H71 The Detection of Rat Decomposition Products in a Plywood Platform Following Specimen Removal

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Learning Overview: After attending this presentation, attendees will have a better understanding of cadaveric Volatile Organic Compounds (VOCs) and changing decomposition odor profiles across animal models as well as novel methods and techniques for sampling decomposition products in plywood matrices.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by contributing to the Decompositional Odor Analysis Database for a previously unstudied model organism, specifically the Sprague-Dawley rat in the advanced stages of decomposition.[1]

Twelve rats were placed in cages on separate plywood platforms and left to decompose outdoors for 222 days through the summer and winter months in Pennsylvania. Following the removal of the advanced-stage decomposition rats from a plywood platform, a modified arson Gas Chromatography/Mass Spectrometry (GC/MS) method was used to test for the presence of decomposition products (VOCs and Volatile Fatty Acids [VFAs]) in the wood of the cage. The goal of this study was to investigate the unique odor profiles of rats and potentially contribute to the growing database of decomposition odor profiles important for entomofaunal succession and cadaver dog training.[2,3]

Expanding upon research that looks to the soil of the Cadaver Decomposition Island (CDI) and the indoor surfaces upon which human decomposition products (microbial macromolecule degradation and the leaching of waste products from the body cavity) may be deposited, this project acted as a pilot study to look at how rat decomposition products were absorbed and retained by a wood platform in an outdoor environment.[4] Arson cans, activated charcoal extraction, and GC/MS were used to determine the presence or absence of cadaveric VOCs, VFAs, and amino acid metabolic products commonly cited in the literature in the wood platform.[3,5]

Numerous studies in multiple countries have been conducted to work toward a comprehensive understanding of the VOCs evolved from decaying human and animal remains as a function of time and environmental conditions, leading to the development of the Decompositional Odor Analysis Database.[1] This database can assist forensic investigators in determining which compounds to look for in cases where there is suspicion that a body has been moved postmortem or when authorities are looking for clandestine graves. However, while there seems to be great interest in this area, many researchers using a variety of different methods and animal models have found it difficult to obtain reproducible decomposition odor profiles that are of any use in postmortem interval estimations or standardized Human Remains Detection (HRD) canine training procedures.[6] While there is extensive research pertaining to VOCs in the soil and air around different animal models for decomposition, it does not appear that these volatile decomposition products have been studied extensively in rat models or from a wood matrix. Therefore, this research sought to determine if decomposition products could be detected from a plywood matrix using a modified arson method, and to use this method to identify the compounds present in the field samples qualitatively following rat removal.

The rats were in the advanced stages of decomposition at the time of removal from the plywood platform, so it was hypothesized that only the higher molecular weight compounds would be detected in the field samples. Few well-known decomposition products were recovered, such as 2-ethyl-1-hexanol, while most of the recovered compounds were indicative of the local entomofaunal activity and the presence of several plant species near the experimental set-up.[7] The modified arson method used shows potential for recovering a variety of compounds, such as cyclic amines and sesquiterpenes, from field samples, but future work is needed to optimize and validate this method.

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