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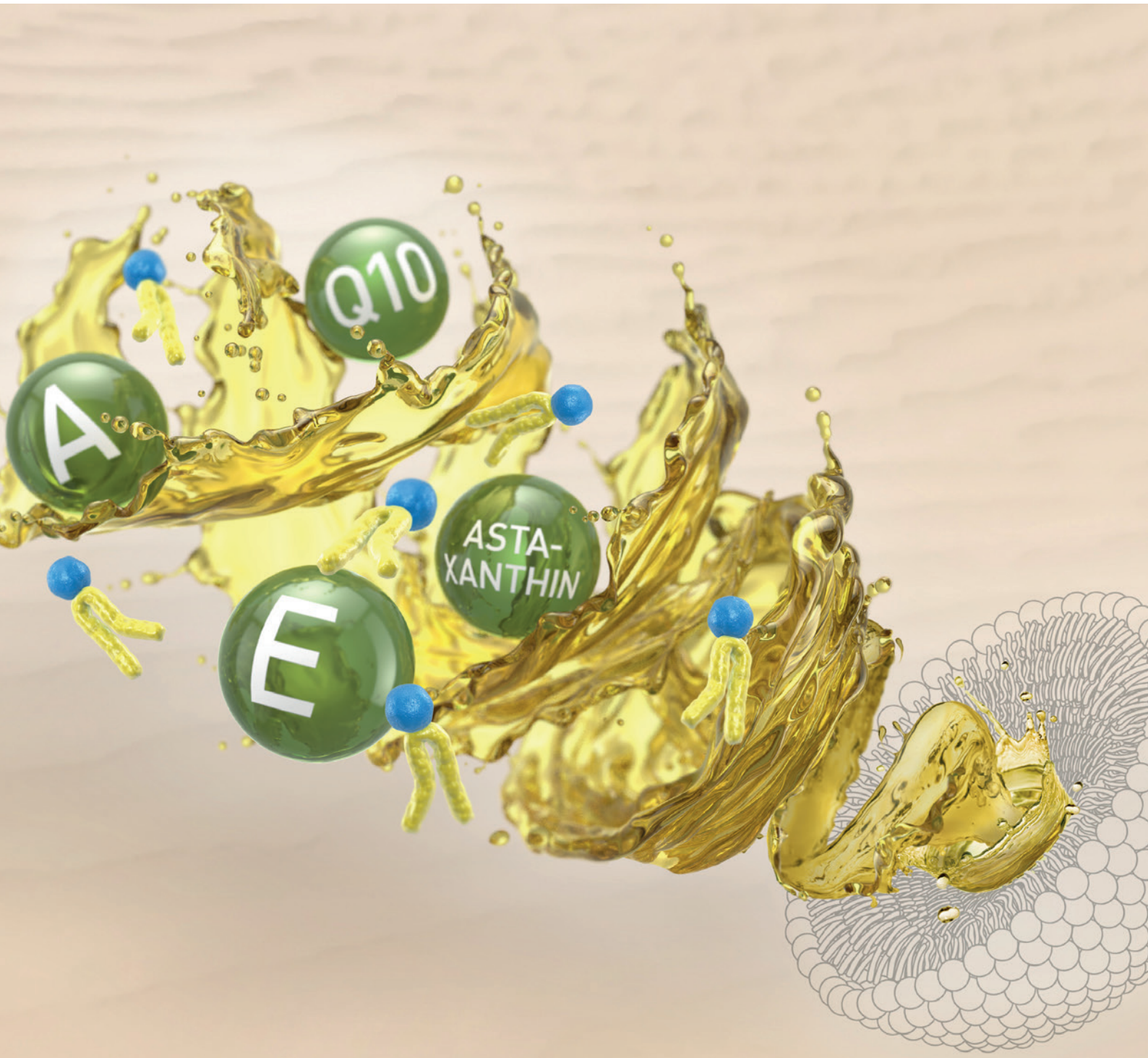
GLOBAL PERSONAL CARE

