Study of the Influence of the Acyl Chainlength in Phosphatidylcholines on the Interaction of their Vesicles with α-Lactalbumin

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The interaction of α-lactalbumin (α-LA) with dimyristoylphosphatidylcholine (DMPC) and dipalmitoylphosphatidylcholine (DPPC) vesicles was studied as a function of temperature and pH. Experiments were carried out

1) by measuring the fluorescence polarization of 1,6-diphenyl-1,3,5-hexatriene (DPH) used as a probe located in the hydrocarbon region of the vesicles; a molar ratio phospholipid/α-LA = 4 was used,
2) by measuring the resonance energy transfer between the tryptophan groups of α-LA and the vesicles containing DPH; here a molar ratio phospholipid/α-LA = 45 was used.

From the polarization measurements it is concluded that α-LA at all temperatures mainly adsorbs to the outer surface of DMPC vesicles at neutral pH with no or small influence on the transition temperature; at pH 4 however α-LA penetrates these DMPC vesicles increasing the transition temperature by about 4 °C. In its interaction with DPPC vesicles the influence of the pH and the incubation temperature is not so drastic as with DMPC vesicles: as well at pH 7 as at pH 4 penetration of the protein into the vesicles seems to be possible, the binding being stronger however at pH 4. In this last case the transition temperature is increased by about 2 °C instead of 4 °C as is the case with DMPC.

Nonradiative energy transfer measurements confirm these conclusions. With DMPC energy transfer is only possible at pH 4. With DPPC a small energy transfer is possible at pH 7; at pH 4 the energy transfer is higher indicating that the binding of α-LA with DPPC is stronger at this pH than at pH 7.