## A27 Collection of Human Remains Volatiles by Non-Contact Dynamic Airflow Sampling

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After attending this presentation, attendees will learn that the scent of human remains is composed of specific volatile compounds and can be easily collected by dynamic airflow sampling.

This presentation will impact the forensic science community because the results presented indicate the possibility of using GC/MS analysis of human remains odor to confirm or reject the alert of a human remains detector canine.

Human remains detector canines or HRD canines are utilized by law enforcement and disaster relief agencies to locate human remains in a variety of environments. Such canines have the ability to distinguish between living and deceased humans, as well as between human and animal remains. The unique scent associated with human remains and detected by the canines evolves during the decay process as the body's building blocks, proteins, nucleic acids, carbohydrates, and lipids, are broken down into smaller components. As these macromolecules break down, volatile organic compounds are released into the surroundings and can subsequently be detected by HRD canines as early as four minutes after death.

Currently, in the United States, canines are used to locate live people with the assistance of a non-contact, dynamic airflow sampling device. This device is a field-portable, dynamic headspace sampling vacuum. It was designed to collect the scent of living humans from a variety of objects. However, this vacuum has the potential to be used for the collection of volatile compounds originating from other sources beyond living humans. This research would be among the first to apply dynamic airflow sampling with such a device to the collection of human remains odor.

The device consists of a small vacuum pump with a Teflon-coated plastic hood affixed to the top. The hood has been designed to hold a small piece of material or gauze with a stainless steel plate. For collection, it is swept over the subject or object of interest while "vacuuming" any volatile compounds associated with the object onto the collection medium. For this research, the scented material is then removed and placed into a vial, where it is allowed to equilibrate over night. The volatile compounds that have escaped from the material into the headspace are sampled using solid phase micro extraction with GC/MS.

The collection medium and vacuum flow rate were first optimized using standard compounds. The standard compounds used were VOCs

known to be associated with cadaver scent. Low, medium, and high flow rates were compared. It was determined that the collection of volatiles was better at the medium and low flow rates depending upon the collection material. Also, the collection and release of the standard VOCs from several types of collection materials were compared. The optimum collection material differed for each compound, thus a combination of several materials were used to maximize scent collection.

To determine the key compounds that could be used to identify the presence of a dead body, the scent from deceased peoples were sampled with the vacuum and analyzed using SPME-GC/MS. A large sample population of deceased bodies, at varying stages of decomposition, was sampled. Samples were collected by sweeping the vacuum over the body for one minute using a combination of pure cotton gauze and Dakron polyester material as the collection medium. The results of this study show that universal compounds do exist in the scent of deceased human material.

Applying dynamic airflow sampling in this way would be beneficial to the law enforcement community. Occasionally HRD canines may indicate the presence of a body when no body is actually present. This occurs because canine olfaction is so sensitive that canines are likely to indicate the presence of a body in a location where there was once a body even after the body is no longer present. This approach permits the use of the sampling vacuum for the collection of human remains volatiles from a location where a body may have once been located, based on the indication of an HRD canine. Key compounds found in the scent using the sampling vacuum with SPME-GC/MS detection could be used to prove or disprove the canine's indication. The results presented indicate that it may be possible to confirm or reject the alert of a HRD canine scientifically.

**Human Remains Odor, HRD Canine, Odor Detection**

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