

Comparative X-Ray Studies on the Interaction of Carotenoids with a Model Phosphatidylcholine Membrane

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The interaction of structurally different carotenoids with a membrane molecular model was examined by X-ray diffraction. The selected compounds were β -carotene, lycopene, lutein, violaxanthin, zeaxanthin, and additionally carotane, a fully saturated derivative of β -carotene. They present similarities and differences in their rigidity, the presence of terminal ionone rings and hydroxy and epoxy groups bound to the rings. The membrane models were multibilayers of dipalmitoylphosphatidylcholine (DPPC), chosen for this investigation because the 3 nm thickness of the hydrophobic core of its bilayer coincides with the thickness of the hydrophobic core of thylakoid membranes and the length of the carotenoid molecules. Results indicate that the six compounds induced different types and degrees of structural perturbations to DPPC bilayers in aqueous media. They were interpreted in terms of the molecular characteristics of DPPC and the carotenoids. Lycopene and violaxanthin induced the highest structural damage to the acyl chain and polar headgroup regions of DPPC bilayers, respectively.