Microcalorimetric and Shear Studies on the effects of Cholesterol on the Physical Stability of Lipid Vesicles

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Abstract

This work measured the dilution heat of phosphatidylcholine (PC) vesicles incorporated with various amounts of cholesterol using isothermal titration calorimetry (ITC). The interaction potential between these PC vesicles was analyzed and the changingsize of the PC vesicles response to various shear force and the zeta potential of the PC vesicles were also measured and discussed along with the ITC results. Experimental data indicate that the repulsive surface potential and the repulsive electrostatic force increases as cholesterol is incorporated into the bilayer. This phenomenon can be attributed to the decrease in the binding ability between the PC vesicular surfaces and the cations in the buffer solution. Incorporating cholesterol into the bilayer promotes the repulsive surface potential (or energy barrier) between the PC vesicles from the surface potential viewpoint. Additionally, incorporating cholesterol into the bilayer makes the PC vesicles more rigid and sustains more severe shear stress in our shear forces studies. This work also reveals that temperature and PC vesicular stability are correlated with each other. The stability of PC vesicles are likely to decline with a rise in the temperature, and the elevated temperature effect is evidence of the rigidity or curvature of the PC vesicles. Furthermore, the repulsive surface potential (or energy barrier) between the PC Vesicles declines with a rise in temperature. [References: 38]