

June 2022

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Phospholipids – nature’s skin care all-rounders

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Phospholipids are highly versatile materials offering both technical and physiological benefits for cosmetic formulations. They number among the body’s own building blocks and are essential constituents of the human cell membrane. These compounds are therefore highly biocompatible and benign, and hence predestined for use in superior high-end skin care products. Owing to their amphiphilic nature and their ability to interact with human skin, phospholipids can serve as active ingredients for skin protection and skin rejuvenation, as carrier systems for cosmetic active ingredients, and as skin friendly emulsifier systems.

Phospholipids support more efficient and better controlled transport of active ingredients

One of the best-known applications of unsaturated phospholipids is the encapsulation of cosmetic active ingredients, ensuring more efficient and better controlled transport into the skin. Such encapsulation is accomplished by vesicles (so-called liposomes) whose outer membrane consists of a phospholipid double layer. The liposomes conventionally used for this purpose in cosmetic formulations have a particle size of 150–300 nm. The relatively large total surface area of the vesicles then comes into intimate contact with the surface of the skin, permitting mass transfer. The phase-transition temperature of unsaturated phospholipids lies below 0°C and the liposomes therefore



exist in a liquid-crystalline state at skin temperature. These conditions permit optimum interaction of phospholipids with the stratum corneum and facilitate penetration of cosmetic actives into the skin, even into the dermis. This effect could be confirmed in an *in vivo* study. An enrichment of niacinamide up to a skin depth of 20 µm could be established by a double-blind

Raman spectroscopy study. An unsaturated phospholipid-based formulation successfully increased the niacinamide concentration in the deeper skin layers by up to 50 % compared to a placebo formulation (Figure 1).

Phospholipids promote hyaluronic acid production and lower MMP-1 activity

Unsaturated phospholipids also serve as efficient cosmetic active ingredients. They play an important role in the process of skin formation and skin rejuvenation and significantly counteract visible signs of skin aging on a cellular level. An *in vitro* study demonstrated that unsaturated phospholipids promote the body’s production of endogenous hyaluronic acid while at the same time lowering the MMP-1 activity – both of which are important factors in slowing down the physiological process of skin aging (Figure 2).

Phospholipids are biomimetic emulsifiers and improve skin feel

Saturated (hydrogenated) phospholipids are excellent biomimetic emulsifiers. They not only allow the production of stable emulsions but also supply the skin with moisture, ensure a pleasant skin feel, and protect the skin. Internal tests showed saturated phospholipids to be excellent o/w emulsifiers for cosmetic formulations. Their high oil uptake capacity of up to 40 % and their applicability over a wide pH range of 4–8 make

