

# Skin barrier disorders - preventive measures

published in Kosmetik International 2003 (9), 36-39

Skin barrier disorders are a widely spread phenomenon today. Most frequently the symptoms are dry and sensitive skin and serious cases of skin disorders are neurodermatitis, psoriasis and cornification disorders in general.

Just like the house is enclosed by walls, the human body is covered by the skin. If the walls show leaks due to a lack of mortar, water and pollutants may penetrate with the result that their condition continues to deteriorate.

In the external skin layer which is also called horny layer and measures about 0.1 to 1 mm depending on the specific areas of the skin, the dead corneocytes can be compared with bricks with the intracellular lipids as the mortar. With their characteristic bi-layered structure the lipids build up barrier layers which run through the epidermis like stripes.

The barrier layers influence the transepidermal water loss (TEWL) which is the amount of water evaporating per hour and square centimetre of skin. On the other hand, the TEWL gives valuable information on the condition of the barrier layers. An increased TEWL means that there is a lack of barrier substances and that the skin is drying out due to humidity loss. Thus, micro organisms as well as other substances may easily penetrate into the skin and the risk of irritations, allergies and inflammations caused by external influences increases.

## Preserving the skin barrier

Preserving the skin barrier and the individually varying natural TEWL basically is the principal aim of skin care. Generally, within a period of about 4 weeks, the skin goes through a complete renewal process. Also, there is a certain loss of substance due to abrasions and peelings which has to be replaced. In addition to that, the skin loses basic substances through the solvent effect of liquids. Even water washes out various protective substances – especially in case of higher temperatures. The swelling effect of a hot bath for instance can easily be observed.

However, a major problem for the skin are surface-active substances as for example soaps and cleansing agents. They wash the natural fatty substances and acids out of the skin and thus form holes in the structure of the barrier layers. Unless skin care products are

used on a regular base, the skin feels drier and drier. In addition to that, the emulsifiers contained in skin care products also show wash out effects which generally are only realized on second sight. Emulsifiers stabilize mixtures of oils and water in form of emulsions. With the application of emulsions also the fatty substances are transported into the skin. After the water has evaporated, most of the emulsifiers stay in the skin and will not degrade. The contact with water while bathing, showering or partially cleansing the skin reactivates the emulsifiers which then again transport fatty substances out of the skin with the result that the skin will not only lose skin care substances but also natural barrier substances. This process is very harmful for sensitive skin and has even worse effects on skins with symptoms of atopic dermatitis.

Also the frequently recommended occlusive skin care is not appropriate. It strongly reduces the TEWL rate but along with it, it also slows down the characteristic skin activity and consequently, the natural skin regeneration will decrease. These products can often be identified by their mineral oil contents.

Products which are free of mineral oils and emulsifiers and which are able to repair any gaps in the barrier layers with similar bi-layer structures are alternatives here. This skin care system also is called barrier-active care. Comparing electron microscope views of the so-called DMS creams (DMS = derma membrane structure) with prepared barrier layers of the skin, proves that their structures are quite similar. In fact, these creams still show significant effects after their application has been stopped. Measurements taken in the occupational field give evidence that the skin barrier layers can effectively be protected against occupational substances by means of a specific barrier-active skin care.

## Adequately balanced ingredients

Similar to the skin barrier layers, barrier-active skin care creams contain e.g. triglycerides, squalane (skin: squalene), phytosterols (skin: cholesterol), phosphatidylcholine and

ceramides as well as moisturizing substances. A major prerequisite is, that these substances are contained in physiologically well-balanced quantities. Under these circumstances, they are able to exactly copy the physical properties of the bi-layer structure of the skin barrier.

In order to apply these creams also on sensitive or sick skin they are free of additives which may have irritating effects as for instance perfumes, preservatives, emulsifiers, amines, which are mostly used as neutralizers in combination with emulsifiers (predominantly triethanolamine) as well as mineral oils, silicones and dyes.

### **Phosphatidylcholine**

The above-mentioned phosphatidylcholine (PC) plays a predominant role for the barrier-active skin care. PC enables the skin to build up bi-layers of lipids and in natural environment it is the most important substance for the formation of cell membranes. PC also provides the fatty acids which are essential for the barrier layers in form of palmitic and stearic acid (saturated PC) as well as linoleic acid (unsaturated PC) for the formation of ceramide I in the horny layer.

Moreover, saturated PC itself has ceramide-like properties and thus is able to substitute ceramides. For a long time, PC which is rich in linoleic acid, has been well-known as a base substance for liposomes. In addition to that, it has anti-comedogenous properties and shows a significantly soothing effect in minor forms of acne.

In cell metabolism, PC transfers its phosphocholine group to ceramides and thus enables the formation of sphingomyelins which are essential for live cells. Both substance groups are of major importance for the homeostasis of the skin and this primarily is why PC is able to influence such different processes as for example atopic dermatitis, psoriasis, skin aging and cornification disorders. In this connection, also transport processes between the stratum corneum and stratum granulosum play a significant role.

### **Protection and transport**

While DMS products with saturated PC have skin protective and skin stabilizing properties, transport properties are predominant in native PC. The molecule bonded linoleic acid is released by hydrolysis and enzymes, the so-called esterases. Part of it will be integrated into ceramide I which contains linoleic acid and which is responsible for the skin-protective effects in the barrier layer. As far as the skin barrier renewal is concerned, a combination of

saturated and native PC can double the effects which still may be increased by adding gamma-linolenic acid (evening primrose oil).

These products frequently use urea as a moisturizing agent. Urea is a natural body component and soothes itching which is particularly supportive in cases of atopic dermatitis. Barrier-active substances enable module based formulations and just like the skin, they are able to incorporate oils as well as watery substances.

### **Confronting skin problems**

Besides the care of healthy skin and the above mentioned skin problems, also aging skin, dermatosis and perianal skin disorders as well as the treatment of scars are typical applications for barrier-active skin care products. Above all, the potentials of optimally adapting barrier protection and the transport of active substances to the individual skin type by varying the different forms of phosphatidylcholine are very promising. The different types of skin with their different contents of fatty substances and moisture can individually be taken into account. Thus, the skin barrier can also be opened for the transport of active agents and then again be closed, an aspect which plays an important role for the cosmetic treatment.

The different possibilities discussed above correspond to the demands of the dermatologic cosmetics where the physiological needs of the skin are the focus of attention. If, in addition to that, the cleansing products are also well selected to supplement the products used, the skin care can meet all the requirements to prevent skin barrier disorders.

In case of a specific personal disposition for skin barrier disorders, some additional aspects should be kept in mind. Very important is the appropriate clothing. Very tight and hermetically sealing clothing may lead to increased transpiration and should be avoided. Emphasis should also be laid on a healthful nutrition. Thus, the person affected may contribute a major part to avoid any possible complications.

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