B4   Pilot Study of the Potential for Using Different Biological Specimens as Human Scent Sources

Maiko Kusano, BA*, and Eladio Mendez, Florida International University, 11200 South West 8th Street, Miami, FL 33199; and Kenneth G. Furton, PhD, International Forensic Research Institute, Florida International University, University Park, Miami, FL 33199

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This presentation will impact the forensic community by monitoring the consistency and inconsistency of these volatile organic compounds over time, as well as to investigate the potential of using previously collected forensic evidence samples as human scent samples for investigative and/or a biometric tool.

The purpose of this presentation is to provide the forensic community with a comparison between the volatile organic compounds present in different biological samples. The goal of this research is to monitor the consistency and inconsistency of these volatile organic compounds over time, as well as to investigate the potential of using previously collected forensic evidence samples as human scent samples for investigative and/or a biometric tool.

The human odor is made up of a variety of organic compounds such as aldehydes, alcohols, alkanes, esters, fatty acids, and ketones. Volatile organic compound (VOC) analysis in biological samples such as expired air (breath), sweat, blood, and urine has been used for various applications such as toxicology, medicine, and forensics. Over the recent years interest has increased regarding the identification of VOCs for metabolic profiling or diagnostic potentials for certain diseases that are known for its association with distinct odor.

Identification of target odor compounds can provide valuable information to both the medical and forensic communities. From the medical perspective, analysis of VOCs in biological fluids can reveal interesting diagnostic properties of different biomarkers. In addition to the disease diagnostic potential, analysis of VOCs in biological samples may be useful in differentiating populations (i.e., healthy vs. illness). From the forensic perspective, biological evidence collected may be useful for human identification in terms of matching individuals to odor from a crime scene. Volatile organic components of human scent play important roles in scent association between a person and evidence. Human scent identification line-ups are possible as each person has distinctive odors. Canines have the ability to discriminate human scent because people smell differently.

Curran et al. have demonstrated that human scent is a combination of various compounds differing in ratio from person to person as well as other compounds that vary among individuals. VOCs present in human odor from sweat samples have been detected and identified by solid- phase micro-extraction gas chromatography mass spectrometry (SPME- GC/MS). This study extends the investigation of the different VOCs present in human odor profile to include various biological specimens including blood, breath, oral fluid, sweat, and urine. Hand odor samples were collected on a pre-treated 2 x 2 sterile gauze pad. Expired air was sampled in a Teflon breath sampling apparatus. Whole blood was obtained by finger stick sampling and collected onto FTA cards. Urine and oral fluid specimens were collected under typical forensic evidence collection methods, which were immediately transferred into 10mL headspace vials. Samples were collected from subjects over a 6-month period and the consistencies and inconsistencies of the VOCs were monitored. SPME-GC/MS was utilized to extract, separate, and identify the volatile components from the collected biological samples.

The results demonstrate that significantly different VOCs are observed from the different biological samples studied with the greatest number of compounds observed from urine samples followed by sweat,

oral fluid, blood, and breath. Studies are ongoing in order to try to improve the number of compounds observed by further optimization of the sampling procedures including additional heating. These results show that different biological specimens have significantly different VOCs under the conditions and instrumentation employed but may not preclude the use of canines for matching samples as they could be utilizing different compounds than those detected in this study. Additional work is ongoing to include subjects with specific medical conditions to evaluate the effect this may have on detectable VOCs.

Human Scent, Volatile Organic Compounds, SPME-GC/MS