

## Abstracts

### International Journal of Cosmetic Science Vol. 28, No. 5, 2006\*

#### Review Article

##### Revisiting Dandruff

C. Piérard-Franchimont, E. Xhaufaire-Uhoda and G. E. Piérard

Dandruff is a common scalp disorder affecting almost half of the postpubertal population of any ethnicity and both genders. It may, however, represent a stubborn esthetical disturbance often source of pruritus. Skin biocenosis, in particular the *Malassezia* spp. flora, plays a key aetiologic role, in combination with the unusual capacity of some corneocytes to be coated by these yeasts. Substantial evidence indicates that keratinocytes play an active role in the generation and expression of immunopathological reactions. This is probably the case in dandruff. Upon stimulation of a critical colonization of corneocytes by *Malassezia* yeasts, the release of pro-inflammatory mediators is increased. This could lead to the subclinical microinflammation present in dandruff. In seborrheic dermatitis, local deposits of immunoglobulins and the release of lymphokines are responsible for the recruitment and local activation of leukocytes leading to the eventual amplification of the inflammatory reaction. Some ancillary non-microbial causes of dandruff may operate through physical or chemical irritants. Many methods have been described for rating dandruff. Our favourite tools are clinical examination and squamometry. Dandruff can precipitate telogen effluvium and exacerbate androgenic alopecia. Antidandruff formulations exhibiting some direct or indirect anti-inflammatory activity can improve both dandruff and its subsequent hair cycle disturbance.

#### Review Article

##### The Biology of Vernix Caseosa

S. B. Hoath, W. L. Pickens and M. O. Visscher

The biology and physical properties of the uniquely human skin cream 'vernix caseosa' are discussed. This material

coats the foetal skin surface during the last trimester of gestation and provides multiple beneficial functions for the foetus and newborn infant. Vernix has a complex structure similar to stratum corneum but lacks lipid lamellae and is more plastic due to the absence of desmosomal constraints. In utero, vernix is made in part by foetal sebaceous glands, interacts with pulmonary surfactant, detaches into the amniotic fluid, and is swallowed by the foetus. At the time of birth, vernix has a remarkably constant water content approximating 80%. Postnatally, vernix is simultaneously a cleanser, a moisturizer, an anti-infective, and an antioxidant. Vernix facilitates acid mantle development and supports normal bacterial colonization. Its hydrated cellular structure and unusual lipid composition provide a 'best' solution for the needs of the foetus and newborn, not least of which is the attraction of caregivers. Vernix is an important natural biomaterial of potential interest to cosmetic scientists, and other disciplines involved in product development and therapies targeting the complex interface between the stratum corneum and a changing terrestrial environment.

##### Effect of Hormone Replacement Therapy on Epidermal Barrier Lipids<sup>1</sup>

M. Misra, C. Feinberg, M. Matzke and D. Pocalyko

Current evidence of the effect of hormone replacement therapy (HRT) on skin lipids, of postmenopausal women is scanty and indirect. Here, we report the ultrastructural differences in epidermal lipids between postmenopausal subjects who were and were not on HRT and a comparison is made with younger subjects. Biopsies were obtained from arms and legs, in a blinded, no-treatment, study conducted on postmenopausal subjects who were and were not on HRT and younger subjects. The ultrastructure of skin lipids and the lipid coverage of underlying corneocytes were compared for biopsies obtained from different subjects. Qualitative assessment as well as quantitative estimation of lipid-covered regions of corneocytes shows

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

that skin lipids do not cover corneocytes effectively in postmenopausal women who are not on HRT. However, women who are on HRT show significantly improved lipid coverage of corneocytes, which is comparable with the younger subjects. This implies that HRT should improve the lipid coverage and skin condition of postmenopausal women.

#### Caffeine Improves Barrier Function in Male Skin

J. M. Brandner, M. J. Behne, B. Huesing and I. Moll

The influence of androgens, especially testosterone and its effector dihydrotestosterone, results in a constitutive disadvantage for male skin, e.g. reduced viability of hair at the scalp and reduced epidermal permeability barrier repair capacity. Dihydrotestosterone can act, among others, as an adenylyl cyclase inhibitor. Caffeine on the other hand is an inexpensive and (in regular doses) harmless substance used in various cosmetic products, which can act as a phosphodiesterase inhibitor. To prove the hypothesis that caffeine as a phosphodiesterase inhibitor is able to override testosterone-induced effects on barrier function, we performed a double-blind placebo controlled study with healthy volunteers. In this study, 0.5% caffeine in a hydroxyethylcellulose gel preparation (HEC) was applied on one forearm, HEC without caffeine on the other forearm of male and female volunteers for 7 days and transepidermal water loss (TEWL) was measured before and at the end of the treatment period. Basal TEWL did not differ significantly between male and female subjects but the application of caffeine significantly reduced TEWL in male skin compared with female skin. We conclude that caffeine is beneficial for barrier function in male skin.

