

FAST AND NONINVASIVE METHOD FOR ASSESSING SKIN HYDRATION

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Synopsis

To control skin hydration many, somewhat clumsy methods are used which have been developed to investigate and monitor pharmaceutical and cosmetic products in properly airconditioned surroundings. These methods can almost never be adapted for out-patient use by dermatologists who usually have different requirements.

The 3C System[®] Dermotech is a new, simple and user-friendly computerized tool for accurate and fast real-time measurement of skin temperature, pH, hydration, TEWL and surface sebum. It does not require to be used in airconditioned environments since displayed measurements are always automatically related to an environmental temperature of 22°C and to a 50% RH by the use of proper correction factors. By this new equipment skin hydration and surface sebum was controlled on thirty women aged 25 to 35 years affected by serious skin xerosis who underwent cosmetic treatment for 120 days.

Results showed that topic constant cosmetic one-dose administrations are able to supply xerotic skin with the necessary water and lipid to restore the skin's eco-system.

Riassunto

Per controllare l'idratazione cutanea sono stati sviluppati ed utilizzati molti metodi per studiare l'attività svolta a livello cutaneo sia da farmaci che da cosmetici in condizioni ambientali controllate. Questi metodi non sono adatti per uso ambulatoriale. Il 3C System[®] Dermotech è un nuovo apparecchio computerizzato semplice da usare ed in grado di rilevare in tempo reale la temperatura, il pH, l'idratazione, la TEWL ed il sebo cutaneo di superficie. Non richiede un ambiente di lavoro controllato poichè le misurazioni sono automaticamente rapportate ad una temperatura di 22°C ed una umidità relativa del 50% a mezzo di appropriati fattori di correzione. Questa nuova apparecchiatura è stata così utilizzata per controllare l'idratazione ed i lipidi di superficie di 30 donne di età compresa tra 25 e 35 anni, affette da secchezza cutanea pronunciata e trattate con un cosmetico monodose. I risultati ottenuti dimostrano che il trattamento costante della monodose cosmetica utilizzata è in grado di riportare alla norma la cute xerotica.

Introduction

Skin condition is usually controlled by physician only on the basis of their medical experience. The new 3C System® Dermotech method controls skin condition faultlessly and objectively.

3C System® Dermotech rapidly and precisely measures the skin temperature, pH value, moisture, surface sebum, and TEWL. The resulting figures are directly displayed on a screen and recorded cards. The measured rates are always adjusted to 22° C room temperature and 50% relative humidity through correction factors. (1-8) This computerized system allows a through cutaneous checkup. It permits a simple and quick determination of the quantity of lipids at the surface of the skin, a reading of the water content linked to NMF, the control of TEWL and the pH of the skin.

All of this is done while ambient environmental conditions are automatically standardized. Measurements of the moisture provide an index for Hydration or dehydration. Measurements of lipid

content provide a Soothing Index. These accurate mathematical values are available on a computer screen and can be printed out, as desired.

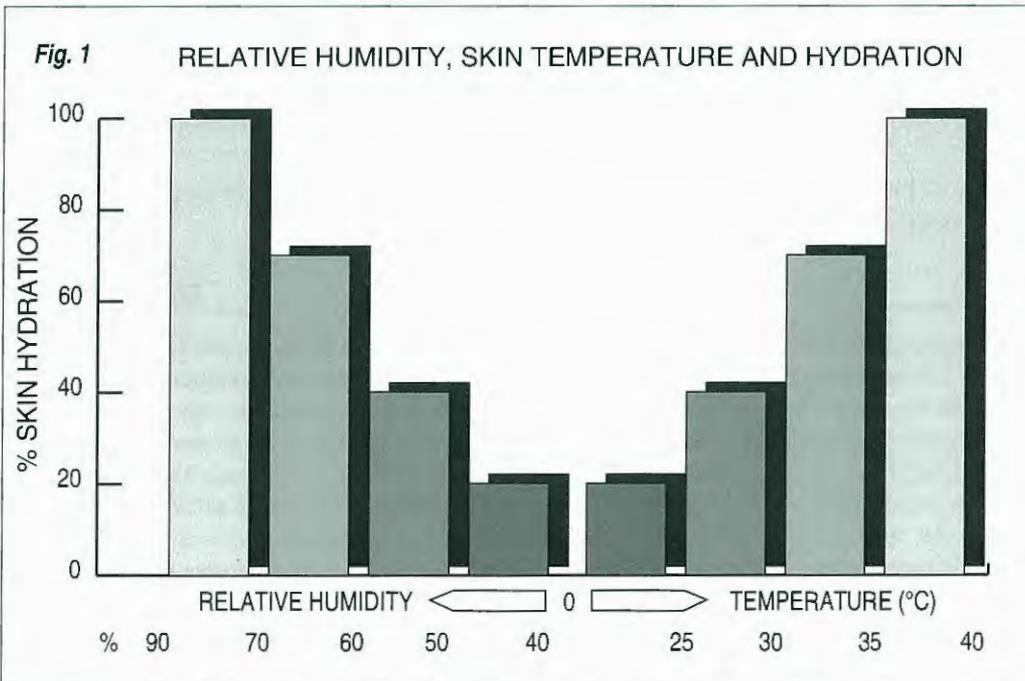
Adjustment to room values is crucial, since moisture rises even by 200% with 80 to 100% humidity in the outside environment. Like moisture increases with increase of the temperature (Figure 1) (9).

