

EPIDERMAL MOISTURE AND SKIN SURFACE LIPIDS THROUGHOUT LIFE AS PARAMETERS FOR COSMETIC CARE

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Synopsis

Aging of the skin is clinically accompanied by increased dryness. Determinations of skin surface lipids and of epidermal moisture were performed in 160 females with normal skin on the forehead and the cheek. The values of 80 females, who were regular users of cosmetic care products were compared with those of age-matched non-users. No significant differences of skin lipids and hydration existed between both groups. In the group of females over 60 years not utilizing cosmetic care products statistical evaluation showed a significantly decreased hydration of the horny layer in comparison to the control group. Supply of the skin with moisturizers thus should be a major aim of cosmetic care.

Riassunto

L'invecchiamento della pelle é clinicamente accompagnato da un incremento della secchezza cutanea. Sono stati controllati i lipidi di superficie e l'idratazione cutanea di 160 donne con cute normale a livello della fronte e delle guance, raggruppate in due gruppi di 80 soggetti. Un gruppo utilizzava normalmente cosmetici mentre l'altro era rappresentato da soggetti non utilizzatrici di creme. Non sono state riscontrate differenze significative tra i due gruppi sia sui parametri sebometrici che nell'idratazione di superficie. Nelle donne con età superiore agli anni sessanta non utilizzatrici di cosmetici é stato riscontrato un decremento significativo dell'idratazione dello strato corneo rispetto al gruppo di controllo. Lo scopo principale che debbono, quindi, raggiungere i prodotti cosmetici sembra essere quello di reidratare la cute.

Introduction

One of the essential components of attractive skin is the water content of the stratum corneum. This content depends on exogenous factors such as humidity and temperature and on endogenous factors such as perspiratio sensibilibis and insensibilis and the natural moisturizing factor — a composite of amino acids, salts and other water soluble components like urea, sodium lactate and others. A decrease of the water content of stratum corneum leads to dry skin and may even cause the xerotic eczema. Together with the skin lipids, the water binding substances form the hydro-lipid film of the skin. At present, the interactions between skin lipids and moisturizing substances of the horny layer are not fully understood. Nevertheless, a major aim of cosmetic skin care is to supply skin with substances imitating the natural hydro-lipid film.

Clinically one of the first symptoms of aging of the skin is increasing dryness. Determinations of sebum and hydration have been performed in order to investigate possible changes of both parameters during the different periods of life. In fact, significant decrease of sebum with proceeding age has been described. (1) However, the importance of sebum for the appearance of the skin is not undisputed. The skin of babies is nearly devoid of sebaceous gland lipids but, nevertheless, serves its functions well and is not "dry" at all. Moreover, the role of stratum corneum lipids is yet not fully understood. Their involvements in the cornification and desquamation processes have been discussed. (2) While the clinical impression of dry skin increases continuously with age, the composition of the stratum corneum lipids remains constant from 50 years of age on. (2)

From previous investigations of the water content of the stratum corneum no common trend could be derived. No change in moisture content of the horny layer with continuous aging

was found by Gloor and Frödin et al. (3,4) However, moderate decrease of hydration in aged skin was reported by Potts et al. (5) The contradictory data prompted us to study hydration of the stratum corneum in different age groups in females with normal skin. In addition, the casual levels of skin surface lipids were determined.

Methods

Test subjects

The measurements were performed in a group of 80 females, who were regular users of various cosmetic care products, the results were compared with those of 80 age matched control subjects not using cosmetic preparations in order to evaluate possible differences. Four groups of age were tested in this total of 160 females. Each group consisted of 20 users of cosmetics and 20 non-users. The groups were: 18–30 years, 31–45 years, 46–60 years, and 61–75 years of age. All subjects were healthy and had clinically normal skin. On the day of the examination, skin had not been washed and nothing had been applied to the face. The forehead and the cheeks were used as test areas.

Measurements

The measurements were performed under standardized external conditions between 11.00 a.m. and noon. Room temperature was 21° C and humidity 40–45%. The instrument used for measurements of hydration of the stratum corneum was the Corneometer CM420 (Schwarzaupt Medizintechnik GmbH 5000, Cologne, FRG), which acts by measuring capacitance. For measurements of the casual level of skin surface lipids the Sebummeter SM 410

(Schwarzaupt Medizintechnik GmbH 5000, Cologne, FRG) was used, which provides photometric measurements of the light permeability of a lipid contaminated foil.

Results

Overall evaluation of hydration revealed no significant differences between users of cosmetics and non-users (Table I).

Table I

COMPARISON OF HYDRATION AND LIPIDS BETWEEN TREATED AND NON-TREATED SUBJECTS

	TREATMENT VALUE			NON-TREATMENT VALUE			P-VALUE
	n	mean value	SD	n	mean value	SD	
HYDRATION							
Forehead	80	76	±24	80	73	±20	NS
Cheek	80	89	±13	80	86	±14	NS
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LIPIDS							
Forehead	80	200	±99	80	179	±96	NS
Cheek	80	127	±98	80	104	±76	NS

SD - standard deviation
NS - no significance.

No significant decrease of hydration and lipid values between treatment and non-treatment group.
Statistical evaluation according to Wilcoxon 2-Sample-Test.

