SENSITIVE SKIN AND BARRIER IMPAIRMENT - QUANTITATIVE ASSESSMENT BY MODELING TEWL DESORPTION CURVES

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INTRODUCTION

Sensitive skin is a vague, subjective and difficult to characterize affliction. It affects a large part of the population and is accompanied with great interest by the cosmetic industry. Some studies have suggested that sensitive skin is the result of impaired barrier function, which leads to the exposure of immune system cells and sensitive nerves, resulting in marked cutaneous responses to otherwise harmless stimuli. This study aimed to investigate the cutaneous barrier integrity of individuals with sensitive skin by a novel approach: a plastic occlusion stress test followed by measurement of transepidermal water loss (TEWL) desorption curves.

METHODS

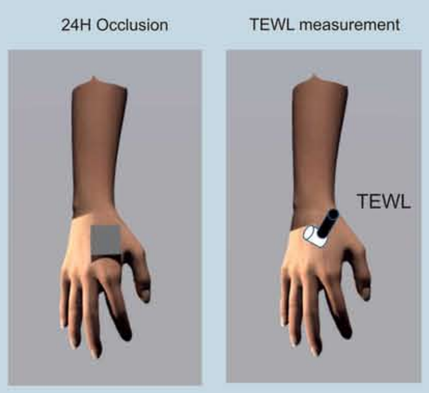
Following informed written consent, 33 female volunteers were selected and divided in two groups (Group I n=15 – auto perception of sensitive skin; Group II n=18 control groupwith no sensitivity complaints). All of the volunteers were submitted to a POST protocol with 24H of occlusion in the hand, following a continuous measurement of Trans Epidermal Water Loss (TEWL, Tewameter TM300, C+K, Germany) during 30 min(Figure 1). A bi-compartmental model, previously developed and validated, was used to analyze TEWL decay curves. $t_{1/2evap}$ and DWM parameters were calculated (Figure 1). Descriptive statistics (MS Excel) and non parametric comparative tests for related data were obtained by the SPSS 16.0 software, and a confidence level of 95% adopted.

RESULTS

Our results show that $t_{1/2evap}$ and DWM were statistically significantly higher (table 1 and Figure 3) in sensitive volunteers that in the control group, no matter the inexistence of TEWL differences between the 2 groups (Figure 2). This supports the thesis that individuals with increased skin susceptibility have impaired barrier function, which can be detected by a more sensitive methodology as compartmental analysis.

CONCLUSION

Whereas in the studies based in basal TEWL measurements only discrete differences were reported, the dynamic approach followed in this study provided unequivocal evidence of barrier impairment. The methodology enabled a more objective characterization of sensitive skin and can potentially be applied to the diagnosis /prediction of sensitivity; as well as the efficacy assessment of cosmetic products that are specifically designed to fulfill the needs of consumers with this skin condition.



$$TEWL = B + I\left(e^{-Kevap \times t} - e^{-Khydr \times t}\right)$$

$$DWM = \int_{t_{max}}^{T} \left(B + I \times \left(e^{-K_{evap} \times t} - e^{-K_{hydr} \times t}\right)\right) dt$$

Figure 1- Protocol summary and compartmental model used in sensitive skin experiments analysis. **B** - baseline effect; **I** - multiplicative parameter common to both exponentials;**Kevap**- evaporation rate constant (used to evaluate the barrier function); **Khydr**- hydration rate constant related to the distribution of the water through both compartments

Table 1- Evaporation half-life (t1/2evap) and dynamic water mass (DWM) values obtained in the study (mean ± SD)

Group	$t_{1/2evap}$ (min)		DWM (g/m^2)	
Sensitive skin (n=15)	33.81±39.72	p=0.005	1216.45±299.83	p=0.0001
Normal skin (n=18)	10.15±5.34		787.51±196.98	

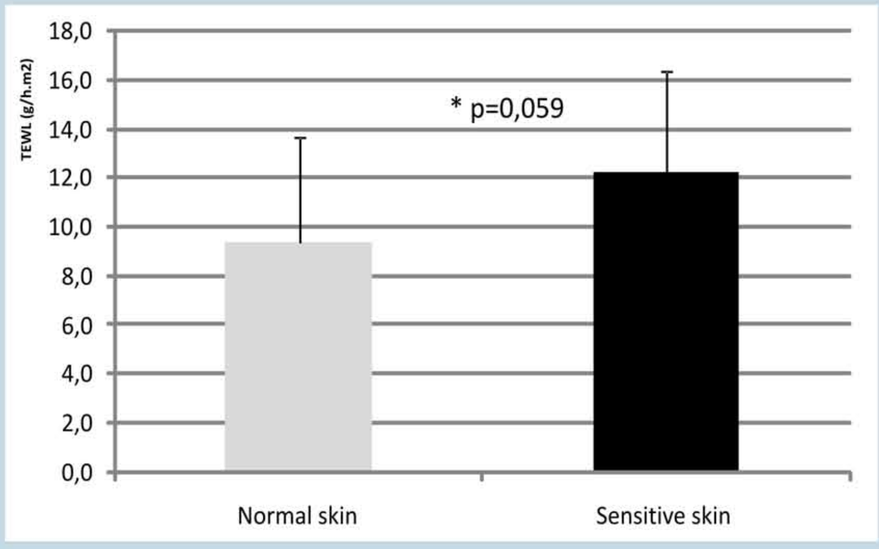


Figure 2- Basal TEWL values in the two groups of volunteers (mean±SD); * statistical significance of the results

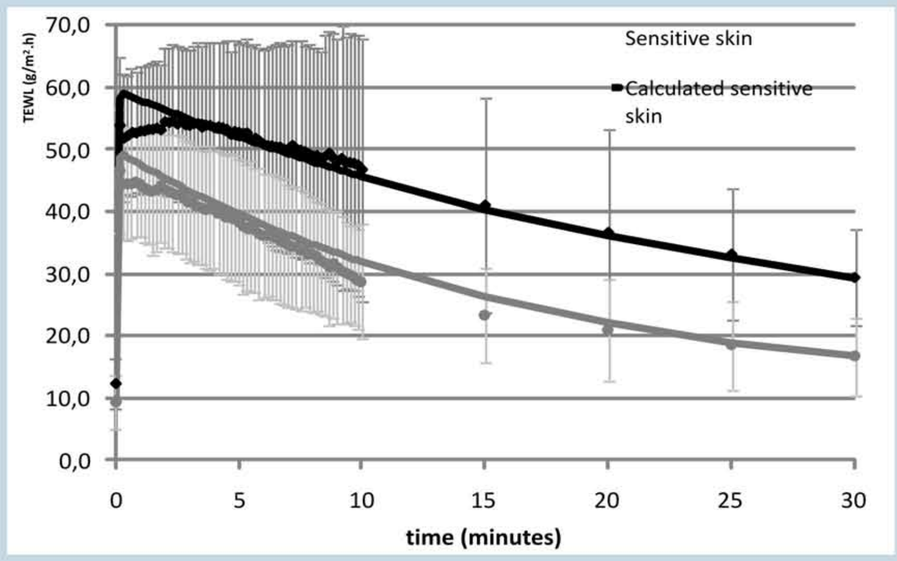


Figure 3- POST desorption curves obtained after 24 hours occlusion (mean±SD); The continuous lines represent the calculated data obtained by application of the model to the median individual parameters.

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