

INFLUENCE OF POLAR AND NONPOLAR CAROTENOIDS ON STRUCTURAL AND MECHANICAL PROPERTIES OF MODEL MEMBRANES

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Abstract

Carotenoids are commonly occurring pigments synthesized by plants and microorganisms. They are also responsible for the bright colors of various fruits and vegetables. These compounds, known primarily for their photoprotective and antioxidant properties, strongly influence physical properties of model membranes. Localization and orientation of carotenoids in the lipid bilayer depend on their structure and are determined by interactions with lipid molecules. This affects both phase behavior and mechanical properties of membranes, which are the subjects of our research. Combination of differential scanning calorimetry (DSC) and atomic force microscopy (AFM) allowed us to gain a direct insight into the interactions between the components of model systems on a molecular level and investigate the correlation between mesomorphic phase behavior of membranes and their adhesiveness. Changes in structure and mechanical properties of the membrane are shown for β -carotene and zeaxanthin embedded in a liposome membrane, as representatives of nonpolar and polar carotenoids, respectively. The studies revealed that the presence of carotenoids in amounts as small as 1mol% has a significant influence on the properties of the investigated system, resulting in an increase of adhesion force between a liposome and an AFM tip. Moreover, adhesion force observed for all measured liposomal systems is sensitive to temperature and shows different type of dependence for β -carotene and zeaxanthin. Presented results will contribute to the understanding of processes occurring in natural membranes, that are an essential part of the photosynthetic apparatus of plant cells.

Keywords: Atomic force microscopy, adhesion, carotenoids, model membranes,

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