LYSOPHOSPHOLIPIDS IN COSMETICS

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Phospholipids

Phospholipids are predominantly isolated from soya or egg lecithin. Among the molecules present in lecithin phosphatidylcholine is quantitatively and qualitatively the most important. Pure phosphatidylcholine is normally used as raw material for the manufacturing of liposomes and mixed micelles in the pharmaceutical and cosmetic field. Pure phosphatidylcholine is a moderate emulsifier. In order to improve the emulsification efficacy the isolation of phospholipids from the above mentioned sources was done without a very sharp fractionation (= concentration of phospholipids). Only the interaction of phosphatidylcholine with other, in some cases loaded, phospholipids and accompanying lipids (e.g. glycolipids) yields an emulsifier which is suited for cosmetic and pharmaceutic application. The HLB values of those fractions mostly lie between 4.5 and 6.5, hence in the range of w/o emulsifiers (1). Depending on the ingredients of an emulsion these phospholipid fractions can also act as o/w emulsifiers.

Their application in cosmetics may be confined owing to the low HLB values, the colour, the specific smell and the sensitivity against oxidation.

These properties could be clearly improved within the last years by means of catalytic hydrogenation. The cosmetic industry's reconsidering of natural raw materials gave rise to a booming market for hydrogenated phospholipids which only marks the beginning of a new era in their application.

The hydrogenated variants are not only distinguished by the physical/chemical advantages but also by an excellent emulsification quality.

A further improvement of the emulsification performance in the area of o/w emulsions could be achieved by selective enzymatic hydrolysis.

Lysophospholipids

Partly hydrolysed phospholipids are already used on a large scale as emulsifiers and wetting agents for the manufacturing of food and feed.

The hydrolysis of phospholipids with phospholipase A2 results in defined products consisting of lysophospholipids and free fatty acids.

During this process (Fig. 1) the ester bond at C-2 of the glycerol backbone is cleaved, releasing a free fatty acid and a free hydroxyl group, which enhances the polarity of the molecule, hence increasing the HLB value. The enzymatically catalysed hydrolysis of phospholipids with phospholipase A2 is an equilibrium reaction which gives only a certain quantity of lyso products. Specific methods allow the production of fractions with tailored concentration of lysophosphatidylcholine (LPC). These processes also remove traces of enzymes as well as free fatty acids.

Skin and eye irritation of a hydrogenated phospholipid fraction with 30 % lysophospholipid were determined by means of the Occlusive Patch Test and the HET-CAM method. Application of a 5 % dispersion gives only negative reactions and hence provides evidence for the safety of this fraction. In these tests SDS was used as a positive control.

A Japanese research group found similar results in their experiments on the penetration of lysophosphatidylcholine on hairless rats. LPC penetrates faster than phosphatidylcholine into the epidermis where it is finally metabolised. Histological alterations of the skin during this process could not be observed (2).

As reported in the literature lysolecithin has an effect on the basal membrane. Thus, lysolecithin stimulates the synthesis of laminin 5, a factor supporting the regeneration of an aging basal membrane (3).

Application

Even today, lysophospholipids, especially hydrogenated lysophospholipids are almost unknown in the cosmetic field.

For the application in cosmetics a hydrogenated product with about 20% lysophosphatidylcholine proved to be suitable. The calculated HLB value ranges from about 7.5 to 8.5.

This material is soluble in ethanol, excellently dispersible in water and combines the advantages of the hydrogenated phospholipids (neutral in smell and colour, oxidatively stable) with that of the more polar lysophospholipids (higher HLB-value). According to the definitions of Führer (4), the BGM (5) and the BDIH (6) hydrogenated phospholipids can be described as emulsifiers of natural origin,

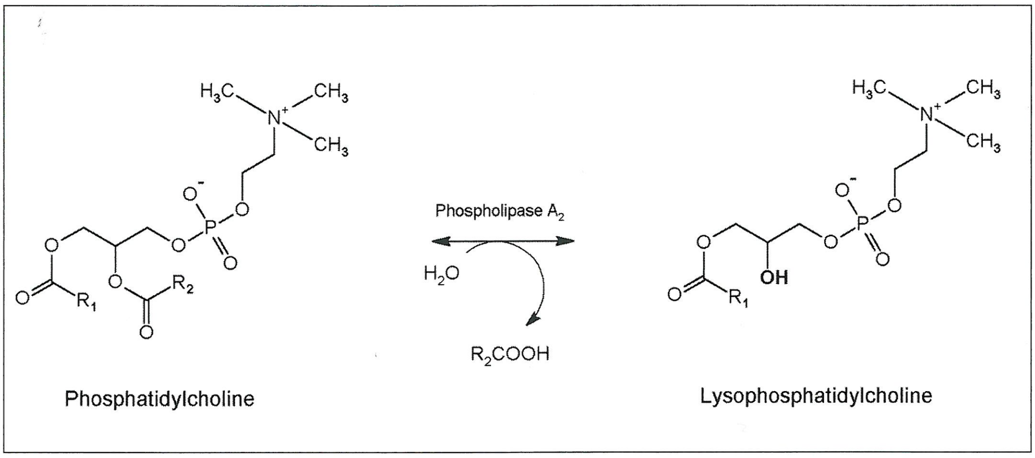

Fig. 1: Enzymatic hydrolysis of phosphatidylcholine by phospholipase A2

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as nature identical emulsifiers or natural emulsifiers.

Creams, Lotions

By use of hydrogenated lysophospholipids formulations can be achieved without a co-emulsifier. With respect to colour, smell and skin feeling esthetically attractive emulsions can be realised with these substances, which are an advancement in the area of natural cosmetics.

A new field of application is opened with sprayable emulsions (requiring profound formulating knowledge) where the content of synthetic emulsifiers can be reduced dramatically in the presence of hydrogenated lysophospholipids.

Oil Cream Bath, Hydrophilic Oils

In the field of cleansing the higher polarity of the lysophospholipids gives rise to homogeneous products with high functionality. Milky dispersible oil cream baths and clear washable oils can be formulated in this way on a natural basis for the first time.

On account of their improved hydrophilic properties lysophospholipids represent an ideal supplement for the phospholipids available on the market and significantly broaden their range of application. Recent research indicates an important role of the lysophospholipids during the preservation of a vital basement membrane. This dualistic character- active ingredient on the one hand and natural emulsifier with improved technological properties on the other - make lysophospholipids an interesting and versatile class of substances in the cosmetic area.

Literature

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