H81 Time and Temperature Effects on Volatile Organic Compound Generation During Early Decomposition

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The goal of this presentation is to inform attendees of recent advancements in the pattern of volatile organic compound evolution during the decomposition process.

This presentation will impact the forensic science community by providing insight into the relationship of time and temperature in the form of accumulated degree hours with the pattern of evolution of Low Molecular Weight (LMW) alcohols and related compounds in relation to Postmortem Interval (PMI).

Currently, there are few scientific methods based on chemical measurements used to estimate the PMI, highlighting the need for more information regarding this important parameter.

PMI can be an important parameter in many homicide or potential homicide investigations. During the immediate postmortem period, breakdown of organic materials takes place, resulting in the formation of LMW volatile compounds from both autolytic processes and, eventually, microbial activity. It was hypothesized that there is a differential pattern in which LMW alcohols and related compounds are generated from tissue during the process of autolysis and decomposition. Further, it was also hypothesized that the pattern of volatile compounds present in a tissue sample may be used, with consideration of time and temperature in the development of a potentially useful analytical technique of measuring PMI.

This study evaluated the pattern of evolution of VOCs from porcine liver at different time/temperature intervals throughout the decomposition process via Headspace/Gas Chromatography (HS/GC). Identification of specific compounds was accomplished by HS/GC/mass spectrometry. Ethanol was determined to evolve from decomposing pig liver in a time/temperature dependent fashion and to serve as a useful marker against which to evaluate the generation of other low molecular-weight alcohols and amines in both a temporal and quantitative manner. This study, therefore, utilized the ratio of several compounds to ethanol in an effort to relate accumulated degree hours of decomposition to the ratio of the marker compound-to-ethanol ratio.

This research has highlighted the potential for the use of specific chemical measurements and their role in estimating the PMI. The time/temperature-dependent compound ratios have been shown to have potential regarding evaluation of the PMI in death cases, which may augment observational information such as stage of decay and insect activity.

LMW Alcohols, Accumulated Degree Hours, Postmortem Interval

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