WHAT IF LIFE WERE TO DEPEND ON DEATH?

This apparently ridiculous question is worth asking because the answer is yes. The subject of this discussion is found in the skin, more specifically in the most superficial part, the stratum corneum epidermidis. As everyone knows, this stratum is formed of a few layers of dead cells called the corneocytes. This may seem derisory compared with all of the noble organs of the body. However, removing the stratum corneum, which is only a few dozen microns thick, would lead to the rapid and inescapable death of the individual. No other organ has a survival function as important as that of such a delicate group of dead cells.

What is so important about the stratum corneum? It is effectively a structure that confines living matter in an envelope and protects it from the environment. This barrier function prevents the escape of bodily fluids, electrolytes and all other biomolecules (1). In the opposite direction, it prevents or limits the intrusion of xenobiotics into the body. This vital barrier function depends on the histological structure and physical integrity of the stratum corneum (2). This structure is regulated by the biological activity and maturation process of keratinocytes present in the living layers (Fig. 1). It is also influenced by environmental conditions (temperature, humidity, dew point, etc.), which interfere with the hydration and physical properties of the corneocytes and affect the flexibility and structural homeostasis of the stratum corneum (3, 4).

SUMMARY: Rough skin or xerosis, commonly referred to as dry skin, results from a defect in the stratum corneum desquamation which normally remains imperceptible. This condition is negatively influenced by winter climatic conditions. Atopic dermatitis and trophic changes related to post-menopause, ageing, diabetes mellitus and other endocrine and metabolic disorders are also involved in this process. Xerosis can be improved to varying degrees by emollients, humectants, hydrating agents and squamolytic agents. 

KEYWORDS: Diabetes mellitus – Stratum corneum – Trophic alteration – Season – Xerosis

The harmony of the structure and the function of the stratum corneum are altered by extreme climatic conditions and by all of the physiopathological processes that affect the life of the epidermis. The latter include malnutrition, various vitamin deficiencies, parainfectious or paraneoplastic conditions, ageing, kidney failure and various hormonal changes, including the post-menopause period, dysthyroid conditions and diabetes mellitus. Clinical manifestations of these changes include the appearance of xerosis, commonly referred to as “dry skin” (Fig. 2).

THE HIDDEN FACE OF DRY SKIN

The only real dry skin is that of mummies. To be more precise, in the field of medicine and dermocosmetology, which helps enormously to analyse problems, you have to substitute the term rough skin for dry skin (5, 6). From a scientific standpoint, the term xerosis is preferable...
because its definition covers disorders of the conformation of the stratum corneum caused by different mechanisms. This could be an anomaly in the cohesion between the corneocytes leading to desquamation (7). The intercorneocyte lipids can be abnormal in composition or relative proportions (8). Hydration of the corneocytes can be impaired, as can their ability to retain water. There can be a disturbance of the barrier function. All of these factors can occur either together or separately.

The most severe and disabling cases of xerosis are classed as illnesses and genetic syndromes in the context of ichthyoses and ichtyosiform conditions. They are treated with oral retinoids and with RAMBAs (“Retinoic Acid Metabolism Blocking Agent”) (9). Much more frequent are xeroses such as atopic dermatitis and physiological or basic deficiency xeroses, possibly accompanied by an internal pathology (10). Emollients and various appropriate cosmetic preparations can perform marvels in record time (11-13). Most people know the instantaneous effect of a so-called hydrating cream on a stratum corneum that has lost its flexibility, lustre and softness. If all medications acted as fast and as well on their targets as dermocosmetics on xerotic conditions, many people suffering from illnesses would be more than happy! It is true that emollients are not always sufficient. Sometimes they need to include hydrating, humectant or squamolytic agents (14-16). The latter are incorrectly called keratolytics because they detach corneocytes from the corneodesmosomes, which are intercellular bridges, but they have no effect in the intercellular keratins (15).

**OBJECTIVE ASSESSMENT OF XEROSES**

The opinion of xerosis sufferers and clinical examination certainly play an important role in assessing the gravity of a xerosis and how to remedy it with medicinal or cosmetic treatment. However, objective measurements are necessary to achieve the level required for evidence-based medicine. In dermocosmetology, the arguments are borrowed from dermometry based on advances in cutaneous bio-engineering (17, 18). The main methods used measure the hydration of the stratum corneum (17-21), the water capture and retention capacity of the stratum corneum (22-24), imperceptible water loss (17, 18) and intercorneocyte cohesion (4, 19, 25-27).

