B70 The Enhancement of Human Scent Profiles as Forensic Evidence

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Learning Overview: After attending this presentation, attendees will understand how human odor profiles can be collected and evaluated, why human scent can be utilized as an individual or class characteristic, and why there is a need for profile enhancement of odor profiles for all ethnicities.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by portraying the reproducibility of findings in previous Caucasian and Hispanic human scent analyses, as well as the novel incorporation of African American odor profiles.

Human scent has been previously defined as a complex mixture of Volatile Organic Compounds (VOC's) detected in the headspace above a scent sample. Humans generate odor from several areas of the body, including the scalp, hair, mouth, hand, axillae, and foot. The analysis of the chemical composition of human scent has enabled scientists to demonstrate variations within these factors (age, gender, and ethnicity) to distinguish between individuals. Due to the novelty of human scent research, human scent evidence has been undervalued in the court of law. However, this type of evidence has significant value when physical evidence is not available at crime scenes. In order to increase the individualization and differentiation power of human scent evidence, this study aims to further investigate the identification of chemical signatures within the hands and axilla of specific ethnicities and genders.

During the study, the axilla of 68 participants were investigated. Upon collection, samples were extracted using Headspace/Solid Phase Micro extraction (HS/SPME) and Liquid-Liquid Extraction (LLE) and analyzed using Gas Chromatography/Mass Spectrometry (GC/MS). The utilization of SPME immediately followed by LLE complements the extraction of semi-volatile and non-volatile compounds, hence filling in the gaps of the compounds that could not be recovered using HS-/PME alone. This ensured that a full VOC profile is obtained, allowing for improved statistical analysis without requiring any additional sample collection. The samples were evaluated statistically via logistic regression to extrapolate data unique to specific individuals and groups.

Scientific advances have enabled the forensic science community to use scent as a feature for individual or class characteristic determination. The analyses of body odors using the VOCs emitted have proven that, when enhanced, human scent can be as useful as fingerprints and DNA in the attempt to identify individuals. In future work, the VOCs emitted from the axilla of human subjects can potentially correlate to specific Human Leukocyte Antigen (HLA) alleles. Additionally, once the unique odor profiles of each ethnicity can be identified and reproduced efficiently, live human scent training aids for canines can be improved.

Volatile Organic Compounds (VOCs), Solid Phase Microextraction (SPME), Human Scent