B2 Biological and Chemical Influences on a Canine's Ability to Differentiate Hand Odor Samples

Davia T. Hudson, BS, and Allison M. Curran, PhD, Florida International University, 11200 SW 8th Street, Department of Chemistry, Miami, FL 33199; Adee A. Schoon, PhD, Canine Unit, Netherlands National Police, PO Box 530, Nunspeet, 8070 AM, Netherlands; and Kenneth G. Furton, PhD, Florida International University, 11200 SW 8th Street, Department of Chemistry and Biochemistry, Miami, FL 33199*

After attending this presentation, attendees will learn about the effects of biological and chemical influences from hand odor samples on alerts produced by human scent identification canines.

This presentation will impact the forensic community and/or humanity by providing a better understanding of the correlation between volatile organic compounds and the human and non-human compounds present in hand odor samples and canine alerts.

Human scent identification line-ups are frequently utilized in European countries such as the Belgium, Bulgaria, Denmark, Finland, France, Germany, Hungary, Lithuania, Netherlands, Poland, Russia, and Slovakia. They establish an association between a suspect and an object or location based on canines matching human scent collected from a crime scene to scent collected from the hands of a suspect. Scent identification line-ups are possible as persons have distinctive odors and canines are capable of discriminating between odors. Many theories have been put forward to explain the production of human odor as it is a complicated process which is not yet fully understood. The basis on which the dogs are producing an alert to human scent is also yet to be determined.

The human body produces odors made up of a variety of organic compounds such as fatty acids, alkanes, aldehydes, ketones and esters. Human scent has been defined as the volatile organic compounds which are present in the headspace of a scent sample. However, other substances may also contribute to human scent. Solid phase micro extraction gas chromatography mass spectrometry (SPME-GC/MS) is an analytical technique which has been used for the extraction of volatile organic compounds which are present in the headspace of various forensic samples such as drugs and explosives. SPME-GC/MS has been successfully used for the extraction, separation, and identification of the volatile organic compounds which are present in the headspace of scent samples.

The human skin can be described as a continuous source of "rafts" which are dead skin cells that are constantly shed from the stratum corneum of the epidermis. It is believed that bacterial action on these "rafts" in combination with genetic differences, diet, and glandular secretions of the skin greatly influences the odor that is produced by an individual. When an individual comes in contact with an object, "rafts" are deposited which makes it possible for a scent sample to be collected. Differences have been shown between individuals in the amount of "rafts" deposited on an item when it is touched. It has been observed that for individuals that have been in contact with objects for four minute time periods, human scent identification canines show greater difficulty in identifying certain individuals as compared to others.

This paper will discuss the influences of volatile organic compounds (VOC's) and human and non-human components of hand odor samples on the alerts produced by human scent identification canines. The identification and quantification of the volatile odor compounds present in the headspace of scent samples collected on pre- cleaned cotton absorbers were obtained using SPME-GC/MS. The absorber materials used in this study were pre-treated with a methanol- modified supercritical fluid extraction (SFE) method to achieve analytical cleanliness. The effects of temperature and light on stored hand odor samples have also been evaluated. Real time polymerase chain reaction (PCR) was used for the quantitative and qualitative analysis of the human and non-human components of hand odor samples collected on pre-cleaned stainless steel bars.

The present study demonstrates that using an optimized pre-cleaned sampling material and storage conditions it is possible to get reproducible inter- and intra-day VOC patterns for individuals and sufficient variation between individuals for differentiation. Observed VOC patterns are generally comprised of alcohols, aldehydes, ketones, and esters. Additional work is needed to determine the role of an individual's microbial flora but initial results demonstrate some variability in the identity and quantity of microbial populations which may contribute to the VOC patterns observed. The obtained results will be discussed in this paper.

Human Scent, SPME-GC/MS, VOC's

 ** Presenting Author*