COMPROBED SKIN BARRIER

The stratum corneum, ie, the uppermost layer of the epidermis, consists of tightly-packed, well-hydrated corneocytes enclosed within a matrix of lipid lamellae, which is made up of 40% ceramides, 25% cholesterol and 25% free fatty acids. Collectively, these components are important for the barrier function and water-binding capacity of the skin.

Barrier function

Essentially, the skin functions as a two-way barrier, preventing the inward or outward passage of water; the integrity of this function depends on the composition and organization of the intercellular lipids. Ceramides with various chain lengths form the backbone of this barrier function. Evidence demonstrates that changes in ceramide chain lengths can reduce lipid ordering and density of the lipid lamellae, and are directly correlated with skin barrier defects seen in atopic eczema.

pH value is another factor that can affect the lipid behaviour of the stratum corneum. The intercellular lipids of the lipid lamellae are formed from lipid precursors via pH-dependent enzymatic processes. The stratum corneum, with a slightly acidic pH value of about 5 and 6, provides an optimum environment for these enzymatic processes. An increase in the pH of the stratum corneum reduces the enzymatic activity, leading to impairment and structural abnormalities of the intercellular lipids that eventually compromise the permeability barrier function of the skin. Furthermore, an increase in the stratum corneum pH promotes protease activity, resulting in increased corneocyte desquamation.

Water content and water-binding capacity of the skin

Water content is important in maintaining normal appearance of the skin. The relative hydration of the stratum corneum is dependent on the following factors:

- Rate of water transport from the dermis to the stratum corneum;
- Rate of transepidermal water loss (TEWL); and
- Water-binding capacity of the stratum corneum.

Within the corneocytes is a group of hygroscopic molecules called natural moisturizing factor (NMF), which is responsible for ensuring that the corneocytes maintain their shape so as to maintain the skin barrier. Made up of free amino acids and their various derivatives, inorganic salts, sugars, lactic acid and urea, NMFs are highly effective humectants, attracting water from the environment and holding it within the corneocytes. The reduction or the lack of NMF manifests clinically as symptoms of dry skin with scaling, flaking, or even fissuring and cracking as seen in atopic eczema, psoriatic skin, ichthyosis, xerosis, skin with routine water exposure and also ageing skin.

ROLE OF MOISTURIZERS

Different moisturizers may have different effects in how they hydrate the stratum corneum. In a comparative study that looked at the penetration behaviour of various emulsions into the skin, Professor Wohlrab and his colleagues found that the emulsion containing phosphatidylcholine (Phospholipid Technology™) consistently stayed at the stratum corneum under various skin conditions (ie, intact, damaged, heated). On the other hand, other preparations containing various conventional emulsifiers permeated the stratum corneum into the epidermis and even the dermis layers (Figure 1). He further added that this type of penetration behaviour seen with conventional emulsifiers is undesirable — it disturbs the barrier function of the stratum corneum by disrupting the organization of the lipid lamellae and reduces its water-binding capacity.

CONCLUSION

The stratum corneum is a dynamic environment with many components functioning to ensure optimal skin barrier function — decompensation of even one of the components can result in dry skin. Physiogel BioMimic Technology™ is clinically proven to strengthen and repair the skin barrier in dry and sensitive skin conditions, including atopic eczema.

Q: In your opinion, how does Physiogel BioMimic Technology™ help to fill in the gap in the current management of dry and sensitive skin conditions? A: Hydration of the stratum corneum is key to managing dry skin condition. Physiogel BioMimic Technology™ mimics the natural condition of the stratum corneum and provides water content that is “locked in” through interaction with the phosphatidylcholine membrane. In my opinion, this product offers a great advantage because it seamlessly acts as a physiological substitute of the stratum corneum, by virtue of similar lipid content and similar molecular order.

Figure 1. Penetration behaviour of hydrated phosphatidylcholine vs conventional emulsifiers

In contrast, Physiogel BioMimic Technology™ forms a membrane-like structure that mimics the lamellar structure of the skin barrier, thus seamlessly repairs and moisturizes dry skin and sensitive skin. Some of its benefits include:

- Increase in moisture retention with a reduction in TEWL
- Substantial relief of objective and subjective symptoms of atopic eczema after regular application
- A gain in quality of life of patients as indicated by patient-related effectiveness (decline of pruritus and loss of sleep)
- Significant reduction in the use of topical corticosteroids in atopic eczema

Q: How does Physiogel BioMimic Technology™ affect skin barrier repair and moisturization compared with other skincare products? A: There are several strategies that we can employ to repair the skin barrier function. The first and most common strategy is to use conventional moisturizers, ie, humectants such as urea and glycerols. These agents draw and bind water effectively, but the effect is not long-lasting. Furthermore, high urea concentration that is bioavailable at the site of application can induce skin irritation. In atopic eczema, this may create a vicious itch-scratch cycle when patients experiencing stings and burns as a result of this.

The other option is occlusion, using agents such as petrolatum. When applied onto the skin, petrolatum acts as a film that is impermeable to water. Water molecules are collected underneath the system, creating an indirect water reservoir. Unfortunately, the petrolatum film is “fixed” only for a short period of time, after which water evaporates when the film is removed upon washing or transfer to other surfaces.

The better option, I think, is the application of physiological membranes. The moisturizing effect is constant and longer-lasting (6 to 10 hours), because the water molecules are bound within the system through interaction with the phosphatidylcholine membrane. Therefore, daily application is sufficient to compensate for the lack of moisture in the skin.

Figure 1