**DIABETIC XEROSIS IN PERSPECTIVE**

Diabetes mellitus affects the skin (28). In particular, a xerotic state can appear where there are secondary trophic vasculopathic and neuropathic disorders. In addition to the unpleasant appearance of the skin, other consequences are likely to occur. The adherence of micro-organisms (various bacteria, Candida spp) increases (29). The mass of biofilm (group of different populations of micro-organisms) increases due to the presence of anfractuosities in the rough stratum corneum. The reduced flexibility of the stratum corneum leads to the formation of microfractures that provide points of entry for infectious agents. Xerosis can also aggravate the pruritus that affects certain diabetic patients.

The use of excessively aggressive cleaning agents and repeated contact with other types of irritant products can aggravate the xerotic condition. The application of antiseptics for preventive or therapeutic purposes can also act on the texture of the stratum corneum. We have shown that iodised povidone (Iso-Betadine®, Uniwash, Viatris) is significantly less aggressive than chlorhexidine (Hibiscrub®) and quaternary ammonium (RBS HDS 10°) (30).

**TREATMENT OF DIABETIC XEROSIS**

The treatment of diabetic xerosis should improve the quality of life of patients and boost preventive anti-infectious measures. Very few dermocosmetic products are specifically aimed at controlling diabetic xerosis and very few studies have been dedicated to them (31, 32). We have identified three formulations: Atrac-Tain® (Coloplast), Naqi Body Lotion® (Naqi) and Naqi Body Care® (Naqi).

Atrac-Tain® is a hydrating cream containing 4% lactic acid and 10% urea. These ingredients
are reputed to act on any type of xerosis of whatever origin. Twice daily treatment during four weeks was reported to be significantly (p < 0.01) more effective than a neutral cream on xerosis of the heel in diabetic patients (30). However, no objective quantitative method has been formulated to support these observations. Xerosis recidivism proved to be much slower (p<0.05) during the two weeks following the application of Atrac-Tain®.

The Naqi Body Lotion® and Naqi body Care® preparations were designed more specifically to correct diabetic xerosis. Some of their constituents were chosen to try to correct some of the biological deficiencies of diabetic skin. In particular, the CM-glucan in Naqi Body Care® is likely to act as an immunostimulant and epidermal repair accelerator (33-35). It helps to maintain a protective film on the surface of the skin. The L-carnosine in the same preparation is a neuropeptide whose effects include the prevention of protein glycation and hence the formation of AGEs (Advanced Glycation End products) (36, 37). The corn oil peroxide produces an anti-inflammatory effect (38) by inhibiting the enzyme 5-lipoxygenase. Various other ingredients in the two Naqi formulations are intended to change the lamellar lipid structure of the stratum corneum in order to improve its barrier function. This aspect was demonstrated in a clinical test to assess the repair of this function, using objective measurements of imperceptible water loss, after having damaged it experimentally (32). The two Naqi formulations also contain humectants designed to retain more water in the stratum corneum.

The effects of a daily application of the two Naqi formulations and a control hydroalcoholic gel were measured on three sites on the xerotic legs of 17 diabetic patients and compared with the other untreated legs. Daily measurements, 6 days a week, were taken during three weeks using an instrument that measures the electrical conductance of the skin (Corneometer®, C+K electronic). The difference in capacitance was calculated and the median value for the group of subjects was recorded (Fig. 3). Non-significant erratic fluctuations were observed on the test site. However, a similar rise in capacitance indicating better hydration of the stratum corneum was observed on the sites treated with Naqi Body Lotion® or Naqi Body Care®. There was a significant effect (p < 0.05) by the end of the first week. The clinical improvement observed by the volunteers and researchers was evident at this time.

**CONCLUSION**

Diabetic xerosis deserves to be treated. It is unsightly, can cause unpleasant pruritis and provide a refuge for an undesirable population of micro-organisms. Certain dermocosmetics provide a suitable means of controlling this cutaneous anomaly.

**REFERENCES**


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