A204 Comparison of the Instrumental and Canine Evaluations of the Chemical Composition of Biological Specimens for Human Scent Discrimination

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After attending this presentation, attendees can expect to have a better understanding of the utilization of chemical profiles emanating from biological specimens for the differentiation of individuals both with the use of analytical instruments and human scent discriminating canines. As a result, attendees will become better acquainted with human scent and its role in forensic science.

This presentation will impact the forensic science community by providing the essential scientific foundation that is required for the use of human scent evidence in the court of law.

Human odor can be considered a biometric measurement with emanating chemicals particular to each person. Research has been done to substantiate this concept and many have shown the individualistic properties derived from chemicals present on the body. Human odor is comprised of volatile and non-volatile constituents arising from internal (genetic), external (diet and environment), and cosmetic origins. Human odor components can be detected through olfaction and instrumental analysis. Chemicals emanating from hands, axilla, and feet have been explored and now work is being done to evaluate novel biological specimens.

The detection and discrimination of human scent has found usefulness in the forensic sciences through the deployment of canines. Dogs have been used for their ability to detect minute concentrations of human scent and match that odor to the person it originated from. Studies have shown that canines are able to distinguish related and nonrelated people whether they live together or apart in addition to being able to match odors from the same person collected from different areas of the body. American law enforcement agencies are slowly integrating human scent discriminating canines for this purpose. However, the admissibility of canine scent discrimination evidence in U.S. court proceedings demands that it adheres to guidelines set forth by rulings such as *Frye* and *Daubert* and detailed in the Federal Rules of Evidence. Consequently, research must be conducted to validate the distinctiveness of human scent and demonstrate the ability for trained canines to be able to discriminate this odor among individuals.

This presentation will explore the human odor emanating from a novel biological specimen, saliva collected onto a buccal swab, and make comparisons to hand odor. Instrumental evaluation of the volatile compounds present from both specimen types will be performed on samples collected from twenty male and twenty female subjects using solid-phase microextraction (SPME) followed by gas- chromatography/mass spectrometry (GC/MS) analysis. The array of chemical constituents from each biological specimen type possesses similarities such as a high percentage of hydrocarbons and aldehydes; however, hand odor contains a greater number of alcohols than saliva while saliva contains a greater number of acids than hand odor. Multivariate, non-parametric statistical tests reveal that the chemicals present from each specimen make the two specimen types distinct.

To further expand the laboratory component of this work, a canine field test was conducted to test canine response to saliva, collected onto a buccal swab, as a human odor source. Previous testing conducted by the laboratory has demonstrated the ability for canines to differentiate people based on their hand odor regardless of the chemistry of the collection medium (i.e., cotton, polyester, wool, etc.) used to collected the odor. For this work, field tests were performed with five canine teams on both hard and soft surfaces to test saliva, as an odor source. Saliva was evaluated

in reference to hand odor, which for testing purposes served as a standard odor source. Hand odor was collected from the palms of the hands utilizing a dynamic airflow collection device, the Scent Transfer Unit 100 (STU-100). Odor from saliva samples was collected from the buccal swab onto cotton gauze with the use of the STU-100. The results of these double blind field experiments demonstrate that canine teams responded similarly to both hand odor and saliva samples. Overall, this study confirms that individual hand odor and saliva samples were distinct chemically however the canines were able to identify persons using either hand odor or saliva samples.

Biological Specimens, Volatile Analysis, Canine Discrimination

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