INGREDIENTS • FORMULATION • MANUFACTURE



- Interview: NYSCC chair John Carola
- Longevity
- Manufacturing
- Sun care
- AI
- Plus: The science behind gut health and clear skin

PhytoSolve®: Amplifying encapsulated cosmetic actives

The performance of lipophilic cosmetic actives can be significantly enhanced by suitable carrier systems. Such carrier systems deliver the actives into deeper skin layers, where they are most effective. In addition, carriers should provide increased solubility and easy processing into cosmetic formulations. Moreover, excellent tolerability and absence of synthetic ingredients or additives are key to modern skin care products.[1,2]

Lipoid Kosmetik's PhytoSolve® technology meets all these requirements. This ready-to-use carrier system is available with the pre-dissolved lipophilic actives coenzyme Q10, vitamin A, vitamin E and astaxanthin. Phospholipids are essential components of this technology and ideal partners for lipophilic actives. In addition to their functional properties as emulsifiers (Figure 1), phospholipids serve as effective penetration enhancers acting via a unique mechanism.

Moreover, phospholipids exhibit skin-rejuvenating effects that complement the cosmetic effects of the actives. Their endogenous nature allows metabolization when they reach deeper skin layers.[3] Therefore, the natural skin barrier is restored after the phospholipids have exerted their penetration enhancing effect.

Formulation: PhytoSolve® facilitates processing in cosmetics products

The PhytoSolve® range is available with four pre-selected actives. The unique technology allows easy processing and boosts the potency of the actives by delivering them deep into the skin.

PhytoSolve® Astaxanthin, a product with an intense red color, was processed into an aqueous formulation and a cream, respectively, at different concentrations. PhytoSolve® enabled an even and complete dissolution of astaxanthin in both formulation types.

In addition, PhytoSolve® results in attractive transparent formulations when being incorporated into water-based products such as serums, tonics, and hydrogels (Figure 2). Moreover, compatibility with several different preservatives was shown. Thus, PhytoSolve® products are ideal for a simple and effective formulation of advanced cosmetic products.

In vitro activity: PhytoSolve® naturally enhances skin penetration

Natural phospholipids enhance the penetration of encapsulated lipophilic actives via a unique mechanism: They modulate the fluidity of the rigid interlamellar lipids present in the stratum corneum.[4] The endogenous nature of phospholipids allows their insertion into these structures.

In addition, the small droplet size contributes to the skin interaction as it enhances the surface area. This mechanism allows lipophilic actives to surpass the stratum corneum and reach their site of action. However, the stratum corneum fluidization is only temporary as phospholipids can be metabolized via physiological pathways.

The penetration enhancing effect of natural phospholipids was shown in an *in vitro* study using a static Franz diffusion cell with freshly excised human breast skin. O/w emulsions with PhytoSolve® A or PhytoSolve® Q10, respectively, were applied to the skin and the amount of active was quantified in the stratum corneum (SC), the viable epidermis (EP) and the dermis (DR). As control, corresponding formulations of retinyl palmitate and coenzyme Q10 but without phospholipids were tested.

PhytoSolve® increased the amounts of both retinyl palmitate and coenzyme Q10 in all skin layers. The cumulative amounts of penetrated

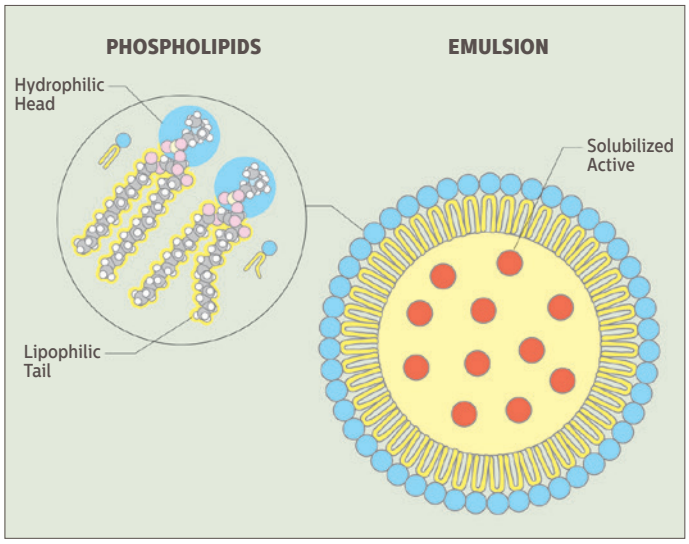


Figure 1: Schematic picture of an emulsion droplet formed with PhytoSolve® products

