Dipalmitoylphosphatidylcholine Membranes Containing Carotenes: Calorimetric Results

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Carotenoids may be present in biological membranes in the form of pigment–protein complexes or as direct components of the lipid phase, acting, possibly, as modulators of the membrane fluidity. In this work we verified the effect of β-carotene (CAR) and lycopene (LYC) in dipalmitoylphosphatidylcholine (DPPC) membranes using Differential Scanning Calorimetry (DSC). Large unilamellar vesicles (LUV) were obtained (with and without carotenes) by injection of DPPC containing 0.5 mol% of dicetyl phosphate solubilized in CH_2Cl_2 into 20mM TRIS-HCl (pH 7.2), followed by extrusion through polycarbonate membranes (100nm). Analyzing LUVs thermograms, the transitional enthalpies (ΔH), main transition temperatures (Tm) and transition cooperativity were determined. Addition of CAR (0.35 mole fraction) in DPPC vesicles produced an increase in ΔH (31.7%), decrease of transition cooperativity (1.12 fold) and Tm was not significantly affected. LYC (0.32 mole fraction) produced a decrease in ΔH (23.2%), decrease of transition cooperativity (4.96 fold) and decreased the Tm of 1.7°C. Only LYC affected the Tm, which indicates an increase in membrane fluidity. According to the literature, a decrease in ΔH without modification in Tm indicates that interference mainly occurs in the bilayer alkyl chains, suggesting an incorporation of the carotenes in its hydrophobic core, as observed in this work for LUV containing CAR. An alteration in ΔH and Tm indicates that there is interference in both alkyl chains and polar heads, as determined here for LYC incorporated LUV. These results indicate that LYC induces a higher degree of bilayer perturbation when compared to CAR.

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