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### **B152 The Analysis of the Fatty Acid Content of Fingerprint Residues Using Gas Chromatography/Mass Spectrometry (GC/MS)**

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After attending this presentation, attendees will understand the within-person chemical variability of fingerprint residues of individuals.

This presentation will impact the forensic science community by providing attendees with an additional means of latent print analysis through the determination of the chemical composition of fingerprint residues. Often, smudged fingerprints deposited at crime scenes are of little value to latent print examiners because smudged prints lack minutiae that are necessary for comparisons. In cases in which DNA or fingerprint minutiae in the fingerprints are not able to identify a suspect or victim, the chemical composition of fingerprint residues could provide a useful investigative lead, if the residues enable the classification of individuals into groups according to biometric traits. For this approach to be possible, one must first establish that the chemicals found on a person's fingers are endogenous and not exogenous, then determine that the within-person variance is smaller than the between-person variance.

One of the recurring issues in forensic science is human subjectivity, especially within the field of fingerprint examination. Smudged fingerprints at crime scenes that contain little to no detail often cause problems to examiners who, in turn, are unable to make an identification or exclusion. Touch DNA is one solution to this problem, but mixed DNA and stochastic dropout are major barriers to interpretation. In recent years, researchers have begun to explore the chemical composition of fingerprint residues to provide an alternative means for including or excluding potential donors.

Research into the chemical composition of fingerprints has shown that it may be possible to determine sex, age, and race from residues that are left behind when a fingerprint is deposited on a surface; however, some issues have been encountered. Lipids, one of the major components of these residues, are also found in personal care products, such as moisturizers and cosmetics. It has been difficult for researchers to distinguish fingerprint residues deposited by an individual from the residues left behind by these products. The purpose of this study is to determine the variability of fingerprint residues within an individual over the course of several months, and to assess the relative proportion of endogenous and exogenous sources of lipids.

This study involved the collection of fingerprint residues of six individuals (three males and three females) over the course of three months. Natural, eccrine, and sebaceous secretions were collected from each participant multiple times per week. Saponification and derivatization were performed on each sample to convert the various types of lipids/glycerides to Fatty Acid Methyl Esters (FAMES). Analysis was performed using a standard GC/MS system with an HP5 column. Data analysis consisted of the identification of peaks and extraction of peak areas. One-way Analysis of Variance (ANOVA) was used to assess within-group variance to between-group variance at a 95% confidence interval to determine the variability of fingerprint residues deposited by individuals over a period of time. Results showed that within-person variability is smaller than between-person variability.

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#### **Fingerprint, GC/MS, Fatty Acid**