A10 Determining Buried Human Decomposition Odor Profiles in Various Biotopes

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After attending this presentation, attendees will learn that buried human remains emit a unique odor profile of volatile organic compounds that analytical instrumentation can detect and identify. With these data, canine training aids can be created for use in locating clandestine burials.

This presentation will impact the forensic science community by providing canine handlers with a consistent and testable mixture of the components that best simulate the odor of a buried human. A mixture that can produce a decomposition odor profile for presentation to canines should improve the likelihood of locating clandestine burials and reduce false positives due to other sources such as decomposing animals or waste products. This research will also help confirm canine alert responses in law enforcement cases.

Current canine training aids for victim recovery investigations vary widely by the handler. The development of scientific methods for determining the exact chemical composition required when creating training aid mimics is difficult. Other complicating factors include both endogenous and exogenous influences. The unique scent associated with human remains changes during the decomposition process as the body's building blocks such as proteins, nucleic acids, carbohydrates, and lipids are broken down into smaller components. A buried human odor profile also changes due to variations in temperature, rainfall, bacteria/microbes, and humidity. Delineating the chemical constituents of the odor over time and in various biotopes is a major goal of this research. Developing the appropriate mixture levels that correspond to the stages of buried (anaerobic/aerobic putrefaction) human decomposition is another objective.

Verifying a canine alert response with on-site field instrumentation would further support canine evidence in law enforcement cases. Human decomposition odor is complex but should not differ significantly between individuals since the internal physiological structural are similar. Thus, identifying a generalized odor profile, even with the variations and quantities of compounds emanating from the source, may be possible. Solid-phase microextraction (SPME), whole air sampling and an Agilent 6890N GC system coupled with an Agilent 5973 mass selective detector were used to analyze the odor of human decomposition. Previous research on human burial subjects identified seven volatile organic compound (VOC) groups produced by decomposition, including: acids/acid esters, alcohols, aldehydes, halogens, aromatic hydrocarbons, ketones, and sulfides.

Soil and soil gas VOC data from two different land sites and from two forensically relevant cases will be presented, utilizing SPME and thermal desorption methods. Preliminary data comparisons between soil and air samples collected at each of the sites indicate there are different VOC profile variances emitted with the various phases of human burial decomposition. If so, development of more specific training aids for human burial investigations might be beneficial for casework. Animal decomposition will also be compared to the human decomposition to show the differences in odor profiles.

Development of more precise training aids should improve the accuracy of canines used in the field for clandestine burial investigations. Thus, training exercises utilizing specific training aids that mimic buried human odor profiles are critical. If a human has a unique odor profile equivalent to that of a fingerprint, this research will be extremely useful in differentiating humans from other sources of decomposition, such as animal remains, and to reduce false positives and increase confidence in canine alerts.

Human Decomposition, Detection Canines, Clandestine Burials

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