B179   Human Scent Biometrics: Paving a Path Toward Improved Data Analysis

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Learning Overview: After attending this presentation, attendees will understand the hurdles facing the use of human scent as a biometric and the Gas Chromatography/Mass Spectrometry (GC/MS) data processing approaches being implemented toward the systemization of scent profile comparisons.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by equipping attendees with approaches for extrapolating the influential features of their GC/MS data, assessing the appropriateness of statistical tests, and venturing into exploratory data analysis as presented through the lens of human scent profiling.

Human scent is a complex mixture of Volatile Organic Compounds (VOCs) detected in the headspace above a scent sample. These VOCs are the culmination of oils, sweat, and other skin secretions enduring microbial action at the skin's surface. With genetic and environmental influences each playing a role in its characteristics, human odor is a product of diverse factors that allow it to be viewed as a biometric that can be used to identify a person.

There is a seeming agreement arising in regard to best practices for human scent collection with multiple reported uses of Headspace/Solid Phase Microextraction (HS/SPME) and wide utilization of Gas Chromatography/Mass Spectrometry (GC/MS) to identify the VOCs extracted from human scent samples. Despite convergences in approaches toward the collection and instrumental analysis, there is no commonly accepted practice for interpreting the resulting GC/MS profile data.

Utilizing hand odor profiles retrieved by HS/SPME-GC/MS efforts to develop a robust systematic approach for human scent profile discrimination will be examined. With regard to previously implemented statistical tests, such as Spearman Rank Correlation, Linear Discriminant Analysis (LDA), and Principal Component Analysis (PCA), additional considerations also have to be evaluated for their utility in defining class barriers and making determinations of association between profiles. Inherent to the improvement of existing approaches, an expanded evaluation of chromatographic feature relevancy has been conducted. Namely, elution time, peak height, and peak area were compared in relation to mass spectral compound identifications to assess the influence of each parameter on profile comparison. The resulting methods for performing human hand odor profile discrimination are presented in conjunction with paths for reducing data complexity and conducting an exploratory investigation of the processed data; with topics including multivariate analysis and clustering methods.

Data analysis continues to be a roadblock between the academic endeavor of human scent profiling and the casework application of this technique. Through further developing the presented methods, a path will continue to be paved between this novel method and the crime laboratory where it may be utilized.

SPME-GC/MS, Human Scent, Data Analysis