G90 Possibility of Postmortem Interval Determination From the Analysis of Degraded DNA of Cadaver Tissues Via Flow Cytometry

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After attending this presentation, attendees will be able to understand the biochemical processes that DNA undergoes after death. Analysis by flow cytometry will show if this process is constant over time and what role temperature and cause of death have in arriving at conclusions.

This presentation will impact the forensic science community by demonstrating the role of flow cytometry and its use to aid in death investigations by providing a more accurate and reliable method with which to calculate the postmortem interval when the death event is recent.

Determining the time-since-death is one of the most important questions that need answering when conducting death investigations. Through the years, many methods have been formulated to deduce this data, but no method is deemed absolute. Temperature-based methods, involving the use of liver and rectal thermometers as well as Henssge's nomogram, appear to be the most widely used. Other methods, such as liver mortis, rigor mortis, and decomposition stage, not only require visual observations to be taken into account, but the physical state of the corpse must also be noted. When using these methods, other external factors must be taken into account, which further complicates the calculation of the postmortem interval. The problem arises when human observations of the physical data must be utilized to arrive at a reasonable conclusion. Human error opens the doorway to questionable doubt as to the accuracy of the postmortem interval determination. Forensic entomology can provide definitive results, but its use is still dependent upon the ability of the insects to gain access to the corpse in a timely fashion. While analysis of the vitreous humor takes note of biochemical changes which occur within the eyeball, the use of this method is limited to only a few causes of death.

In this study, determination of the reliability of calculating the postmortem interval based upon the analysis of necrotic brain and cardiac tissues using Flow Cytometry (FCM) to map a cellular pattern which correlates directly to the death event was reasearched. Use of the FCM allows for the almost instantaneous analysis of thousands of cells, resulting in data which is unbiased, making it ideally adaptable for the study of cell death. This study will use cadaver tissues collected from 20 random autopsy cases performed by the medical examiner at Alabama Department of Forensic Sciences Montgomery Medical Laboratory. Information about the age, race, sex, and cause of death will be recorded, as well as the known time of death. The study will be conducted in two temperate conditions (4°C and 21°C) to ascertain the role of temperature in the cellular degradation process and its effects on the resulting data conclusions. Previous studies have found the use of flow cytometry to study other organ tissues to be viable up to 72 hours; however, this study hypothesizes that the use of brain and cardiac tissue is more durable and reliable, depending on the cause of death.

Postmortem Interval, Cadaver Tissues, Flow Cytometry

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