This new equipment allows for an easier prescription of treatment by physicians, since hydrating and soothing indexes are directly displayed on the screen (1,2,4).

Hydrating and soothing indexes express the water and lipid amounts needed to restore the skin to its normal moisture rates.

In fact an increased Hydration Index (H.I.) corresponds to an increased rehydrating power of the cosmetic, in similar fashion, an increased Protective Index (P.I.) corresponds to an increased ability to provide sun protection, and a Soothing Index (S.I.) relates to the ability to balance the surface lipidic film.

Moreover this remarkable new technology



provides information necessary for the selection of cosmetic products correctly formulated to re-balance skin hydration and surface lipidic film. Differently skin types, classified according to numeric references similar to those now used for sun protection, may be matched to cosmetic lines, based upon a factual reading of the patient's cutaneous ecosystem.

Materials and methods

Material

Single-dose cream ⁽¹⁾ (S.I. 20)

Cyclomethicone, Petrolatum, Decyloleate, Cetareth-20, Stearyl Heptanoate, Sunflower seed oil, Borago oil, Sorbitan Sesquioleate, Pentaerytril Cocoate, Stearilcitate, Ceresin, Beeswax, Alluminium Stearate, Isopropyl Lanolate, Lanolin Alcohol, Capric Trygliceride, Squalane, Cetyl Alcohol, Micronized Titanium Bioxide, Bisabolol, Lecithin, Wheat Bran Lipids, Tocopheryl Acetate.

Cleansing Lotion ⁽²⁾

Distilled water, Cetareth-6, Isopropyl Myristate, Isoctyl Stearate, Sorbitol, Glycerin, Propylene Glycol, Tocopheryl Acetate, Retinyl Palmitate, Imidazolidinyl Urea, Fragrance, Linoleic Acid, Linolenic Acid, Methyl Paraben, Soluble Collagen, Carbomer 940, Disodium EDTA.

Method

3C System® Dermotech

Surface sebum and skin hydration were measured on the skin cheeks by the use of the 3C System® Dermotech. This computerized system permits a simple and a quick determination of the quantity of lipids and hydration at the surface of the skin, while environmental conditions are automatically standardized (RH=50% t=22°C).

The 3C System® measures the skin hydration through the capacitative resistance of the stratum corneum and adjacent epidermis to a maximum



⁽¹⁾ Trade name IDROSKIN® 20

⁽²⁾ Trade name MAVIGEN® LATTE

penetration depth of 80 μm . Its measurement principle is based on the differing dielectric constants of water and of other substances, eliminating any influence of the living object. Hydration is expressed in relative 3C units.

Skin lipids are measured photometrically through the use of a special transparent plastic foil. It is pressed against the skin for few seconds allowing adherence of skin lipids in a 1 cm^2 area. The obtained readings are automatically converted into $\mu\text{g}/\text{cm}^2$.

Folium used may be also utilized for thin layer and gas liquid chromatography (Fig. 2)

The TEWL measurements are based on the estimation of the vapour-pressure gradient immediately adjacent to the surface of the skin. The surrounding microclimate influence is automatically balanced through correction factors.

pH is directly measured on the skin. The pH

probe, with an automatic temperature compensation, has an amplifier built into a replaceable pH electrode completely resinated. The signal, of low impedance, transmitted to the meter is directly displayed on the screen and recorded cards with a resolution and accuracy of ± 0.2 and an operating temperature from 0 to 50°C.