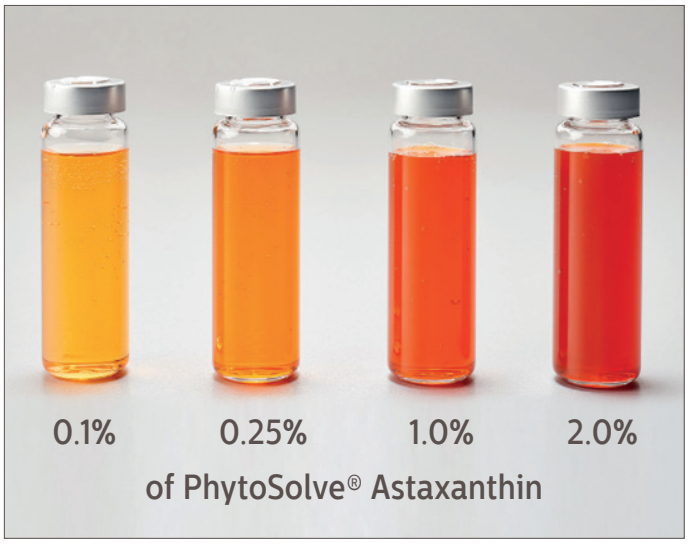


Figure 2: Transparent water-based products with different concentrations of PhytoSolve Astaxanthin

lipophilic actives are significantly increased by PhytoSolve® at a skin depth between 0 and 680 µm. In comparison to the control groups without phospholipids, the PhytoSolve® technology significantly elevated the amounts of actives by 413 % (retinyl palmitate) and 315 % (coenzyme Q10), respectively (Figures 3 and 4).

Conclusion

PhytoSolve® is a unique technology that provides a synergistic complex between natural phospholipids and attractive cosmetic actives. PhytoSolve® products ensure effortless processing into cosmetic formulations, effective and safe skin penetration and an improved potency of the actives. PC

References

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4. Kirjavainen M, Mönkkönen J *et al.* Phospholipids affect stratum corneum lipid bilayer fluidity and drug partitioning into the bilayers. *Journal of Controlled Release*. 1999; 58, 207 – 214

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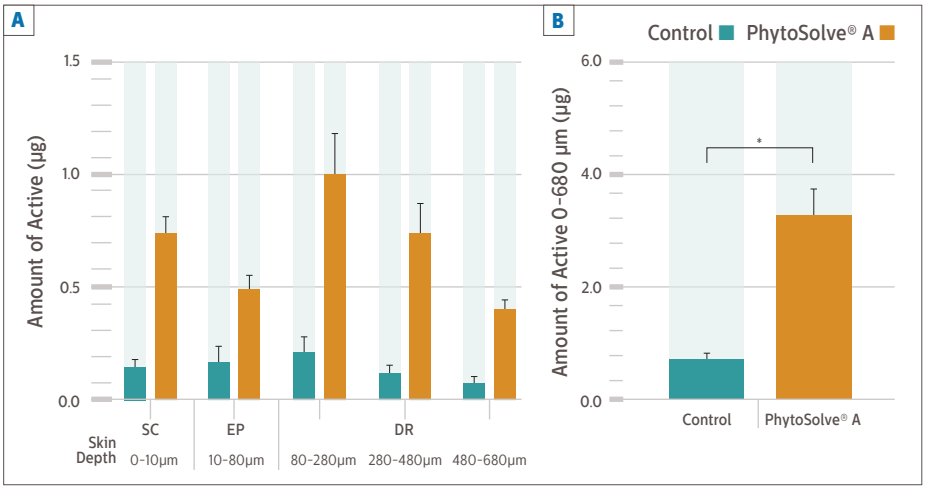

