

## Interaction Studies in Complex Fluids with Optical Biosensors

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### Akademisk avhandling

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### Abstract

In this thesis interactions in complex fluids, such as serum and meat juice, were analysed with optical biosensor techniques.

Panels of lectins immobilised on gold surfaces were used for investigation of differences in protein glycosylation pattern in sera and meat juices between various species. The present panel was also used for investigation of global glycosylation changes of serum proteins in type I diabetes patients. Biorecognition was evaluated with null ellipsometry and scanning ellipsometry combined with multivariate data analysis techniques (MVDA). Principal component analysis (PCA) showed that the lectin panel enabled discrimination between sera from the different species as well as for the different meat juices. The results also indicate that there is a measurable global alteration in glycosylation pattern of serum proteins in type I diabetic patients compared to healthy subjects. Using an artificial neuronal net (ANN), it was also possible to correctly categorise unknown serum samples into their respective class or group. The analytical potential of combining information from lectin panels with multivariate data analysis was thereby demonstrated.

Also, a sensitive and specific method based on surface plasmon resonance (SPR) for detection of insulin autoantibodies (IAA) in serum samples from individuals at high risk of developing type I diabetes (T1D) has been developed. When measuring trace molecules, such as autoantibodies, in undiluted sera with label-free techniques like SPR, non-specific adsorption of matrix proteins to the sensor surface is often a problem, since it causes a signal that masks the analyte response. The developed method is an indirect competitive immunoassay designed to overcome these problems. Today, IAA is mainly measured in radio immunoassays (RIAs), which are time consuming and require radioactively labeled antigen. With our SPR-based immunoassay the overall assay time is reduced by a

factor of  $>100$  (from 4 days to 50 min), while sensitivity is maintained at a level comparable to that offered by RIA. Finally, the assay was used in a screening study of newly diagnosed type 1 diabetes patients and non-diabetic subjects.



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