Stabilization of lipid multilayer systems by polysaccharides

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Hyaluronic acid (HA) is a high molecular weight polysaccharide. It is involved in a wide range of processes in the human body, such as wound healing, tumor progression and joint lubrication [1, 2, 3]. In this contribution we show, that HA also stabilizes lipid multilayer systems at physiological conditions. The observed effect may be an important contribution to joint lubrication as lipid films covering the cartilage of natural joints are assumed to reduce internal friction. Neutron reflectometry investigations were carried out at V6 and the new BioRef neutron reflectometer at Helmholtz-Zentrum Berlin [4]. Measurements against excess D\textsubscript{2}O verified, that an oligolamellar DMPC lipid bilayer coating remains stable on a silicon substrate at 21°C in its ordered state (L\textsubscript{β’}, P\textsubscript{β’}) with a d-spacing of 66 Å, but detaches almost completely from the solid support at 38°C in its chain-disordered state (L\textsubscript{α}) [5]. By contrast oligolamellar lipid bilayers remain stable on a substrate at 38°C when incubated with a solution of HA in D\textsubscript{2}O. Lamella transformations occur over time, resulting in a new lamella phase with a d-spacing of 247 Å. This effect has to our knowledge not been reported before. We will discuss potential consequences of the “new” lamella phase with respect to further insight in joint lubrication.

References