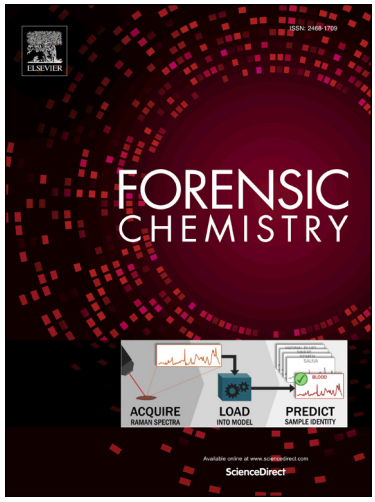

Full length articles

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Monitoring compositional changes of the lipid fraction of fingermark residues deposited on paper during storage

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Abstract

Characterising the changes in fingermark composition as a function of time is of great value for improving fingermark detection capabilities by understanding the processes and circumstances under which target compounds become degraded. In this study, gas chromatography-mass spectrometry was used to monitor relative changes in the lipids from latent fingermarks over 28 days. Principal component analysis of the relative composition of 15 lipids in fingermarks showed that fingermark age was a significant contributor to the variability observed in the data, but that interdonor variability was also significant. This was attributed principally to changes in the relative amounts of squalene, which rapidly decreased in the fingermarks. It was also observed, however, that most fingermarks exhibited relatively small changes in composition during the first seven days, followed by more rapid changes up to 28 days. Significant inter-donor variation of both initial fingermark composition and the rates and nature of loss processes was observed, which was reflected in the relative projection of samples from different donors. Finally, samples stored with no exposure to light or airflow for 28 days were projected significantly closer to the samples analysed on the day of deposition than those exposed to light, due to the reduced photodegradation rate of squalene.

Keywords: Latent fingermarks, Lipids, Degradation, Gas chromatography–mass spectrometry, Principal component analysis

1. Introduction

In recent years, there have been several investigations into the changes in latent fingermark composition that occur as a function of time. The stated aims have included the development of a means to estimate the age of a fingermark for the purposes of criminal investigations [1-6], as well as obtaining a better understanding of the processes of fingermark degradation that affect their detection [1, 7], and the identification of compounds which remain stable over time (or are stable degradation products) as potential targets for fingermark development [1, 8-10].

The lipid fraction comprises the more durable portion of latent fingermark residue (compared to the water-soluble eccrine components), due to its hydrophobic and non-volatile nature. It is also highly subject to compositional changes, and so it is this fraction of latent fingermarks which has been