D10 Volatile Organic Compounds — From Science to Victim Recovery Canine Training: A Method to Aid in Determining the Location of Human Remains

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The goal of this presentation is to demonstrate to the forensic science community the specific Volatile Organic Compounds (VOCs) that elicit an appropriate response from victim recovery canines.

This presentation will impact the forensic science community by illustrating how the identification of these VOCs from blood may be useful to develop specific human aids for the training of cadaver dogs and may eventually allow them to identify human remains.

Because canines rely on olfactory rather than visual cues, a properly trained "cadaver dog" can be effective at locating human remains that may be buried or hidden from view.

From a crime scene perspective, the use of trained canines is also considered "nondestructive." Detection dogs are the most common and widely accepted biological detectors due to their proven relative accuracy, their sensitivity and selectivity, and their ability to be rapidly deployed and cover a large area.

Particular research efforts have focused on establishing the volatile chemical signature of compounds that could indicate the presence of buried human remains where surface clues are lacking.

In fact, human scent is defined as the most abundant VOCs that are identified in the headspace of a collected scent sample; but only a few VOCs, evolved from a biological specimen, can stimulate canine olfactive alerts in every cross-matching condition.

A study was performed to release the VOCs in the human cadaveric blood which stimulate canine olfactive using Gas Chromatography-Mass Spectrometry (GC/MS). The VOCs released into the headspace of four different samples of cadaveric blood (two male and two female subjects, both White and Black) were analyzed.

The inclusion criteria for the selection of the samples, taken from a cadaver, were from cadavers between 20 and 25 years old with multiple causes of death, excluding cases of intoxication.

The cadaveric blood samples were stored at -20°C; but, prior to analysis, the samples were allowed to equilibrate for 21 hours at room temperature (22°C and 45% relative humidity). Then 0.5mL of each single sample were stored in 10mL sample vials and sealed with Teflon®-faced septa caps. Serial injections were carried out at an initial column temperature of 50°C, reducing progressively up to a temperature of 30°C. An injection of methanol was used after each injection of cadaveric blood sample.

Over 100 VOCs have been identified, but some of these are the result of a cross-reaction between the cadaveric blood and environmental contamination. Specific compounds have been identified as key markers of cadaveric samples.

The purpose of this research has been to identify the type and relative concentrations of VOCs present in human cadaveric blood exposed at different temperatures. These results could be included to aid in training canines in order to improve the ability to use olfaction to locate human remains.

Additionally, field trial experiments to determine canine interest in the observed VOCs will be conducted to identify correct canine positive responses (PPV) to these few VOCs, with minimal false positives or false negatives by using the same methodology applied in previous work. There is ongoing university research directed at the development and improvement of victim recovery dogs' performances.

Victim Recovery Canines, Volatile Organic Compounds, GC/MS

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