B154 The Instrumental Analysis of the Volatile Organic Compounds Present in Human Scent by SPME-GC/MS and the Evaluation of Scent Preservation Methods

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Attendee will learn about the commonalities and the differences in human scent profiles across different individuals.

This presentation will impact the forensic community and/or humanity by demonstrating the variability of human scent profiles and allowing for the better utilization of human scent evidence as an investigative tool in criminal cases.

Human scent evidence and scent identification canines have become more commonly used by the law enforcement community for investigative purposes in recent years. Canines, *Canis lupus* var. *familiaris*, have demonstrated the ability to discriminate between individuals based on their odor. For these identifications to be valid, the hypothesis about human scent is that each person has a unique odor that is stable over time. Scientific research into the ability of canines to distinguish between individuals based on their scent supports this theory. The research presented here also supports the hypothesis of the uniqueness of human scent. Solid Phase Microextraction Gas Chromatography Mass Spectrometry (SPME-GC/MS) has proven to be a viable method for the extraction, separation, and identification of the volatile compounds which comprise human scent and various types of compounds have been identified, such as organic fatty acids, alcohols, aldehydes, and ketones

The majority of the scientific research into human odor has been conducted on sweat collected from the axillary (armpit) area and the feet by the cosmetics industry. The production of human odor is a complicated process which has yet to be fully understood. A number of factors make the axillary region a good odor producing area in the human body: (1) the contents of the apocrine gland secretions may serve as bacterial substrates; (2) moisture is available from the eccrine glands; (3) there is a resident population of bacteria to transform non-odorous substances to odorous substances; and (4) the presence of axillary hair may aid in the dispersion of the odor. The human body has 2-4 million sweat glands distributed over its surface. Sweating is the process of releasing a fluid secretion on the body's surface in an effort to control temperature. The human axillary (armpit) region is the area of the body where the largest collection of sweat glands in both size and number are located. Apocrine, eccrine, and sebaceous glands, which are the major glands responsible for the secretion of "sweat," are all present in the axillary region of the body.

Forensically, odor collected from the hand is also of great interest. The use of detector dogs for "human scent lineups" has been utilized in European countries, including the Netherlands, Poland, Russia, Belgium, Germany, Denmark, and Hungary for decades. A "human scent lineup" is an identification based on a canine matching the human scent collected from a crime scene to a possible suspect. The process for conducting a "human scent line-up" in the Netherlands begins when scent evidence is collected at a crime scene, packaged, and preserved. When a suspect is taken into custody he or she may be asked to submit to a "human scent lineup." The suspect then holds a metal bar in his hands for a period of time, and this metal bar is collected. This metal bar from the suspect along with metal bars that have been held by other individuals and collected at random throughout the population are set up in a sterile room, where the law enforcement certified canine is then exposed to the scent evidence, and allowed to work the line-up of hand scented metal bars independently. Scent identification indicates an association between the suspect and the scent evidence. Canines performing "human scent line-ups" are utilizing hand odor for their distinctions between individuals.

This paper discusses the use of SPME-GC/MS for the analysis of scent samples collected from both the hand and armpit region of individuals differing in age, sex, and race. The stability and reproducibility of an individual scent profile over time for the purpose of creating a baseline for human odor will also be discussed. The common compounds determined between individuals and their relative ratios across individuals will be presented along with some compounds that are uncommon. The analysis of scent samples collected from identical twins living under the same environmental conditions and different environmental conditions will also be presented and compared.

Various collection techniques for axillary scent and hand odor samples will be discussed as well as the stability of these samples when stored at room temperature. Sampling methods and mediums are also being investigated in an attempt to optimize the recovery and storage of human scent from forensic specimens. Different absorber types, including both sterile gauze and King's Cotton, which is used by the Dutch National Police for human scent collection, have been evaluated based on their ability to collect human scent. Persistence/dissipation studies of human scent using SPMEGC/MS will also be presented evaluating variables such as light (UV, VIS) and temperature effects.

Human Scent, Odor Profiles, SPME-GC/MS

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