B141 Indole and Related Non-Volatile Compound Release From Decomposing Mammalian Liver Homogenate

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Learning Overview: After attending this presentation, attendees will have a greater understanding of the pattern of release of indole and some of the non-volatile compounds generated during decomposition.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by clarifying the pattern of indole generation and release during the decomposition process. This knowledge could potentially be used in the determination of postmortem interval.

During the process of decomposition, biomolecules in the body are broken down via bacteria and other chemical reactions, most of which occur during the second and third stages, bloat and active decay, respectively. The transition period between these two stages is important because the release of the gaseous and liquid decomposition compounds from the body, or putrefaction, characterizes the end of the bloat stage and starts the active decay stage. The compounds produced throughout the process of decomposition include volatile, semi-volatile, and non-volatile species. Volatile compounds have been extensively studied and characterized using headspace Gas Chromatography/Mass Spectrometry (GC/MS), Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), and Time-Of-Flight (TOF) techniques.[1] The appearance of these compounds has been examined in relation to time, temperature, location, and other factors, with hundreds of unique volatile compounds having been identified over the course of numerous studies. However, an important issue regarding such volatile compounds is how long these compounds may remain or otherwise be detectable in the air surrounding the body, which is not only a question of time but also of weather conditions and other activity in the area. Relatively non-volatile or semi-volatile compounds, such as indole and similar species, in contrast, may be detectable near the body or gravesite longer, due to their lower volatility. Such compounds may therefore remain and be detectable to some extent, even after a body has fully decomposed.

Few studies have investigated the non-volatile compounds produced during decomposition. Prior studies on the non-volatile compounds of decomposition have noted the presence of fatty acids and cholesterols.[2,3] This study focuses on smaller, non-volatile compounds, specifically indole, that are produced by decomposition. Extracts of beef liver homogenate were utilized as the basis to analyze the non-volatile compounds obtained from these samples over a multi-day time course. GC/MS was used to analyze and qualify compounds extracted from the decomposing materials. Preliminary results confirm the presence of many fatty acids and cholesterol in the decomposed samples. However, also noted was the persistent appearance of indole in most of the decomposition samples, making it a prime candidate for future use as a marker compound for the decomposition process. Indole is an intermediate in the biosynthesis of tryptophan, as an intramolecular intermediate in the enzyme tryptophan synthase. Indole may be generated during the autolytic and putrefactive stages of decomposition by the action of bacterially generated tryptophanase. Indole, and related products from decomposition extracted from fluids, may provide information relating to the postmortem interval of decomposing bodies.

Reference(s):

1. Swann L.M., Forbes S.L., Lewis S.W. Analytical Separations of Mammalian Decomposition Products for Forensic Science: A Review. *Analytica Chimica Acta* 2010:682(1–2):9–22.
2. Swann, L.M. et al. Preliminary Studies into the Characterization of Chemical Markers of Decomposition for Geoforensics. *Journal of Forensic Sciences* 2010:55(2):308–14.
3. von der Lühe, B. et al. Investigation of Sterols as Potential Biomarkers for the Detection of Pig (*S. s. Domesticus*) Decomposition Fluid in Soils. *Forensic Science International* 2013:230(1–3):68–73.

Decomposition, GC/MS, Biochemistry

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