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INVESTIGATIVE REPORT

Characteristics of Self-estimated Enhanced Skin Susceptibility

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A considerable number of people complain about enhanced skin sensitivity. The aim of this study was to investigate the characteristics of subjective statements and objective measurable parameters in subjects with self-estimated enhanced skin susceptibility. Four-hundred-and-twenty volunteers completed a questionnaire form with a self-estimation of skin susceptibility, possible triggering factors and other skin problems. In addition, basal values of transepidermal water loss, cutaneous blood flow and skin hydration were measured. One-hundred and fifty-two volunteers were also patch-tested with sodium lauryl sulphate 0.5% on the forearm and evaluated by bioengineering methods. We found no correlation between self-estimated skin susceptibility and bioengineering values, neither basal nor after sodium lauryl sulphate testing. These findings, along with interpretation of the questionnaire form, suggest that self-estimated enhanced skin susceptibility is a subjective problem mostly reported by women and of all ages. ***Key words: bioengineering methods; epidermal barrier; irritant contact dermatitis; stinging; transepidermal water loss.***

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Patients with self-estimated enhanced skin susceptibility (SEESS) are well known to dermatologists. Many complain of "aggressive" skin-care products or climatic change, despite the skin showing no visible changes. Whether SEESS is a result of a different anatomic or biophysical skin condition (which can be evaluated by bioengineering methods) or the consequence of a different perception of skin sensation remains unclear. It is usually the skin reaction to topically applied substances that has been investigated (1, 2). The term "stingers" has been defined for people who feel burning or itching after application of mild irritants such as lactic acid (1). Employing different bioengineering measurements and a patch test with sodium lauryl sulphate (SLS), the aim of our study was to investigate the skin condition of *all* people with a SEESS (not just "stingers").

MATERIALS AND METHODS

Study population

Four-hundred and twenty volunteers (162 men, 258 women, mean age 46 years) participated in the study; 268 were recruited at a mobile centre for skin problems organized by a dermatologist (H. Löffler) in spring and summer 1999 in different cities in Germany. For SLS patch-testing, 152 patients were recruited from the Department of Dermatology, University of Marburg. None of the volunteers showed any sign of skin lesions at the test site. Informed consent was obtained from all tested participants and the study was approved by the ethics committee of the University of Marburg.

Questionnaire form

All 420 participants were asked to fill in a questionnaire form for self-estimation of skin susceptibility and skin problems (Table I). The questions were designed intentionally vague, as many subjects cannot specify their SEESS. Atopy scores (according to Diepgen et al. (3)) and skin type (according to Fitzpatrick (4)) were evaluated by the same investigator.

Bioengineering measurement

After a rest period of 30 min with uncovered forearm, basal values were measured on the middle of one randomly chosen flexure side. Values obtained were transepidermal water loss (TEWL) (TEWAMETER TM 210), cutaneous blood flow (Laser Doppler (LD) PF 5010 using an integrating probe (probe 413)) and skin hydration (Corneometer CM 820). To minimize the influence of intraindividual variation, the presented TEWL values are the mean of 3 measurements and the skin hydration values the mean of 10 measurements. Only one measurement had to be performed for evaluation of cutaneous blood flow, as the value of the integration probe (probe 413) is the mean of 7 measured areas.

Irritant patch testing

One-hundred and fifty-two volunteers were patch-tested with aqueous SLS 0.5% (SLS Sigma, 99% purity); 60 µl was applied in Large Finn Chambers® (inner diameter 12 mm) and patches were applied for 48 h on clinically unaffected skin at the flexor side of the randomly chosen forearm. TEWL was measured 1 h after removal of the patch with the TEWAMETER TM210 (Courage & Khazaka, Cologne). After SLS patch tests, TEWL seems to reach a stable plateau 1 h after the patch is removed (5). The test evaluation was performed by two trained persons in accordance with the guidelines for TEWL measurement of the Standardization Group of the European Society of Contact Dermatitis (6).

Statistical methods

Descriptive and statistical analysis was conducted with SPSS for Windows (SPSS Inc., Chicago, IL) and SAS 6.12 (SAS Institute Inc., Cary, NC). Statistical significance was assessed according to standard practice. We calculated Wilcoxon and Kruskal-Wallis tests for comparing continuous responses in different groups. Associations between continuous variables were measured using the Pearson correlation coefficient and between ordinal variables with a directed test of independence in a linear-by-linear association log-linear model (7).

