UNIVERSITY OF AMSTERDAM







# FORENSIC RESEARCH PROJECT

## RESEARCH PROJECT

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| Title | : Time of deposition of blood - identification of ageing biomarkers |
| Keywords | : UPLC, Mass spectrometry, (fluorescence) spectroscopy, data analysis, forensics, body fluids |
| Forensic Expertise Area | : Biochemistry, biophysics, forensics |
| Department | : Biomedical Engineering & Physics |
| Institute/Company | : Amsterdam University Medical Centers, locatie AMC/ Netherlands Forensic Institute |
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## SHORT DESCRIPTION

In the forensic field, knowledge about the time of deposition of human biological traces is extremely valuable to law enforcement agencies to assess the relevance of the traces and the validity of witness testimonies. However, to date, no method exists that is able to estimate the time of deposition of such traces, due to the complex chemistry of the constituents and variation in degradation patterns. In our group, we have developed a model that is able to estimate the age of blood, fingermarks and semen stains using (fluorescent) spectroscopy [1-3]. To estimate the time of deposition, non-destructive blood stain age estimation can be performed using visible reflectance spectroscopy to measure the relative fractions of hemoglobin derivatives. While for the other body fluids, the autofluorescence plays a crucial role. It is thought that due to the presence of air unsaturated lipids will oxidize and form reactive oxidation products (LipOx), which will react with proteins (Prot) to form fluorescent oxidation products (FOX).
To understand the chemical reactions occurring in blood and the other body fluids, it is important to detect and identify important ageing markers[4]. Therefore in this project, (fluorescence) spectroscopy will be combined with mass spectrometry analysis to gain a more in depth understanding of the ageing of dried body fluid stains.
This project is a close collaboration between the AmsterdamUMC and Netherlands Forensic Institute.

## REQUIRED/RECOMMENDED EXPERTISE

We are looking for a master student with a biomedical- or chemistry background. It is required that the student can work with human material. Experience with mass spectrometry and spectroscopic analysis is beneficial, but further training can be offered.

## REFERENCES


1. Edelman, G. et al. Hyperspectral imaging for the age estimation of blood stains at the crime scene. Forensic Science International,1–3 (2012)
2. Achetib, N. et al. Estimating the Time of Deposition of Semen Traces using Fluorescence Protein-Lipid Oxidation Signatures. Anal. Chem. acs.analchem.8b05625 (2019). doi:10.1021/acs.analchem.8b05625
3. van Dam, A. et al. Oxidation monitoring by fluorescence spectroscopy reveals the age of fingermarks. Angew. Chemie - Int. Ed. 53, (2014).
4. Oonk, S. et al. Proteomics as a new tool to study fingermark ageing in forensics. Sci Rep 8, 16425 (2018). https://doi.org/10.1038/s41598-018-34791-z