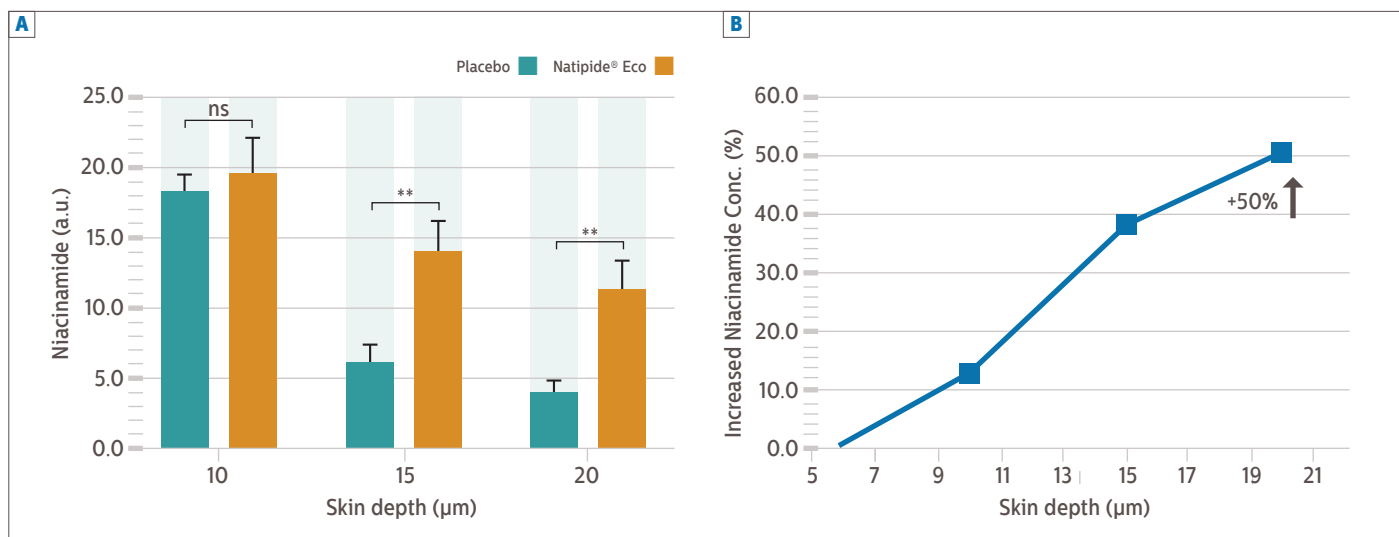


Figure 1: Natipide® Eco carries niacinamide deeper into the skin. (A) Natipide® Eco shows superior penetration properties in deeper skin layers (15µm and 20µm), represented by one subject as an example. (B) Natipide® Eco increases the niacinamide concentration by 50%. All subject with n=7; SEM; Student’s t-test versus untreated and between treatments; ns=p>0.05; **= p<0.01

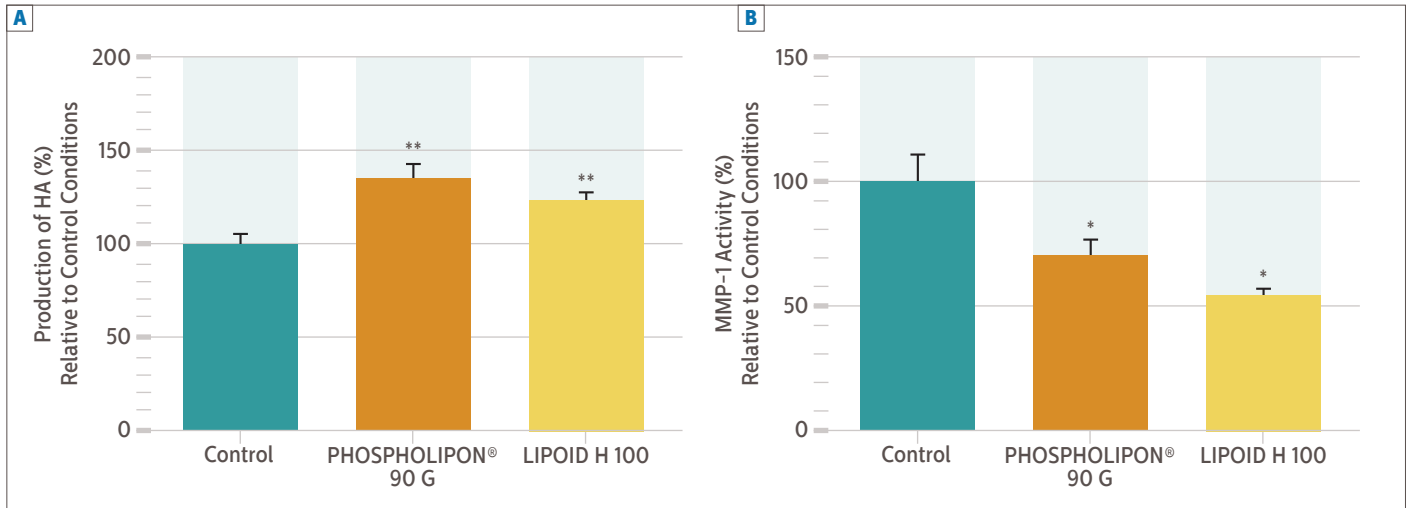


Figure 2: Phosphatidylcholine rejuvenates skin on a cellular level. (A) Significant increase of HA production by NHDFs after 72h of treatment with PHOSPHOLIPON® 90G or LIPOID H 100. (B) Significant decrease of MMP-1 activity by NHDFs after 72h of treatment with PHOSPHOLIPON® 90 G or LIPOID H 100. n=3; Mean ± SD; Student's unpaired t-test versus untreated; * = p<0.05, ** = p<0.01

saturated phospholipids suitable for numerous cosmetic preparations.

The pleasant skin feel left by saturated phospholipids is an additional benefit. Even the use of just small amounts has a significant effect. An application test with 20 female test persons of ages between 18 and 60 showed saturated phospholipids to be an ideal natural replacement for silicone oils. They leave the skin feeling very pleasantly silky and smooth (Figure 3).

