ashing problems these subjects experience. In very general terms, as the desquamatory enzymes are extruded with the lamellar granules, subjects with lowered SC lipid levels are expected to have lowered desquamatory enzyme levels. Increased pores size, sebum secretion and skin surface microflora occur in Negroid subjects. Equally, increased mast cell granule size occurs in these subjects. The frequency of skin sensitivity is quite similar across different racial groups but the stimuli for its induction show subtle differences. Nevertheless, several studies indicate that Asian skin may be more sensitive to exogenous chemicals, probably due to a thinner stratum corneum and higher eccrine gland density. In conclusion, we know more of the biophysical and somatosensory characteristics of ethnic skin types but clearly, there is still more to learn and especially about the inherent underlying biological differences in ethnic skin types.

Fluorescence and Scanning Electron Microscopic Characterization of Cuticle Erosion in Human Hair

Sigrid B. Ruetsch and Yash K. Kamath

TRI/Princeton, 601 Prospect Ave., Princeton, NJ 08542, USA

Environmental and natural grooming damage of hair were investigated by the microfluorometric method using Rhodamine B as the fluorescent tracer. An increase in fluorescence intensity of tracer-tagged hair as we moved from the root to middle section and tip end is indicative of weathering and progressive mechanical damage. The locus of Rhodamine B penetration and interaction occurs at the scale edge in the root end, changing to the scale face and scale edge

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

in the middle section, and finally to the cortical cell surfaces and the intercellular cement at the tip end in long hair. The resulting increase in fluorescence emission intensity is indicative of progressive damage to the cuticular structure, ultimately resulting in the loss of the cuticular sheath. Scanning electron microscopic observations show detailed features of progressive cuticle erosion and ablation. Characteristic changes in the physical nature and shape of the cuticle cell compared to its appearance as it emerged from the follicle are indicative of environmental and mechanical damage inflicted upon hair. Change of the smoothly contoured scale edge to its jagged shape, frequent appearance of »failed endocuticular material« left behind after the inextensible A-layer and exocuticle have been chipped away, and »tear lines« or »seams«, which are the loci where the surface cuticle cells were originally attached, are indicative of progressive cuticle erosion.

Resolving the Conflict of a Simultaneously Highly Moisturizing and Occlusive Emulsion Film

Yuji Sakai, Masashi Suzuki, Yasuhiro Ohara, Shinya Okabe

Skin Care Products R&D Department, POLA Chemical Industries, Inc., 27-1 Takashimadai, Kanagawa-ku, Yokohama 221-0833, Japan

Two basic functions of emulsion-based cosmetic products, moisturization and occlusion, are markedly affected by the ratio of hydrophilic to lipophilic parts in the emulsion. However, due to their conflicting requirements, it is difficult to simultaneously improve both functions. In studies to resolve this problem, we focused on the emulsion film structure because an applied emulsion film is in contact with skin directly and performs functions of the emulsion. We hypothesized that if an emulsion film were similar in structure to healthy stratum corneum, it would be possible to simultaneously enhance the moisturizing and occlusive functions because healthy stratum corneum contains large amounts of water and the amount of water loss from the skin surface is low. To disperse a large quantity of water in the lipophilic part, just as corneocytes of healthy stratum corneum contain a large quantity of water, we focused on the dispersant. Polyglycerin-type surfactants and cetyl alcohol proved useful. To strengthen the hydrophilic part, just as intercellular lipids of the stratum corneum are rigid, we focused on the emulsification method and hydrophilic surfactant. Due to the properties of a polyglycerin-type surfactant, it is generally difficult to form a liquid crystal structure, but we were able to do this using polyglycerin-13-polyoxybutylene-14-stearyl ether and the D-phase emulsification method. We confirmed through laser microscopic studies that droplets in conventional emulsions disappear quickly after the film has formed and dried, whereas in our experimental emulsions the droplet shape is even retained. We also found that the inherent film-moisturizing index (IFM) and the inherent film-occlusive index (IFO) were both high for the experimental emulsions. Furthermore, after one month of continuous use, stratum corneum removal (an indicator for skin moisture) and corneocyte arrangement (an indicator for barrier function) also improved significantly. The results of this study show that by focusing on the structure of emulsion films, particularly the relationship between lipophilic and hydrophilic parts, emulsion functions can be enhanced and certain limitations overcome.