RESULTS

Almost 50% of volunteers estimated their skin sensitivity as strong or severe, while the remainder considered that they had

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Table I. *Questionnaire form*

Question	Possible answers
General skin susceptibility	1–4 Scale: 1: no, 2: moderate, 3: strong, 4: severe.
Skin susceptibility in summer	
Skin susceptibility in winter	
Skin sensitivity to sun rays	
Skin susceptibility to sheep wool	
Skin susceptibility to cosmetics, soaps, deodorants or perfume	
Skin dryness	
Signs of skin susceptibility	Itching, burning, reddening, tension, development of eczema, other
Localization	Hands, face, other
Flexural eczema	Yes or no
Eczema of hands or face	
Itching during sweating	
Itching during contact to sheep wool	
Allergy against nickel	

low skin sensitivity (Table II). The SEESS in women was significantly higher than that in men (Table II), but there was no correlation between SEESS and age. However, there are significant correlations between the self-estimated skin susceptibility and the following statements:

- Enhanced skin sensitivity during winter
- Enhanced skin sensitivity during summer
- Skin sensitivity to sun rays
- Skin susceptibility to sheep's wool
- Skin susceptibility to cosmetics, soaps, deodorants or perfumes
- Skin dryness
- Atopy score (and flexural eczema)

There was no significant difference between SEESS during summer or winter.

The predominant features of SEESS were reddening, burning and tension. Itching, development of eczema or other signs were not associated with degree of SEESS.

It is known that people with a high SEESS have skin problems on the face and other parts of the body, but not on the hands.

There was no correlation between skin type (according to Fitzpatrick (4)) and SEESS. In contrast, the correlation between frequency of nickel allergy and SEESS was statistically significant.

As far as the bioengineering evaluations were concerned, neither the basal nor the post-SLS measurements showed any sure correlation with SEESS (Table III). These values (skin hydration, skin blood flow and TEWL) showed no convincing differences between the distinct degrees of self-estimated skin susceptibility. The volunteers with a SEESS therefore did not show any different skin physiological properties compared to the average.

Table II. *Frequency of self-estimated skin sensitivity (severity 1–4) in men and women*

	Severity of self-estimated skin susceptibility			
	1	2	3	4
Men	59	44*	34*	25*
Women	45	74*	90*	49*

*Significant difference between men and women ($p < 0.01$).

DISCUSSION

The number of individuals consulting dermatologists with a subjective enhanced skin sensitivity is increasing. It is still unclear whether this is a result of changed environmental parameters (occupational, leisure-time activities, sun rays, air-conditioned rooms, skin care and cosmetic products) or of changed skin perception (it is considered fashionable to have a susceptible skin). The aim of this study was to investigate the differences between subjective statements and objective measurable parameters of people with an SEESS.

It is remarkable that almost 50% of volunteers estimated that their skin sensitivity was strong or acute. This is comparable with earlier studies (8), but more than the number of subjects with signs of eczema regardless of genesis (9). But, in contrast to patients with eczema (1, 10, 11), the volunteers with an SEESS showed no changes in biophysical functions compared to those with a self-estimated normal skin susceptibility, neither basal nor after SLS testing. In general, there was no correlation between the degree of self-estimated skin susceptibility and any one of the measured parameters. The group of volunteers with an SEESS showed comparable reactions to the stingers in previous studies (2, 12). It therefore seems that the SEESS is a non-objective estimation, probably influenced by the individual's education and even more by the mass media. There are few cosmetic products that do not carry the statement "for sensitive skin". Furthermore, it seems to be fashionable to have a susceptible skin, particularly women and men in high life society. Although changes have been found in biophysical skin functions in the elderly (13), there is no correlation between SEESS and age of the subjects.

There are significantly more women than men with an SEESS. However, the basal bioengineering values, as well as skin susceptibility to SLS, did not differ between women and men. It therefore seems that the SEESS in women is caused more by subjective feeling than by distinguished measurable skin conditions. It was shown that it is mostly women who suffer from irritant contact dermatitis on the hands (9). The bioengineering findings (basal and after SLS testing), however, were not different between women and men (14). The reason

Table III. *Mean basal values (± SD) of skin hydration, skin blood flow (Laser Doppler) and TEWL ($g \cdot m^2 \cdot h^{-1}$) depending on severity of self-estimated skin susceptibility. TEWL before (basal) and after (delta: post-basal) testing with 0.5% sodium lauryl sulphate*