Improved barrier function, protection against moisture loss

Owing to their unsurpassed compatibility and mildness, saturated phospholipids are particularly suitable for use in dermocosmetics, in products for sensitive or damaged skin, and in baby care or intimate care products. They support the repair and regeneration of the natural protective barrier of our skin by imitating the lamellar structure of the extracellular matrix; they accumulate in the stratum corneum and form a protective layer which prevents loss of moisture from the skin. The effect of Lipoid's Skin Lipid Matrix® (SLM) on transepidermal water loss (TEWL) could be determined in a double-blind *in vivo*

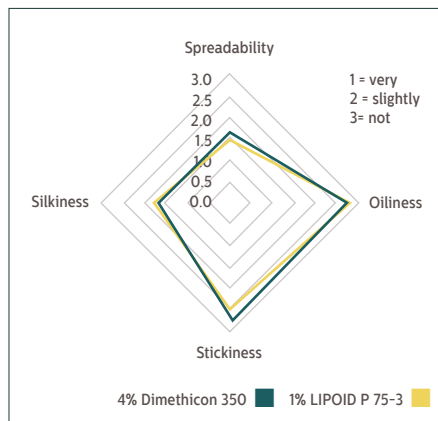


Figure 3: Sensory assessment of a formulation with 1% LIPOID P 75-3 vs. 4% Dimethicon 350. The use of LIPOID P 75-3 results in an equally smooth and silky skin sensation as the use of Dimethicon 350 even at significantly lower use level

study. An SLM-based saturated phospholipid formulation was compared with a formulation containing glyceryl stearate citrate (GSC). The skin barrier was damaged with sodium lauryl sulfate and subsequently treated twice with

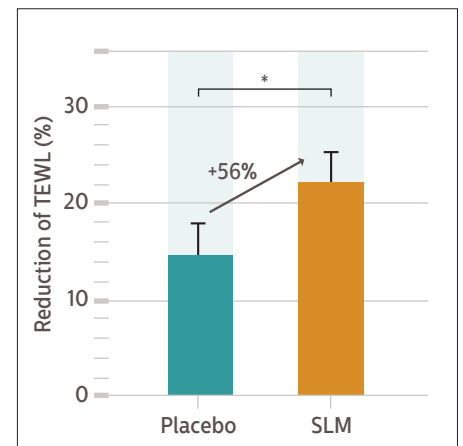


Figure 4: The formulation with SLM significantly decreased the transepidermal water loss in comparison to a placebo with glyceryl stearate citrate n=22, Mean ± SEM; *p<0.05

the appropriate formulation. The TEWL was determined with the aid of a Tewameter® about 12 hours after the second treatment. The SLM-based formulation significantly reduced the TEWL by 56 % compared to the phospholipid-free formulation (Figures 4 and 5).

In addition to all the above advantages of phospholipid products, most of them are based on non-GMO soy or sunflower lecithin, making them suitable for COSMOS-approved formulations. Moreover, not only are phospholipids produced from natural renewable resources but they are also completely biodegradable, making them a perfect fit for today's zeitgeist with its ever-increasing emphasis on sustainability. **PC**

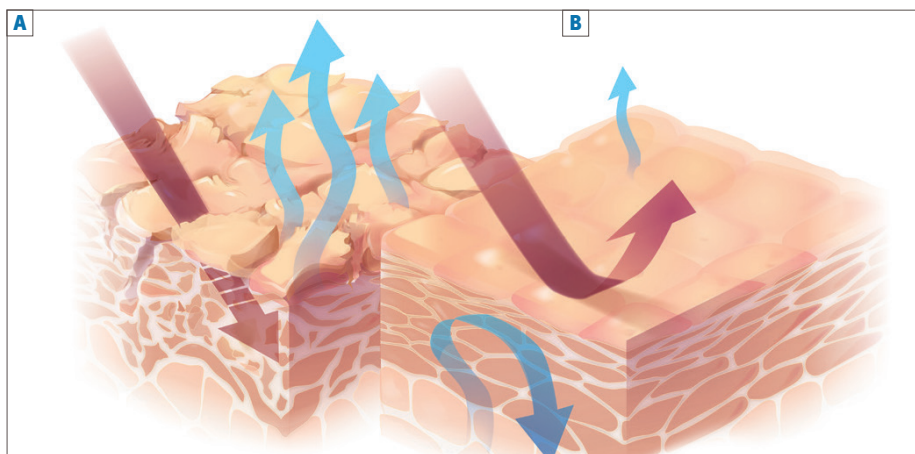


Figure 5: Skin with compromised (A) and intact (B) lamellar lipid matrix; impact on repulsion of external aggressors (red arrows) and transepidermal water loss (blue arrows). Absence of essential skin lipids can lead to a damaged skin barrier

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