How Skincare Ingredient Concentrations Can Modulate the Effect of Polyols and Oils on Skin Moisturization and Skin Surface Roughness

Gae Won Nam[1], Seung Hun Kim[1], Eun Joo Kim[1], Jin Han Kim[2], Byeong Gun Chae[2], Hae Kwang Lee[1], Seong-Joon Moon[1], Hak-Hee Kang[2], and Ih Seop Chang[1]

[1] Skin Research Institute, Amore-Pacific Corporation/R&D Center, Yongin, Korea, 129-749 [2] Cosmetic Research Institute, Amore-Pacific Corporation/R&D Center, Yongin, Korea, 129-749

The aim of this study was to evaluate the influence of different skincare ingredient concentrations on the effect of polyols and oils on human skin moisturization and skin surface roughness. Polyols and oils are essential ingredients in a skin care formulation, but it is still not understood how their concentrations affect their efficacy and sensory properties on human skin. We studied various concentrations of ingredients from cosmetic companies using noninvasive methods. The polyols consisted of glycerin and butylene glycol (BG) in a ratio of 1:1, and the oils consisted of equal parts of hydrogenated polydecene, cetyl ethylhexanoate and pentaerythrityl tetraethylhexanoate. All compounds were tested in O/W emulsions in concentrations ranging from 0~27% for polyols and from 0~35% for oils. We investigated the effect on water content and stratum corneum roughness on forearm skin after application of the compounds. The skin water content was determined by skin capacitance measurements and the skin surface roughness by visual scoring of skin surface biopsies in the scanning electron microcrographs. The water content of the skin correlated highly with the polyol (up to 20%) and oil (up to 12%) concentrations, respectively. Two hours after application the correlation coefficients were 0.971 and 0.985, respectively ($p<0.01$). Skin surface roughness not only showed a strong concentration-dependence on polyols and up to 6% on oils, but in a multiple regression analysis also correlated with a ratio of 2.5 to 1 (polyols and oils). Further studies will be conducted with other ingredients such as surfactants, lipids and aqueous materials, and with other methods for noninvasive measurement.

Formulating for Fast Efficacy: Influence of Liquid Crystalline Emulsion Structure on the Skin Delivery of Active Ingredients

Johann W. Wiechers[1], Caroline Kelly[2], Trevor G. Blaese[2], and J. Chris Dederen[3]

[1] Uniqema Applied Research, Skin R&D, P.O. Box 2, 2800 AA Gouda, The Netherlands [2] Uniqema Applied Research, Wilton Centre, Redcar, UK [3] Uniqema Applied Research, Meerbeek, Belgium

In a previous publication, we described how the extent of skin delivery of an active ingredient can be optimized in a cosmetic formulation by the choice of a primary and secondary emollient. This paper describes our initial attempts to explain the influence of the emulsifier system on the

dermal delivery of an active ingredient. Some of the emulsifiers studied in this investigation induced liquid crystal formation in the formulations and were found to interact in two different ways. On the one hand, they prevented the evaporation of water from the formulation when applied on the skin and in doing so prolonged the delivery phase of water-soluble active ingredients as only solubilized molecules penetrate the skin at reasonable rates. On the other hand, when combined with lipophilic active ingredients, the location to which the active ingredient is delivered was changed. This can be explained by a possible interaction of these emulsifiers with the skin lipid bilayers. These are present in an orthorhombic, an hexagonal and a liquid packing, which co-exist simultaneously and are characterized by a relatively low, an intermediate and a high permeability, respectively. The results obtained in this study suggest that the use of these liquid crystal formation inducing surfactant systems favors the presence of the more permeable packing states. In a given time, an active ingredient will therefore penetrate deeper into skin with emulsifier systems that induce liquid crystal formation than with systems that do not. It is therefore suggested that such emulsifier systems be used when fast delivery of a lipophilic active ingredient or more delivery of a hydrophilic active ingredient is required, and non-liquid crystalline systems if slower or less delivery is required. The use of liquid crystalline emulsifier systems therefore allows cosmetic formulators to regulate the extent (hydrophilic active ingredients) or speed (lipophilic active ingredients) of active ingredient delivery and thus to formulate for fast efficacy.