	Severity of self-estimated skin susceptibility			
	1	2	3	4
Basal skin hydration	67.3 ± 11.4	70.9 ± 15.4	69.4 ± 11.8	67.6 ± 11.1
Basal skin blood flow	11.1 ± 8.5	8.4 ± 6.6	9.4 ± 12.5	7.0 ± 7.6
Basal TEWL	7.8 ± 4.0	7.6 ± 3.9	8.0 ± 4.4	7.9 ± 4.0
Delta TEWL	32.6 ± 15.2	28.4 ± 15.4	33.5 ± 14.6	28.9 ± 15.3

for the higher incidence of women with an irritant contact dermatitis is that it is women who more frequently carry out wet jobs, e.g. cleaners, kitchen workers, nurses, hairdressers. No significant difference in skin susceptibility between women and men was proven (15).

We found no differences in SEESS between winter and summer. If SEESS is a fashionable complaint, it is reasonable that it is not dependent on season. This kind of sensitivity seems to be a distinctive feature, prevalent throughout the year. However, this is contrary to findings that the number of irritant skin reactions, as well as some bioengineering parameters (e.g. TEWL), is enhanced during winter (16, 17), thereby underlining again the non-comparability between SEESS and measurable skin parameters.

It is intriguing that the SEESS were mostly localized on the face and body and *not* on the hands. This is remarkable, as most clinically relevant skin problems related to irritations are localized on the hands (e.g. irritant dermatitis due to occupational influence). However, the face is a primary target for atopic skin problems (3, 18), and we found a significant correlation between SEESS and atopy score. Hence, the subgroup of atopic patients is included in the group of volunteers with SEESS. This may explain the high incidence of nickel allergy in the group with a SEESS, as atopics more frequently show nickel allergy than non-atopics (19). However, it must be remembered that the information "nickel allergy" is a medical history and can be influenced by the general feeling of an increased skin sensitivity.

The finding that atopics are included in the group with a SEESS may lead to the assumption that the basal bioengineering values and the SLS test parameters of this subgroup must be enhanced. However, we found no correlation between TEWL and self-estimated skin susceptibility. This may be due to the small number of atopic volunteers in our study (only 12% of all volunteers had an atopy score of 10 or higher). Furthermore, previous studies concerning skin physiological parameters in atopics have revealed non-consistent findings. TEWL and skin blood flow are undoubtedly enhanced in individuals with acute atopic dermatitis before (basal) and after SLS application (10, 20). However, in atopic patients without acute skin affections, some studies have found increased basal TEWL values (10, 21, 22) while others have failed to (19, 23, 24). The reason for these divergent findings may be the different populations concerning disease severity (and definition of symptom-free skin) and especially the different atopy definitions used (Diepgen et al. (3) or Hanifin & Rajka (18)).

Supported by the predominant regions affected by SEESS (leading region: the face), rosacea might be another diagnosis correlated with SEESS. The missing correlation of the SEESS with age contradicts an influence of rosacea, though. However, as rosacea was not evaluated in our study, a final assessment remains to be made.

Almost every proposed trigger for SEESS was judged by the subjects (sheep wool, cosmetics, soaps, deodorants, parfume, sun rays) as relevant in regard to their skin problems, but none of the chosen triggers was significantly correlated with changes in bioengineering values. It is interesting that skin susceptibility to sun rays was enhanced, but that there was no correlation to skin type according to Fitzpatrick. It looks as if, without any differentiation, every influence was proposed by people with a SEESS; however, objectivity is missing. For the most part, indescribable terms were used, e.g. feeling of tension, burning or reddening, but exactly defined and objectifiable skin problems, such as eczema, were not associated with the degree of SEESS. This underlines again the diversity between subjects with objective skin problems (such as eczema) and those with subjective skin problems (such as SEESS) and is supported by Berg & Axelson (25) who also found a poor correlation between objective skin findings and subjective complaints about skin symptoms. The SEESS is therefore better classified as a dermatological non-disease (26) than as a primary dermatological disease forcing treatment.

Our data suggest that the general question "Do you have an enhanced skin susceptibility?" is of no clinical benefit to the dermatologist, but it may give a positive signal to the patient, i.e. "I care about how your skin feels".

All things considered, we are convinced that SEESS is:

- not objectifiable and confirmable by bioengineering methods
- not dependent on real skin conditions (except in the case of atopics).

Since subjects with SEESS react normally after exposure to the standard irritant SLS, we assume that the feeling of enhanced skin susceptibility is a fashionable non-causative complaint reported mostly by women, and of all ages.

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