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Casein interaction with lipid membranes: are the phase state or charge density of the phospholipids affecting protein adsorption?

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Abstract

Casein micelles are ~200 nm electronegative particles that constitute 80 wt% of the milk proteins. During synthesis in the lactating mammary cells, caseins are thought to interact in the form of ~20 nm assemblies, directly with the biological membranes of the endoplasmic reticulum and/or the Golgi apparatus. However, conditions that drive this interaction are not yet known. Atomic force microscopy imaging and force spectroscopy were used to directly observe the adsorption of casein particles on supported phospholipid bilayers with controlled compositions to vary their phase state and surface charge density, as verified by X-ray diffraction and zetametry. At pH 6.7, the casein particles adsorbed onto bilayer phases with zwitterionic and liquid-disordered phospholipid molecules, but not on phases with anionic or ordered phospholipids. Furthermore, the presence of adsorbed caseins altered the stability of the yet exposed bilayer. Considering their respective compositions and symmetry/asymmetry,

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