In the group of non-users of cosmetic care products significant changes of epidermal hydration were observed only on the forehead at different periods of life. However, no significant changes of hydration were found in the cosmetic group in both sites in the face (Table II).

Table II

COMPARISON OF HYDRATION AMONG THE DIFFERENT AGE GROUPS IN TREATED AND NON-TREATED SUBJECTS AND TREATED AND NON-TREATED SUBJECTS WITHIN THE SAME GROUP OF AGE

Age group	<30 years			31-45 years			46-60 years			>60 years			p-value
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	
FOREHEAD													
Treatment values	20	74	±25	20	84	±22	20	69	±26	20	78	±21	NS
Non-treatment values	20	73	±17	20	83	±18	20	78	±18	20	59	±21	p<0.01*)
p-value	NS			NS			NS			p<0.05**)			
CHEEK													
Treatment values	20	91	±13	20	91	±9	20	84	±16	20	89	±11	NS
Non-treatment values	20	83	±17	20	88	±10	20	91	±14	20	83	±15	NS
p-value	NS			NS			NS			NS			
SD - standard deviation NS - no significance													
*) Significant change of hydration throughout the different groups of age within non-treated subjects in the forehead. Statistical evaluation according to Kruskal-Wallis-Test.													
**) Low significant lower level of hydration on the forehead in the non-treatment group in comparison to the treatment group over 60 yrs. Statistical evaluation according to Wilcoxon 2-Sample Test.													

Comparison of hydration values of cosmetic users and non-users within the same age group revealed a significant decrease in non-users above 60 years of age against the age matched users of cosmetic care (Table II). Hydration parameters of the groups younger than 60 years showed no significant differences between users and non-users.

The statistical evaluation of skin surface lipids showed no significant differences between the groups of utilizers of cosmetic care and non-utilizers within the same age. Significant variations of skin surface lipids were found at the different ages in both groups (Table III). In addition, for the total of users and non-users independent of the age for skin lipids no significant differences became evident (Table I). Comparison of the 4 age groups showed significant changes of the levels of skin surface lipids

and of hydration. Distinctly lower levels of both parameters were to be found in the eldest group in comparison to the younger groups.

Table III

COMPARISON OF LIPIDS BETWEEN THE DIFFERENT AGE GROUPS IN TREATED AND NON-TREATED SUBJECTS AND BETWEEN TREATED AND NON-TREATED SUBJECTS WITHIN THE SAME GROUP OF AGE

Age group	<30 years			31-45 years			46-60 years			>60 years			p-value
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	
FOREHEAD													
Treatment values	20	195	±70	20	228	±84	20	232	±133	20	145	±76	p<0.05*)
Non-treatment values	20	213	±87	20	211	±85	20	166	±94	20	126	±98	p<0.001*)
p-value	NS**)			NS**)			NS**)			NS**)			
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CHEEK													
Treatment values	20	141	±96	20	163	±91	20	137	±121	20	69	±55	p<0.01*)
Non-treatment values	20	119	±67	20	128	±68	20	96	±83	20	72	±75	p<0.05*)
p-value	NS**)			NS**)			NS**)			NS**)			
SD - standard deviation NS - no significance													
*) Significant changes of skin surface lipids throughout the different age groups within treated and non-treated subjects. Statistical evaluation according to Kruskal-Wallis-Test.													
**) No significant differences of skin surface lipids between treated and non-treated subjects within the same age groups. Statistical evaluation according to Wilcoxon 2-Sample Test.													

Discussion

Similar to sebum, which shows different levels in various locations, also hydration of the horny layer may show variations according to the anatomical site. In previous measurements of skin hydration mainly the lower arms or the legs were used as test areas. In our study, which focused on the comparison between cosmetic users and non-users 2 sites in the face were selected. The statistical overall evaluation between users of cosmetic care and non-users, disregarding age showed no significant differences between both groups for moisture and lipids. However, the decrease of hydration on the forehead in the over 60 years old females, who used no cosmetic care products was a significant finding. This finding shows that at

least in some locations water content of the stratum corneum decreases from 60 years on and is a target for the use of moisturizers.

The decrease of skin surface lipids with age is partly due to reduced sebaceous gland function. This is in accordance with the results of sebum investigations at various ages, showing a significant decrease with increase of age.(1) In addition, a decrease of epidermal lipids caused by the thinning of the epidermis in aged persons may be contributory to the diminution of skin lipids.

The absence of a difference in skin lipids between the groups utilizers of cosmetic care products and non-users indicates equal skin condition with regard to lipids in both groups, and no effects of cosmetic preparations on skin surface lipids. The significantly lower water content of the stratum corneum in females over

60 not utilizing cosmetic in comparison to regular users accentuates the importance of moisturizers for cosmetic care.

Recent studies have shown that intercellular lipids — mainly sphingolipids in combination with other neutral lipids — play an important role in the establishment or maintenance of water retention properties in the stratum corneum.(11) Topical application of isolated intercellular lipids was demonstrated to repair previously impaired water retention properties.(12)

Moreover, the positive effects of preparations of liposomes of the stratum corneum lipids have been reported.(13) Developments of new technologies, like the liposome technique, could reduce the cleft between scientific knowledge and its practical application. Thus, products closely imitating the natural moisturizing factor most closely could be created and the decrease of epidermal moisture in aged persons could be equalized.

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