

Age estimation of body fluids for forensic purposes– Surface Plasmon Resonance Imaging

Background – In the forensic field, knowledge on the time of deposition of human biological evidence is extremely valuable to law enforcement agencies to assess the relevance of traces and the validity of testimonies. However, to date, no methods exist that are able to estimate the time of deposition of these traces, due to the complex sample chemistry and variation in degradation patterns. In our group, we have developed a model that is able to predict the time of deposition of fingermarks and semen traces using the fluorescent signatures of ageing biological stains. Upon ageing, when exposed to air, unsaturated lipids will oxidize and form reactive oxidation products (LipOx), which in turn will react with proteins (Prot) to form fluorescent oxidation products (FOX). The fluorescent changes of the protein fluorescence and the FOX fluorescence can be measured over time, revealing distinctive ageing patterns ^{1,2}. However, the method has several limitations, including interfering backgrounds (high intrinsic fluorescence) and multiple measurements over time. To overcome these issues, we would like to investigate the possibility of detecting degradation biomarkers in the different body fluids and explore whether the detection of these biomarkers will result in distinctive ageing patterns. Here, we would like to use a method that is based on antibody-antigen interactions, Surface Plasmon Resonance Imaging (SPRi)

SPRi is an optical method used to study molecular interactions. An antibody-coated biosensor can be used to detect biomarkers in the different body fluids, resulting in unique biomarker patterns and qualitative and quantitative result ³.

Goal - Identification and characterization of degradation patterns of protein and lipid biomarkers in fresh and aged body fluids using SPRi.

Requirements – A background in bio(medical), bio(chemistry), bio(physics) or other related scientific fields is required

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1. van Dam, A. *et al.* Oxidation monitoring by fluorescence spectroscopy reveals the age of fingermarks. *Angew. Chemie - Int. Ed.* **53**, 6272–6275 (2014).
2. Achetib, N. *et al.* Estimating the Time of Deposition of Semen Traces using Fluorescence Protein-Lipid Oxidation Signatures. *Anal. Chem.* [acs.analchem.8b05625](https://doi.org/10.1021/acs.analchem.8b05625) (2019). doi:10.1021/acs.analchem.8b05625
3. Stravers, C. S., Gool, E. L., van Leeuwen, T. G., Aalders, M. C. G. & van Dam, A. Multiplex body fluid identification using surface plasmon resonance imaging with principal component analysis. *Sensors Actuators, B Chem.* **283**, 355–362 (2019).