D45 Detection of *Canis familiaris* Signature Odor Chemicals in Human Remains Using Derivitization/SPME/GC/MS

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After attending this presentation, attendees will understand the importance of analytical analysis of canine work. This presentation will impact the forensic community and/or humanity by proposing to identify the components of human decomposition that human remains canines alert to while conducting search and recovery missions. The results of this experiment can be used as a means of establishing reliability standards for such canines and validating the work that they do. The goal of this project is to help validate and improve upon the reliability standards associated with human remains detection canines.

Detector dogs have successfully established themselves as an invaluable aid to law enforcement and forensic officials. For over thirty years, the United States has sought the help of canines for such purposes as narcotic and explosive detection. While it is generally accepted that canines possess a superior sense of smell due to their abundant olfactory receptors, what it is that they smell and how they are able to distinguish between scents, for the most part, is still a mystery. For forensic purposes, it is extremely important to be able to scientifically validate the work of canines. One way to accomplish this is by successfully determining to which compounds the detector dogs alert.

The focus of this study will be on human remains canines (a.k.a. Cadaver Dogs). These dogs are specially trained to alert to the scent of human decomposition. As such, when they are employed it is crucial that they consistently alert to human remains as opposed to being distracted by the surrounding environment. Distractions can come in many forms including sewage, decaying vegetation, and other decomposing animals. Consequently, it is vital that the odor of human remains is characterized and therefore distinguished from that of other scents, especially other mammalian remains. In an effort to accomplish this, a comparative study of decaying pigs and cows has been conducted.

The canines used for this study are actively employed and certified by the Miami Dade Police Department. Weekly field tests with the suspected compounds, human samples, and animal samples were conducted. In an effort to avoid conditioning the canines to any confounding variables, the searching procedures have been established and are implemented by the handler. In addition, some experiments were blind (where the handler was not aware of the presence or absence of a sample) and some were not. This was done to help assess the amount of influence (and subsequent bias) the handlers imposed upon their canine partners. Field tests have shown a complete lack of interest in varied forms of cow remains and distracters including human sweat and perfume. Conversely without fail, they have alerted to assorted forms and quantities of human remains including dried blood. Additionally, a high percentage of alerts were contributed to such standard chemicals including dimethyl-disulfide, butyric acid, and hexanoic acid.

The dynamic process of human decomposition culminates in the breakdown and release of an array of biological compounds. Several studies have been conducted to gain insight into the process of human decomposition and separate studies have been conducted on human remains canines. However to date, information on which decomposition chemicals the cadaver dogs alert to is not available. For this study, approximately fifteen compounds have been the focus and they were subsequently broken down into the following five categories: biological amines, alcohols/cresols, indoles, methyl sulfides, and organic fatty acids.

In order to identify and quantify the chemical composition of the samples, headspace analysis by solid phase microextraction/gas chromatography/mass spectroscopy (SPME/GC/MS) was conducted on both a DB5-MS column and a Fatty Acid Methyl Ester (FAME) column. Due to the nature of the compounds present in human remains (highly polar to highly basic) derivatization is needed on the standard column. An on-fiber method containing chloroformates for the basic amine components and BFTSA for the polar acidic counterparts is currently being optimized for the standard column. However, the use of the FAME column is being investigated as an alternative to the manual derivatization process. The method developed allows for the rapid detection of odor signature chemicals emanating from decomposing human remains and is helping to identify the dominant chemicals used by cadaver dogs to reliably locate human remains.

Human Remains, Animal Remains, Canine Scent Identification

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