B35 Comparison of Pressurized Fluid Extraction Methods of Adsorbents For Use In Human Scent Evidence Collection

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After attending this presentation the attendee will learn the uses and applications of pressurized fluid extraction methods and their implementation for the purpose of the removal of organic volatile compounds from adsorbents used to collect human scent.

This presentation will impact the forensic community and/or humanity by providing a better awareness for the selection of adsorbent materials used in the collection of human scent. The removal of the organic compounds present initially on collection materials will lead to a more "chromatographically clean" medium from which to analyze human scent for evidentiary purposes.

The use of human scent identification by canines has been featured recently in a number of recent high profile court cases within the United States. While accepted in several European countries, the strict requirements for scientific evidence admissibility in the United States, set forth by the *Frye* and *Daubert* rulings have restricted the application of canine human scent identifications within the U.S. This is due in part to a lack of definitive studies demonstrating the reliability and validity of this approach, which has led to successful legal challenges to the use of these biological detectors in a court of law. As part of the scientific investigation into the forensic validity of canine identification of human scent, the chemical composition of scent must be proven to be unique to an individual and the scent profile must be proven to be stable over time. The instrumental determination of the organic compounds present in human odor plays an important role in determining the uniqueness of human scent, and thus the optimization of mediums for the collection of human odor is also of great interest.

Presently, there are two main methods for the collection of human scent for the purpose of both instrumental and canine scent identification. The direct method is collecting the actual object, and the indirect method is collecting the odor on an absorber such as sterile gauze. Sterile gauze can be placed either in direct contact or placed close to the person or object of interest. Air is also commonly drawn through the gauze pad in an attempt to increase the collection of odor. Canines have shown the natural ability to discriminate between odors in the presence of a high background, whereas instrumental analysis requires a significantly lower background. Despite sterilization through autoclave cleaning, the headspace analysis of sterile gauze pads using Solid Phase Microextraction with Gas Chromatography - Mass Spectrometry (SPME-GC-MS) has highlighted the presence of several organic compounds present within the sterile gauze prior to use. Thus sterile does not equate to chemically clean, and the contamination of the gauze observed has proven to be a serious limitation of the use of sterile gauze as an effective odor collection media for the instrumental identification of the compounds present in an individual odor profile.

This paper discusses the use of carbon dioxide Supercritical Fluid Extraction (SFE) as a potential method of chemical cleaning of the gauze pads. A parallel study of the effect of SFE and Subcritical Water Extraction of absorbers will be presented. Optimization of the extraction parameters evaluated includes temperature, pressure and extraction time, and the use of chemical modifiers such as methanol and water will also be presented. Soxhlet extraction of absorbers through the use of various solvents, such as methylene chloride, methanol and chloroform, will also be presented.

The chemical odor of gauze pads from various manufacturers and the absorbers currently used in European countries for the collection of scent evidence will be presented before and after SFE cleaning. This study is intended to demonstrate the importance of informed selection of gauze pads with minimal background odor, and those which can be cleaned most effectively to minimize any potential distracting odors from the gauze. With the use of chemically clean odor absorbers it is proposed that a better understanding of the composition of the chemical profile of human scent may be obtained, in turn benefiting the scientific acceptance of human scent identification by canine.

Human Scent, Supercritical Fluid Extraction, SPME-GC/MS

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