B109 Optimization of Collection and Storage Methods for Scent Evidence and the Identification of the Volatile Components Comprising an Individual Human Odor Signature

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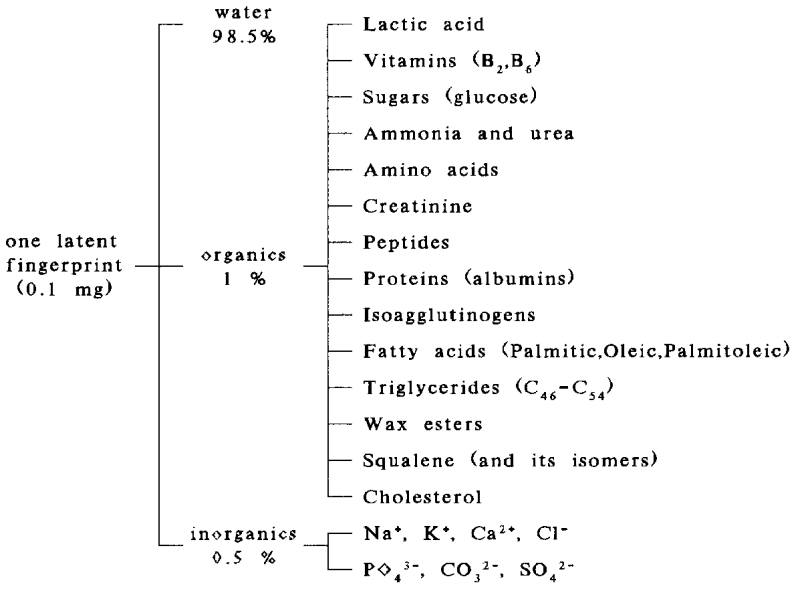
After attending this presentation, attendees will understand the best procedure for the collection, as well as the preservation, of human scent evidence samples and different passive headspace sampling techniques used to evaluate the uniqueness of human odor.

This presentation will impact the forensic community and/or humanity by demonstrating the optimization of scent evidence collection and preservation procedures as well as an evaluation of the uniqueness of human odor may lead to scent evidence being utilized in the U.S. as an investigative tool in criminal cases.

The use of canines, *Canis lupus* var. *familiaris*, within the fields of law enforcement and forensic science is widely accepted, however, to date, there are few peer reviewed studies confirming their accuracy and reliability. The use of detector dogs for "human scent lineups" has been utilized in European countries (such as the Netherlands) but has not gained widespread acceptance in the United States due, in large part, to the lack of definitive studies demonstrating the reliability of this approach. This lack of information has resulted in successful legal challenges to the use of these biological detectors in a court of law.

Fingerprints recovered from evidence and at crime scenes can be used to identify suspects. However, if a print recovered from a crime is smudged or incomplete it may be hard to distinguish between individuals in question. The identification of the chemical and volatile components of the print may aid in the discrimination between individuals in question. The identification of the chemical components within fingerprint residue may lead to a 'chemical fingerprint' of the individual as may also hold true for the volatile components of fingerprint residue. These volatile components are what comprise the signature odors that law enforcement certified canines alert to when searching for humans and distinguishing between individuals.

Chemical residues of human fingerprints have been studied in some detail but, at present, there have been few reports of the volatile constituents of human odor from various parts of the body. The following diagram shows some of the chemical components found in fingerprint residue:



This paper describes the use of headspace extraction combined with gas chromatography and mass spectrometry to identify the signature odors that law enforcement certified detector dogs alert to when searching for humans and distinguishing between individuals. Comparisons of two different passive headspace extraction techniques: solid phase micro-extraction (SPME) and activated charcoal strips (ACS) will be presented. Studies include the analysis and identification of the headspace 'fingerprint' of a variety of samples, followed by completion of double-blind dog trials of the individual components in an attempt to isolate and identify the target compounds to which dogs alert. SPME–GC/MS and SPME-LC/MS have been demonstrated to have unique capabilities for the extraction of volatile compounds from the headspace of

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forensic specimens and show great potential to aid in the investigation and understanding of the complicated process of canine odor differentiation. Major variables evaluated for the headspace SPME include fiber chemistry, a variety of sampling times, and the resultant effect on ratios of isolated volatile components.

Various methods for sampling human scent will be presented, including the use of the Scent Transfer Unit – STU-100 (Lynn Peavey Company, Lenexa Kansas). Different mediums are being evaluated for use in the collection of human scent, such as: sorbents (silica, octadecyl, Florisil, etc.), cotton pads (soft, stiff), cotton balls, polyester, and wool. Sampling methods and mediums are being investigated in an attempt to optimize the recovery and storage of human scent from forensic specimens. Persistence/dissipation studies will also be presented evaluating variables such as static conditions, dynamic airflow, and temperature effects. Various containers are being evaluated for use in storage of human scent samples, including: glass jars, paint cans (lined, unlined), bottles, Ziplock bags, heat sealed bags (i.e., Kapak), as well as different plastics. Headspace and bulk human scent residues collected in different ways will be compared. Determining the effect of odor traces collected from different areas of the body (feet, hands, underarms, etc.) will also be presented.

Canine, Human Scent, Odor Signature

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