H117 The Temporal Relation of the Generation of 3-Methylbutanol and Related Compounds in Decomposing Chicken Liver

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Learning Overview: The goal of this presentation is to investigate the time-dependent pattern of evolution of ethanol, 2-butanone, 3-methyl butanol, and 3-methylbutanal from a chicken liver homogenate. Attendees will learn of the potential for time-related volatile generation during the decompositional processes to be related to Postmortem Interval (PMI).

Impact on the Forensic Science Community: This presentation will impact the forensic science community by investigating the time-related pattern of evolution of volatile compounds during the decompositional processes to be related to PMI.

Overview: The hypothesis examined was that temporal differences in the appearance and concentration of volatile compounds during autolysis and decomposition could be related to the time and temperatures during which the processes occur and may therefore provide a basis for a chemical-measurement based estimation of PMI.

Homogenate of fresh chicken liver was prepared as a 1:1 ratio with water, strained, and constantly stirred for a 96-hour sampling period in 125ml erlenmeyer flasks at room temperature. Starting volume was ~ 85mL. Five 0.4ml aliquots from the autolytic chicken liver homogenate were collected at each time point for 12-hour intervals from 0–96 hours. Samples were preserved with sodium fluoride/potassium oxalate (~2.5, and 2mg/ml, respectively) and refrigerated prior to analysis. Samples were heated in an oven ten minutes prior to analysis. Headspace analysis by Gas Chromatography/Mass Spectrometry (GC/MS) was performed on the samples, and peak areas for ethanol, 2-butanone, 3-methylbutanal, and 3-methyl butanol were used to determine both the pattern of their generation and the ratios between the various species. The ratios of species generated were analyzed in accordance with the time at which they appeared in the decompositional process.

In this system, 3-methylbutanal became detectable at 12 hours, with maximal levels achieved at ~36 hours, declining thereafter. In contrast, ethanol became detectable at 36 hours, with the concentration increasing through 96 hours. 3-Methylbutanol and 2-butanone also became detectable at 48 hours with the continued increase of 3-methylbutanol while 2-butanone reached an apparent maximum at 84 hours, declining thereafter. In the experimental system utilized, generation of volatile decompositional products did not appear at similar rates, with 3-methylbutanal appearing prior to ethanol, 2-butanone, and 3-methylbutanol, and different times to maximal concentrations. While data from this artificial decompositional environment would not necessarily be applicable to any real-world situation, the results suggest the possibility that species and organ-specific volatile compound ratios may be relatable at the autolytic stage, via estimation of the temperature history of the body to the postmortem interval.

Decomposition, Volatiles, Postmortem Interval

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