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Investigation of Time Dependent Competitive Protein Adsorption to Surfaces Using Mass Spectrometry

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Introduction

Surfaces in a complex protein solution will adsorb proteins. This event is fast and dynamic and triggers a biological response against the inserted/implanted biomaterial that eventually will lead to biofouling and encapsulation. This affects the properties of the inserted devices, such as hampered membrane functions of microdialysis (MD) probes or distortion in response of biosensors.

Methods

Untreated and coated filtration membranes were used as adsorption templates for human ventricular cerebrospinal fluid (vCSF). After adsorption in an incubation chamber, the membranes were washed, dried and the proteins were reduced, alkylated and digested. The sample preparation procedure was conducted according to an on-surface enzymatic digestion (oSED) protocol previously described by our group. The oSED digests were analyzed by nanoLC ESI-MS/MS using a 7T hybrid LTQ FT and Velos pro orbitrap mass spectrometer.

Preliminary Data

In this study, we present a time resolved map of protein adsorption. Non-coated and tri-block polymer coated, polycarbonate membranes was used as templates. As expected, a time and surface property dependent protein adsorption relationship was observed. It is not surprising that the degree of protein binding onto modified and non-modified surfaces was dependent on the properties of the protein as well as the properties of the surface. The process of biofouling for in vivo inserted materials can be postponed and thereby increasing the lifetime and use of e.g. microdialysis probes for patient monitoring. The preliminary data are very promising making it possible to identify a spectra of adsorbed proteins on different surfaces in a time dependent way.

Keywords: Competitive, Surface, Adsorption