

Transition Temperatures of Vesicles Prepared with Mixtures of Cationic and Zwitterionic Lipids

Floencio, L.C.; da Silva, M.A.; Daghastanli, K.R.P; Cuccovia, I.M. and Chaimovich, H.

Departamento de Bioquímica, Instituto de Química, Universidade de São Paulo, São Paulo, SP, Brazil

Introduction: Literature on the effect of temperature on bilayers containing mixed lipids, particularly with positively charged compounds, is contradictory. The aim here is to determine transition temperatures, T_m , of mixed vesicles prepared with 1,2-dipalmitoyl-3-trimethylamine propane chloride (DPTMA), a cationic amphiphile, and dipalmitoyl phosphatidylcholine (DPPC), a zwitterionic lipid. **Results:** The T_m 's of vesicles were determined using differential scanning calorimetry (DSC). Large unilamellar vesicles (LUVs) prepared with DPTMA, with or without DPPC, were prepared by hydration of a film containing the lipid with a solution at the desired pH, at 50°C. The vesicle suspension was passed, under pressure, through two polycarbonate membranes (100 nm) at 50°C. Our initial DSC scans in water were not reproducible, exhibiting, at times more than one T_m or no transition. DPPC and DPTMA are glycerol diesters and positively charged vesicles concentrate OH^- ions inducing hydrolysis of ester bond. The hydrolysis may explain data inconsistencies. Therefore a study of the pH effect upon lipids hydrolyses was undertaken. No hydrolysis was detected in HCl $5 \times 10^{-4}\text{M}$, pH 3.4, while at higher pHs there significant hydrolysis occurred. In pH 3.4 as DPPC molar fraction increases T_m increases reaching a maximum at 1:1 (mol/mol) DPTMA:DPPC. The increase in the DPTMA:DPPC ratio leads to a decrease in the lipid cooperativity together with a pre-transition heat increase. **Conclusion:** Previous inconsistencies can be eliminated by avoiding hydrolysis in lipid mixtures. Mixtures of DPTMA:DPPC exhibit a maximum in T_m at 1:1 molar fraction. Cooperativity of the transition reaches a minimum at 0.75 mole fraction of DPTMA.

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