Figure 3: PhytoSolve® A increased the amount of penetrated retinyl palmitate. (A) shows an overview of penetrated retinyl palmitate per diffusion area (µg/cm²) in all analyzed skin sections. (B) summarizes the penetrated amount of retinyl palmitate in a skin depth up to 680 µm. N = 3; Mean ± SEM = Student's t-test Control vs. PhytoSolve® A, * = p < 0.05

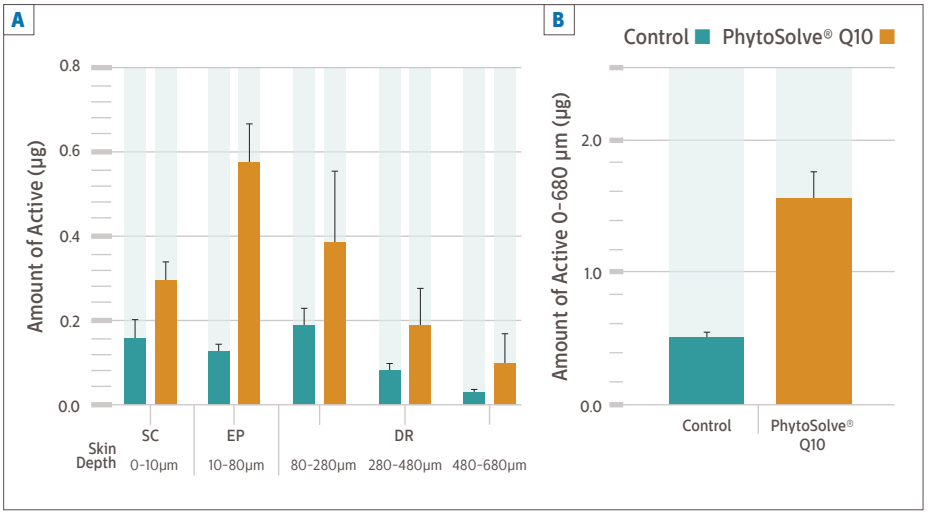

Figure 4: PhytoSolve® Q10 increased the amount of penetrated coenzyme Q10. (A) shows an overview of penetrated coenzyme Q10 per diffusion area (µg/cm²) in all analyzed skin sections. (B) summarizes the penetrated amount of coenzyme Q10 in a skin depth up to 680 µm. N = 3; Mean ± SEM

TABLE 1: PHYTOSOLVE® PRODUCTS AND THEIR CHARACTERISTICS

PhytoSolve® Q10	PhytoSolve® A	PhytoSolve® E	PhytoSolve® Astaxanthin
Skin energizer ■ Improvement of skin vitality ■ Reduction of fine lines **INCI:** Glycerin, Aqua (Water), Ubiquinone, Caprylic/ Capric Triglyceride, Lecithin, Tocopherol, Sodium Hydroxide	**Anti-aging hero** ■ Stimulation of cell renewal ■ Reduction of wrinkle depth **INCI:** Glycerin, Aqua (Water), Retinyl Palmitate, Caprylic/Capric Triglyceride, Lecithin, Tocopherol	**Antioxidant shield** ■ Protection of skinfrom environmental stress ■ Skin repair **INCI:** Glycerin, Tocopheryl Acetate, Caprylic/Capric Triglyceride, Aqua (Water), Lecithin, Tocopherol	**Marine power booster** ■ Skin repair & protection ■ Reduction of wrinkles ■ Skin tone improvement **INCI:** Glycerin, Aqua (Water), Caprylic/Capric Triglyceride, Lecithin, Haematococcus Pluvialis Extract, Tocopherol, Sodium Chloride, Sodium Hydroxide, Helianthus Annuus (Sunflower) Seed Oil