AN APPROXIMATE COOPERATIVITY ANALYSIS OF THE PHASE TRASITIONS OF DPPC-DOCNA DISPERSIONS

STEFAN HOBAI* and ZITA FAZAKAS
University of Medicine and Pharmacy, Department of Biochemistry, 4300 Târgu Mureş, str.G.Marinescu 38, 4300 Târgu Mureş, România.

Multilamellar vesicles (MLV) dopped with bile salt were obtained using dipalmitoylphosphatidyl choline (DPPC), purchased from the Sigma Chemical Co. and purity tested using thin-layer chromatography on Silicagel (single spot iodine staining), and sodium deoxycholate (DOCNa), purchased from the Merck Co. The thermotropic and thermodynamic characteristics of MLV-DPPC-DOCNa systems were determined using DuPont-Instruments equipment. DOCNa has a strong effect on the caloric peak of the main phase transition. Bile salt decreases the T_m value of the chain-melting temperature at the middle of the process, proportionally to its molar fraction. The shift of this temperature is about 5^oC at a DPPC/DOCNa molar ratio of 2. This suggests that solid solution laws play an important role in these systems. The bile salt abolished the caloric effect of the pretransition. Considering that equilibrium in the distribution of the solute (DOCNa) between the lipid phases is maintained during the transition, and that its partitioning between the aqueous and lipid phases does not change appreciably within the narrow temperature range of the transition, the van 't Hoff enthalpy, ΔH_{vH}, of ordered-fluid transition can be estimated by the approximate expression $\Delta H_{vH} \approx 6.9 \cdot T_m^2/\Delta T_{1/2}$. Here, $\Delta T_{1/2}$ is the width (in degrees) at the half-height of the caloric peak. The bile salt produced a major increase in $\Delta T_{1/2}$ as a result of the decrease in main phase transition cooperativity, determined by the presence of DOCNa molecules among the phospholipid molecules. The bile salt molecules produce an interruption of the interchain contact of DPPC molecules and determine the decrease in the number of van der Waals chain interactions. The increase in the cooperativity parameter value, $\sigma=(\Delta H_{cal}/\Delta H_{vH})^2$, where ΔH_{cal} is the calorimetric enthalpy of transformation, i.e. the decrease in size of cooperative unit, $CU = 1/\sqrt{\sigma}$, were calculated.

* E-mail: hobai@fx.ro