B109 Compounds Present in Human Scent: A Population Study

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After attending this presentation, attendees will the understanding of key volatile organic compounds found in human hand odor samples rein- forcing the individual odor theory across a population study.

This presentation will impact the forensic community and/or humanity by demonstrating the usefulness of human scent as a viable method for differentiation among individuals.

The ability of canines to distinguish humans based on their scent is well established. When a suspect is identified, human scent collected from a crime scene can be compared to that of odor collected from the hands of a suspect through use of a canine line-up. The majority of scientific research into human odor has been conducted on sweat collected from the armpit area and the feet; however, forensically hand odor is of greater interest. The scent collected from a crime scene is usually (collected from) an object that was handled by the perpetrator. The collection of scent from suspects in criminal investigations is most often collected from the palms of the hands. Different regions of the body vary in the presence and amount of secretory glands and thus the odor produced from different areas may also vary. Hand odor is said to be a combination of the influence of both the sebaceous and eccrine glands, whereas odor collected from the armpit also contains influence of apocrine gland.

Headspace solid phase micro-extraction in combination with gas chromatography / mass spectrometry (SPME-GC/MS) has been employed for the analysis of hand odor collected from a population of sixty people consisting of thirty males and thirty females ranging in age from seventeen to twenty-eight. The collection process consisted of washing the hands and forearms using an olive oil based fragrance-free soap, air drying, rubbing the hands over the hair on the forearms, and then holding a piece of pre- treated gauze for 10 minutes between the palms of the hands. The pre- treatment of absorbers consisted of a methanol-modified supercritical fluid extraction (SFE) and ensured the analytical cleanliness of the collection material prior to use. This process yielded a combination of secretions from both the eccrine glands present in the palms of the hands and sebaceous glands from the hair follicle on the forearms. These samples were allowed to sit for 24 hours, and then analyzed using a divinylbenzene/carboxen on polydimethylsiloxane SPME fiber chemistry.

The evaluation of sixty subjects shows that volatile profiles among individuals express qualitative similarities with stable quantitative differ- ences between individuals, as well as stable qualitative differences among individuals. The detected compounds consist mainly of five groups by functionality: alcohols, aldehydes, alkanes, acid esters and ketones. Some of these compounds were detected across the population with a high fre- quency, such as phenol, nonanal, and decanal which were present in 100% of the subjects. 6,10-dimethyl-5,9-Undecadien-2-one and hexanedioic acid-dimethyl ester are express in approximately 80%, whilst other compounds including heptanal and octanal are seen in less than 30% of the population.

Previous work has shown the ratio pattern of compounds present in the headspace of collected armpit odor samples from males to be relatively stable for an individual and discernable among a population, yet the sta- bility of female armpit profiles proved more difficult. However, hand odor collected from females has shown to be relatively stable in weekly sam- plings across a month. An explanation for this may be that hand odor is produced without contributions of the apocrine gland which is influenced by the menstrual cycle in females. This study demonstrates that com- pounds present in the volatile profiles obtained from collected hand odor samples can also be differentiated among a population, and thus supports the individual odor theory suggested through canine human scent discrim- inations. The relation of the components of hand and armpit odor is important in establishing the compounds present in the overall odor of an individual and will also be discussed.

Human Scent, SPME-GC/MS, Canines

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