

PO B 5

INFORMATION ABOUT MORPHOLOGY AND THERMAL PROPERTIES OF SEMISOLID PHOSPHOLIPID PREPARATIONS OBTAINED BY ELECTRON MICROSCOPY, DSC AND RHEOMETRY

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Only a few techniques are suitable to get a better insight into the characteristics of semisolid phospholipid preparations such as liposomal preparations. They are investigated e.g. at present as parenteral drug carriers especially for cancer treatment in form of vesicular phospholipid gels (VPG).

In order to get more information of those preparations e.g. concerning stability aspects or parenteral implantability we used differential scanning calorimetry (DSC) and freeze-fracture electron microscopy of high pressure homogenized VPG made of several phospholipid components and cholesterol. Freeze-fracture electron microscopy was useful to elucidate the superstructure of the VPG. We compared the data of phase transition temperatures obtained by DSC with rheological measurements and found that rheometry may be in certain cases an alternative possibility to determine phase transition behaviour of semisolid liposomal preparations which have their phase transition above 0° C.

The following species of phospholipid (PL) were used for preparation of VPG: L- α -dipalmitoyl-sn-glycero-3-phosphocholin (DPPC), L- α -dimyristoyl-sn-glycero-3-phosphocholin (DMPC) and hydrated egg phosphatidylcholin (EPC). Mixtures with cholesterol in a ratio of 5.5:4.5 molar (PLCholesterol) were prepared of hydrated EPC. The total lipid content of each sample was about 40 % (w/w). The gels were prepared without gelifying agent using buffer, glycerol and phospholipid and applying high pressure homogenization (APV Gaulin Micron Lab 40, 10 cycles, 70 MPa).

Rheometry was performed in the oscillation mode with a rotating plate/plate geometry of 25 mm in diameter (Rheostress 100, Haake, D - Karlsruhe). Cooling and heating was controlled between 0° C and 70° C by a Pettier element (TC 81, Haake, D - Karlsruhe).

For DSC an instrument was used which does not work adiabatically and which was cooled by nitrogen (PL - DSC Model 12000, PL Thermal Sciences Ltd., UK - Epsom).

Freeze-fracture samples were prepared in a BAF 301 (Balzers AG, FL - Balzers) and micrographs were obtained using a transmission electron microscope (Zeiss 912, Leo Elektronenoptik, D-Oberkochen).