Liposomes as a Carrier System for Topical Applications

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1. What are liposomes?

Liposomes are microscopic small vesicles (hollow spheres), consisting of one or more lipid bilayers that surround a watery nucleus. They are used in cosmetics as carrier systems and as stabilizers of active substances whilst regarding their moisturizing properties as well.

Fig. 1 Liposomes

The byword "liposome" has its origin from the Greek and means "fatty body" - and here the confusion begins: Which fat is a component of the liposomes? Liposomes are generally made of lecithin, at least the liposome described firstly in the literature consisted of phospholipids [A.D. Bangham; Adv. Lipid Res., 65-104, 1963]. However, lecithin for itself is a blend of quite different phospholipids that can be distinguished by its head groups and its fatty acid chains.

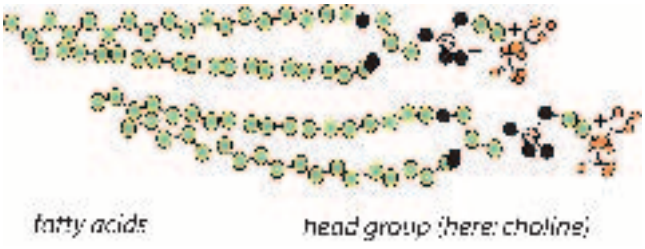

Fig. 2 Liposome Structure

2. Penetration of liposomes

[Dr. U. Schäfer, University of Saarbrücken]

Do all liposomes have the characteristic to deliver active substances into the deeper skin layers? What must a liposome look like to actually fulfil these claims?

To answer these questions, one investigated the liposomes' ability to penetrate independently of the lecithin composition.

For this, two different fluorescently labeled molecules – the hydrophilic carboxyfluorescein and the lipophilic rhodamin-PE – have been encapsulated into liposomes with the same size, the same loading and the same quantity of lecithin.

The decisive difference between these variable liposomes was the lecithin used for this purpose. Rovisomes consist of a high-quality phospholipid with a percentage of 80 % phosphatidylcholine. The fatty acids of these phospholipids are mainly unsaturated (linoleic acid) and provide the liposome with a flexible membrane. Furthermore, liposomes were produced from a very "cheap" lecithin with a small amount of phosphatidylcholine, which have, however, the feature of unsaturated fatty acids. The PL 90H-liposomes are based on a very high content of phosphatidylcholine (< 90 %) with hydrated, saturated fatty acids that strengthens the vesicle membrane.

The ethanolic solution and the three liposome-preparations were non-occlusively and ex vivo applied onto human skin obtained after cosmetic surgery. The experiment was carried out in Franz-type diffusion cells. One made sure that the acceptor compartment was filled with phosphate buffer below the skin to avoid over-hydration [T.J. Franz, Curr. Probl. Dermatol. 7, 58-68, 1978]. Three hours after application, the skin surface was cleaned and skin cylinders were punched. After cryo-fixation, pieces with a thickness of 10 μm were cut. The penetration of the marker-molecules were examined by confocal laser scanning microscopy.

Only the Rovisomes act as a carrier system that sets free the lipophilic as well as the hydrophilic marker in the epidermis, so