#### Effects of Environmentally Realistic Levels of Ozone on Stratum Corneum Function

Q. C. He, A. Tavakkol, K. Wietecha, R. Begum-Gafur, S. A. Ansari and T. Polefka

The impact of troposphere ozone ( $O_3$ ), the major oxidant in photochemical smog, on the overall wellbeing of skin is of considerable interest. To date, limited information is available on the impact of  $O_3$  on human skin. Using a specially designed  $O_3$  exposure chamber, we provide the first evidence that exposure of human skin to  $O_3$  (0.8 ppm, 2-h time-weighted average) significantly reduced vitamin E by 70% and concomitantly increased lipid hydroperoxides by 2.3 fold in the superficial stratum corneum (SC). Although the dose of  $O_3$  used here reduced the resident microflora population by 50% and created a state of oxidative stress within the SC, it did not affect several key enzymes involved in SC homeostasis including the redox-sensitive transglutaminase and the SC tryptic (KLK5) and chymotryptic (KLK7) proteases. Importantly, no signs of skin dryness or erythema were observed. We hypothesize that the limited effects of low doses of  $O_3$  on SC function is attributable to several factors including: (i) protection provided by the anti-oxidant defence system; (ii) inability of  $O_3$  to penetrate the SC; and (iii) limited water available to catalyse the Criegee reaction. Although chronic exposure

to  $O_3$  may produce a different outcome than that reported here, our data suggest that exposure to environmentally relevant doses of  $O_3$ , at best, induces a moderate state of oxidative stress, without producing a visible clinical response. In our opinion, exposure of skin to UV radiation is a much more significant threat than exposure to ground-level  $O_3$ .

#### Natural Skin Surface pH is on Average Below 5, Which is Beneficial for its Resident Flora

H. Lambers, S. Piessens, A. Bloem, H. Pronk and P. Finkel

Variable skin pH values are being reported in literature, all in the acidic range but with a broad range from pH 4.0 to 7.0. In a multicentre study ( $N = 330$ ), we have assessed the skin surface pH of the volar forearm before and after refraining from showering and cosmetic product application for 24 h. The average pH dropped from  $5.12 \pm 0.56$  to  $4.93 \pm 0.45$ . On the basis of this pH drop, it is estimated that the 'natural' skin surface pH is on average 4.7, i.e. below 5. This is in line with existing literature, where a relatively large number of reports (c. 50%) actually describes pH values below 5.0; this is in contrast to the general assumption, that skin surface pH is on average between 5.0 and 6.0. Not only prior use of cosmetic products, especially soaps, have profound influence on skin surface pH, but the use of plain tap water, in Europe with a pH value generally around 8.0, will increase skin pH up to 6 h after application before returning to its 'natural' value of on average below 5.0. It is demonstrated that skin with pH values below 5.0 is in a better condition than skin with pH values above 5.0, as shown by measuring the biophysical parameters of barrier function, moisturization and scaling. The effect of pH on adhesion of resident skin microflora was also assessed; an acid skin pH (4-4.5) keeps the resident bacterial flora attached to the skin, whereas an alkaline pH (8-9) promotes the dispersal from the skin.

#### Sunblocking Efficiency of Various $TiO_2$ -Loaded Solid Lipid Nanoparticle Formulations<sup>1</sup>

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In this study, titanium dioxide ( $TiO_2$ ) was incorporated into solid lipid nanoparticle (SLN) formulations using both classical and novel preparation methods. The SLNs were investigated by evaluating their stabilities and physicochemical characteristics. UV-protection abilities of formulations were investigated using *in vitro* Transpore™ and Sun To See™ test methods. Results have been discussed by comparing the classical SLN formulation with the novel SLN, hybrid SLN (H-SLN) and the emulsion formulations. The results showed the superiority of the H-SLN formulations compared with the classical SLN; all SLN formulations were better when compared with the emulsion formulations considering the UV protection. Incorporation of  $TiO_2$  as a sunscreen agent into SLN formulations gives opportunity to produce stable and safe formulations with reduced amount but high UV-protection ability.