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Scaling, Dry Skin and Gender

A bioengineering study of Dry Skin

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Dry skin and scaling was studied in a group of 72 healthy volunteers by using subjective selfassessment and by clinical assessment by a dermatologist, as well as application of noninvasive bioengineering techniques to measure scaling and epidermal hydration. The study revealed that 67% of the volunteers had subjective complaints, while only 5.6% had definite clinical signs of dry skin at the time of examination. Subjective complaints were more common in women than in men ($p < 0.001$), though neither clinical nor objective measurements showed any sex difference, which suggests that other factors may play a role in the way men and women perceive dry skin. Subjective and clinical scores were correlated ($p < 0.02$), though neither was significantly correlated to objective measurements. Grading of skin scaling on D-squame® tapes correlated with densitometry of the tapes ($p < 0.001$), as did the electrical capacitance ($p < 0.001$). Both clinical and objective methods can identify dry skin. However, the study showed that in healthy persons a number of irrational factors play a role in the use of moisturizers, and while these factors cannot be measured, they must be taken into account. Healthy, but dry skin is a vaguely defined clinical entity, which may explain the generally poor correlation between the two methods. This underlines the need for several methods to be used simultaneously in order to elicit complementary information. ***Key words: Bioengineering; Moisturizers; Dry skin; Gender.***

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The very widespread use of moisturizers is generally based on subjective assessment of skin dryness by the consumer, rather than on an accepted and well documented definition of dry skin. Such a definition would be of value not only in documenting the effect of moisturizers, but also help to distinguish between physiological and pathological conditions. Furthermore, an improved definition is important for the rational exploration of the underlying mechanisms.

Increased scaling is intuitively perceived as a feature of dry skin. It was therefore decided to compare subjective, clinical and objective measurements of dryness and scaliness in normal healthy volunteers.

MATERIALS AND METHODS

A sample consisting of 72 volunteers employed in office work participated in the study. No further selection was made, and all 72 were enrolled in the study. There was no history of atopic disease. Nine persons had an active skin disease, but none in the region examined. One person had contact dermatitis to nickel, one acne rosacea, one keratosis follicularis, one pityriasis rosea, one discoid eczema, one unclassified eczema, 2 had psoriasis, and one complained of dandruff. Volunteers were asked to stop their normal use of moisturizers for 2 days prior to evaluation of and measurements on their skin.

Each person made a subjective assessment of skin dryness. At the same time an independent clinical assessment was made by one of the authors (J.S.). Two objective methods were used for the assessment of dry skin. Electrical capacitance was used as a measure of the hydration of the stratum corneum using the Corneometer CM420® (Schwartzhaupt, Cologne, FRG) (1.2). The method is considered to reflect hydration in the deeper part of the stratum corneum (1,3,4), although measurements can be affected by the presence of other electrically conductive molecules besides water. D-Squame® tape was used as the second objective method. These adhesive tapes are used to obtain biopsy material from the most superficial layers of the stratum corneum. It allows for a grading of the scaling pattern, as well as objective measurement of the quantity of scales harvested (5), by measuring the optical transmission through the tape and any scales attached thereto (densitometry). Densitometry results are expressed as lux per tape, and calculated as: unused tape lux – used tape lux. The smaller and finer the scales are, the more light passes through the tapes, and the lower the densitometry value will be.

All measurements and assessments were made on the ventral side of the forearm in the office under standardized conditions during December. Statistical calculations were carried out on a MacIntosh^R SEII computer using the Statview^R program, correlations, contingency tables. Student's t-test and ANOVA test were used where appropriate. $P < 0.05$ was considered as denoting statistical significance.

RESULTS

The volunteers were 50 women and 22 men. Their mean age was 36 (range 21 to 61) years. The average electrical capacitance was 91.4 ± 8.5 a.u. (range 73–116), and the average optical transmittion was 23.8 ± 5.5 lux (range 13–55). Subjective, clinical and objective scores of dryness and scaling are given in Tables I to III. The influence of sex is illustrated in Table IV. Comparisons between the various measures of dry skin are given in Table V. The correlation between observations is discussed later.

Table I: A simple count and distribution of subjective complaints of dry skin.

	No. of Volunteers	Percent
Constantly or daily use of moisturizer	23	31.9
Occasionally or weekly use of moisturizer	25	34.7
Never or less than weekly use of moisturizer	23	31.9
Unanswered	1	1.4

Table II: A simple count and distribution of the clinical assessment of the volunteers' skin and signs of dryness.

	No. of volunteers	Percent
Definite	4	5.6
Possible	22	30.6
Normal	41	56.9
Not examined	5	6.9

Table III: A simple count and distribution of the scaling as evaluated by D-Squame® tapes, viewed in a medical viewer.

