MS8 Membranes and membrane interacting proteins

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MS8-P1 pH- and surface pressure-depend adsorption of human apolipoprotein A1 at solid/liquid- and gas/liquid-interfaces

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In natural cells, proteins face a very complex environment, in which crowding and confinement can affect the conformational stability and the adsorption behavior of proteins or lead to aggregation. Interactions of proteins with solid surfaces are major issues in a number of fields of research such as biology, medicine, or biotechnology [1, 2]. Apolipoprotein A1 (apoA1) is an important protein of high density lipoproteins (HDLs) and plays a vital role in reverse cholesterol transport. Reduced plasma levels of HDL and apoA1 are the key risk factors for atherosclerosis and cardiovascular disease [3]. Lipidfree apoA1 is the main constituent of amyloid deposits found in atherosclerotic and senile plaques [4, 5]. Due to its anisotropic surface, apoA1 is able to interact with surfaces or interfaces via different interaction mechanisms. We investigated the adsorption behaviour of apoA1 at hydrophilic silicon dioxide surfaces as a function of the pH-value and the surface pressure-depend adsorption behaviour at DOTMA/DOPC-monolayer by means of x-ray reflectivity (XRR). The pH-depend adsorption behavior of apoA1 was examined at BL9 at the synchrotron light source DELTA (Dortmund, Germany) at the solid/liquid-interface (pH-value 3-7). Surface pressure-depend adsorption measurements were conducted at the gas/liquid-interface using a Langmuir trough with a Bruker-AXS D8 diffractometer (20-30 mN/m). The pH-depend measurements show that apoA1 adsorbs in different conformations depending on the microenvironment. Between pH 4 and pH 6, an adsorption window with different electron densities and layer thicknesses is determined. The adsorption within this window is mainly driven by electrostatic interactions, since the protein and surface are oppositely charged in the region of these pH-values. The protein is described as a molten globule with a loosely fold state [6] which are able to adsorb. With lowering the pH-value in the acidic region the protein undergoes molecular transitions where the α-helical segments are reduced and the protein gets into a random coil state [7]. At the monolayer apoA1 causes a complete reduction of the electron density without changing the layer thickness. It seems that apoA1 adsorbs, penetrates and finally solubilizes the lipids into solution. [1] Kasemo et al., 2002 [2] Castner et al., 2002 [3] Small et al., 2014 [4] Wisniewski et al., 1995 [5] Westermark et al., 1995 [6] Gursky et al., 1996 [7] Gwynne et al., 1974

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