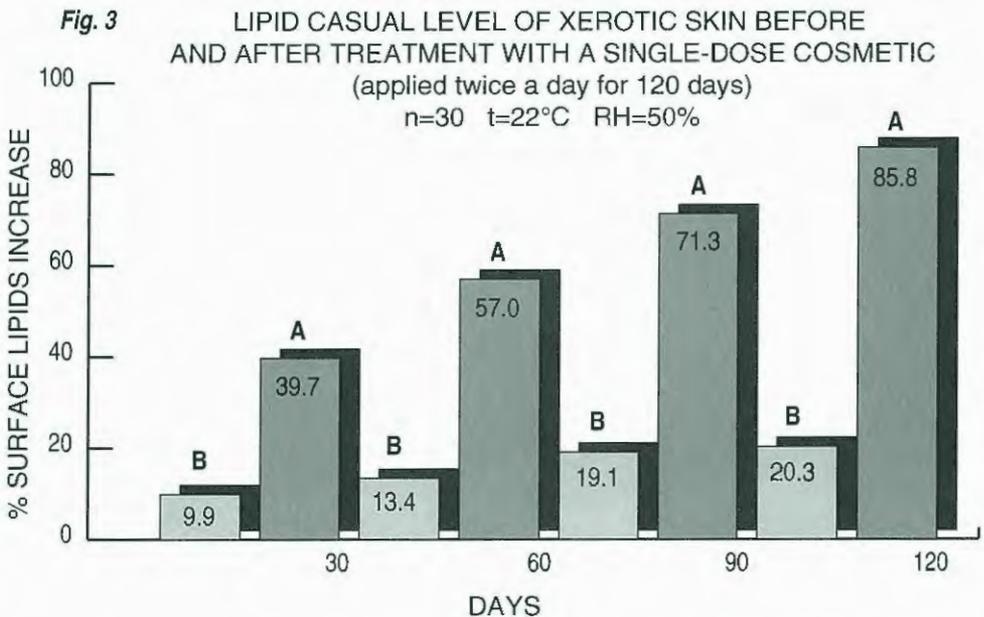
Cosmetic treatment

By this method skin moisture and surface sebum were measured in 30 female out-patients aged 25 to 35 with clear symptoms of skin xerosis and divided into two groups of 15 people:

group A: cosmetic treatment

group B: no treatment (control)

The study lasted 120 days from December 1990 to March 1991.



- NO TREATMENT (B)

- SINGLE-DOSE TREATMENT (A)

A VERSUS B $p < 0.001$

A 30 VERSUS A 60, 90, 120 $p < 0.001$

B 30 VERSUS B 60 ns

B 30 VERSUS B 90, 120 $p < 0.05$

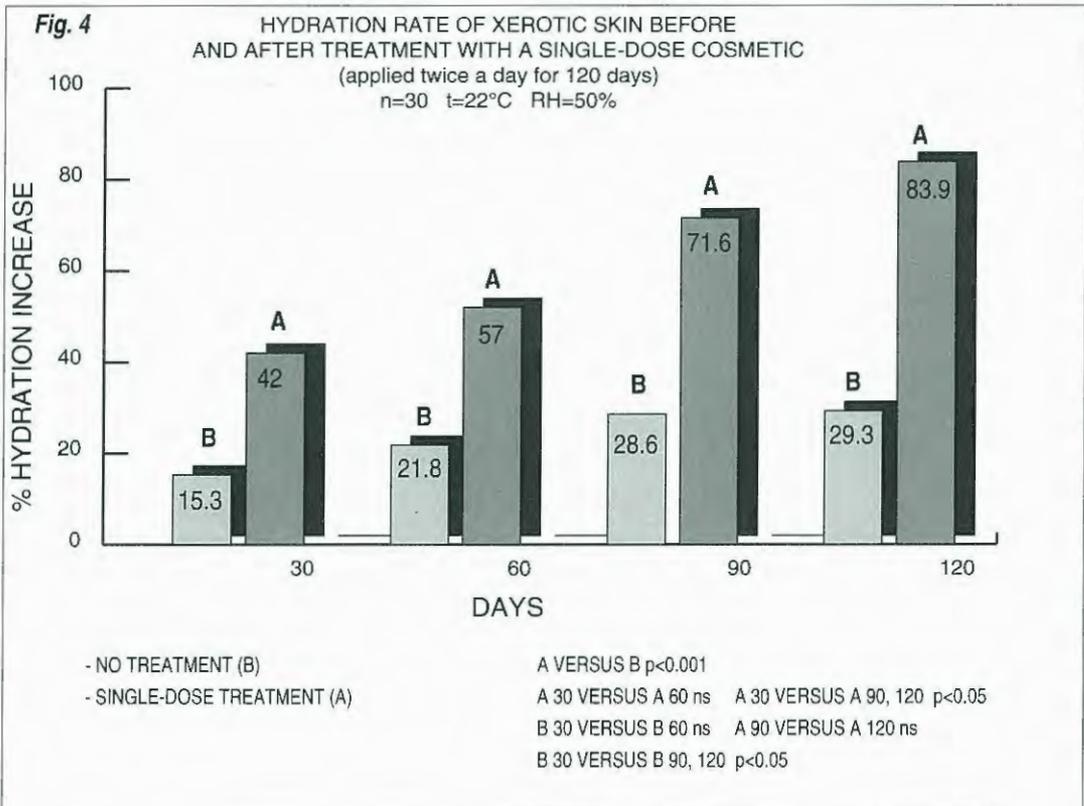
Controls were always performed weekly at 10 a.m. into out-patient departments.

Patients' skin was cleansed with a cleansing lotion (Mavigen® Latte) provided by us and the study product (Idroskin® 20-single-dose-cream S.I. 20) was applied twice a day (11 a.m. and 9 p.m.).

The mean values for surface sebum and skin hydration were taken from each subject by carrying out four separate measurements in adjacent areas on the cheeks, as previously described (4). Results are shown in Figure 3 and 4.

Results and comments

These obtained data suggests that the normal moisture and sebum rate can be restored in the xerotic skin when a well-formulated cosmetic is applied. In this way it is possible to obtain an immediate improvement in skin smoothness and longer term rejuvenating of the xerotic skin can be the result of a successful cosmetic therapy. Moreover this new 3C System® Dermotech can be easily used also in standard consulting rooms and the patient can be provided with a printed description of measurement taken at each encounter, as well as the cosmetic and pharmacological products which are recommended for the continuation of the treatment program.



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