Degree of scaling	No. of volunteers	Percent
Heavy	22	30.6
Moderate	37	51.4
Slight	11	15.3
None	2	2.8

Table IV: Sex differences by number. Age[1] (mean) is given in years. Capacitance[4] is measured in arbitrary units, and densitometry[5] is measured in lux. Figures marked [2] have been analysed using a contingency table, while figures marked [3] have been analysed using the standard error of difference between two means. Missing answers have not been included in the table, and the counts may therefore not always add up to 72. n.s. = values not statistically significant. + = SD.

Parameter	Male	Female	P-value
Numbers	22	50	–
Age[1]	34	37	n.s.[2]
Subjective complaints			
– always dry skin	1	22	p<0.001[3]
– sometimes dry skin	7	18	
– never dry skin	13	10	
Clinical score by dermatologist			
– dry skin	1	1	n.s.[3]
– possible dry skin	3	19	
– normal skin	16	25	
Electrical capacitance[4]	92.7+8.4	90.8+8.6	n.s.[2]
Scaling assessment of D-Squame® tape			
– heavy scaling	7	15	n.s.[3]
– moderate scaling	10	27	
– slight scaling	5	6	
– no scaling	0	2	
Densitometry[5] *of D-Squame® tape*	23.0+5.2	24.4+5.6	n.s.[2]

Table V: Agreement between the various measurements of dry skin, using the ANOVA test or simple correlation [1]. n.s. = values not statistically significant.

	Subjective	Clinical	Capacitance	Scaling
Densitometry	n.s.	n.s.	p<0.001	p<0.001
Subjective	–	p<0.02	n.s.	n.s.
Clinical		–	n.s.	n.s.
Capacitance			–	n.s.

DISCUSSION

In a clinical setting there are several components that form an impression of dry skin: a lacklustre surface, visible scales, a greyish pale complexion, and generally dry look. Subjective complaints of an uncomfortable, tight and stiff skin also appear to be common. In the present study, 67% reported regular use of moisturizers – at least weekly – to relieve dry skin, although a clinical assessment revealed that most of the volunteers had skin, which appeared to be normal. A large proportion of the volunteers (30.6%) were deemed to have possibly dry skin, and only few (5.6%) were found *de facto* to have dry skin on clinical examination by a dermatologist.

Significantly more women than men complained of dry skin, although neither clinical grading by a dermatologist nor objective measurements revealed any differences. This suggests that other factors may be involved in the subjective perception of dry skin.

Several effects of moisturizers can be measured. Dry skin is *per se* more difficult to define objectively. The electrical capacitance correlated negatively with D-Squame® tapes, indicating that skin with a higher capacitance had fewer scales. Scaling evaluated on D-Squame® tape and densitometry are significantly correlated, as demonstrated previously (5). The correlation between changes in the electrical characteristics of the epidermis and size of scales has also been found in psoriasis (6). In this study of dry but otherwise healthy skin, the bioengineering techniques chosen were in good mutual accord.

Disparity may be due to differences in the nature of the assessments. This shows that while both types of technique can be used, they are different in scope. Subjectively, a sex difference was found in the prevalence of dry skin, while clinical assessment and the bioengineering techniques chosen did not reveal any objective difference. This underlines the point that the common use of moisturizers has, probably, a considerable psychological component, which must be taken into account, whenever bioengineering methods are applied. Before a more precise definition of dry skin is agreed upon, the different techniques should therefore be used in a mutually complementary rather than a mutually exclusive way.

REFERENCES

1. Blichmann C, Serup J. Assessment of skin moisture. Acta Dermatovenerol (Stockh) 1988; 68: 284–290.
2. User's manual. Corneometer CM420®. Cologne: Schwarzhaupt GmbH, FRG.
3. Treibskorn A, Gloor M, Greiner F. Comparative investigations on

the water content of the stratum corneum using different methods of measurement. Dermatologica 1983; 167: 64–69.
4. Frödin T, Helander P, Molin L, Skogh M. Hydration of the stratum corneum studied in vivo by optothermal infrared spectrometry, electrical capacitance and evaporimetry. Acta Dermatovenereol (Stockh) 1988; 68: 461–467.
5. Serup J, Winther A, Blichmann C. A simple method for the study of scale pattern and effects of a moisturizer. Qualitative and quantitative evaluation by D-Squame® tape compared with parameters of epidermal hydration. Clin. Exp. Derm. 1989; 14: 277–282.
6. Serup J, Blichmann C. Epidermal hydration of psoriasis plaques and the relation to scaling. Acta Dermatovenereol (Stockh) 1987; 67: 357–366.