B52 Preliminary Experiments on Human Bloodstain Age Estimation by ^{1}H,^{13}C Nuclear Magnetic Resonance (NMR) Spectroscopy

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After attending this presentation, attendees will understand the advantages and the possibilities offered by high-resolution ^{1}H and ^{13}C NMR in studying the aging of bloodstains found at a crime scene. Indeed, the possibility of dating blood still represents a challenge of paramount importance in the forensic sciences research field and, although numerous techniques have been proposed in recent years, an accurate estimation of the time elapsed since the crime was committed by using bloodstains is still not possible.[1]

This presentation will impact the forensic science community by presenting the preliminary results on the use of NMR spectroscopy in monitoring the changes of bloodstain spectra as a function of time.

Despite the typical lower sensitivity and higher cost of this technique with respect to other techniques which are more commonly found in forensic laboratories, mainly Mass Spectrometry (MS) and Raman spectroscopy, this techniques' main advantage relies on the possibility of acquiring spectra that directly represents the molecular composition of the whole sample, thus realizing an "-omics" approach, similar to what has recently been proposed for food matrices.[2-4]

Since blood constitutes a complex biological matrix, the possibility of monitoring the modifications of the different classes of molecules present in the whole blood over time is extremely appealing in a forensic framework.

Fresh peripheral blood was collected from different healthy adult volunteers. The obtained simple bloodstains were aged without the addition of any anticoagulants.

NMR spectra were recorded on a Bruker FT-NMR AVANCE III HD 600 MHz spectrometer with a CryoProbe™ BBO H&F 5mm probe and ^{1}H NMR data were acquired using standard Bruker pulse sequences: zg (1D sequence), zgcppr (1D sequence with pre-saturation, using composite pulse for selection), ledbpgp2s1d (Bipolar Longitudinal Eddy Current Delay (BPPLED) pulse sequence), and cpmgpr1d (Carr-Purcell-Meiboom-Gill (CPMG)).

Multivariate data analysis was applied to the collected NMR spectra in order to condense redundant information, to examine overall differences, trends in variation, and relationships between samples and variables, therefore identifying the pools of compounds able to discriminate the age of a particular bloodstain found at the crime scene.

Reference(s):

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