Vyjádření školitele k disertační práci ing. Cesara Rodrigueze Emmenegera na téma
SENSITIVE LAYERS FOR OPTICAL BIOSENSORS AND PROTEIN CHIPS

Biosensors and protein chips are supposed to provide an essential base for future medical diagnostics on the molecular level in which low concentrations of biological markers and sequences of their interactions should be detected in biological fluids, particularly blood serum and plasma, containing a huge amount of various other biological compounds, mostly proteins. Unfortunately, the biosensors capable of label-free detection in-real time cannot differentiate between the analyte binding to specific bioreceptors immobilized on the transducer surface and nonspecific deposition of proteins and other macromolecules from the tested biological media. This crucial problem cannot be solved by any physical method. Thus, Rodriguez focused primarily on the preparation of surface coatings resistant to the fouling and the study of blood plasma interactions with such antifouling surfaces. The initial study of the currently used antifouling surfaces suggested that even total resistance to the adsorption of the main plasma protein, albumin, IgG, and fibrinogen from standard model solutions is not sufficient for the resistance to the fouling from blood plasma. Subsequently, he managed to prepare a new polymer brushes from poly(HPMA) that provided the second so far known surface suppressing the plasma fouling below the SPR detection limit. Surprisingly, the poly(HPMA) brushes do not follow the currently accepted requirements for protein resistant surfaces, as they have hydrogen bond donors and are considerably less wettable than the first known plasma resistant coating composed of poly(carboxybetaine) brushes. The analysis of plasma deposits on antifouling PEG based coatings prepared by Rodriguez, which was performed in Institute of hematology and blood transfusion, discovered that the deposits contained only six proteins and that the fibrinogen adsorption was mediated by the adsorption of some other protein. These and other Rodriguez results suggested that the current theories dealing with the surface resistance to the protein adsorption could not explain the interaction with plasma and indicated a new directions for the future research. The developed coatings with covalently attached bioreceptors were applied for fabrication of a new SPR biosensor capable of detecting EB virus infection in real clinical serum samples.
Definitely, the articles derived from the thesis have contributed significantly to the research field and opened ways to new potential biomedical applications.
According to my opinion the complex interdisciplinary research resulting in the excellent results makes the thesis superior to those prevalently submitted. I recommend the thesis for the defence.

Prague, May 11, 2012

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