B7 Nucleic Acid Based Methods for Assessing the Age of Bloodstains

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After attending this presentation, attendees will learn about the potential for examining the degradation of genetic material in order to estimate the age of bloodstains at a crime scene. A collection of RNA markers were assayed that have differing stabilities and rates of decay, serving as an indicator of a stain's age.

This presentation will impact the forensic community by serving as a tool to aid in the determination of the age of biological evidence. The technique may help to establish the time at which a crime occurred, and therefore could be applied to many aspects of a criminal investigation.

Determining the time at which a crime occurred is often one of the most important aspects of a forensic investigation, as this may impact suspect alibis, potential witnesses, and other relevant information. In order to pinpoint a time period, investigators often utilize evidence that undergoes reliable change, such as insects that develop in a corpse. However, it is possible that other forms of evidence may provide clues to the age of the scene, even in the absence of a victim.

The varying types of RNA molecules, including ribosomal RNA (rRNA), transfer RNA (tRNA), and messenger RNA (mRNA), have different functions in the cell, and thus have differing stabilities. For example, most mRNA molecules have a high turnover rate and decay relatively rapidly, while rRNA molecules exist in the relatively stable ribosome. Because of this, the presence or absence of these molecules in a bloodstain has the potential to serve as an indicator of the time elapsed since deposition.

This presentation will outline a method for quantifying levels of RNA markers and establishing their ratios for use in estimating the age of biological stains. The technique utilized a combination of reverse transcription and quantitative PCR to determine the levels of RNA molecules at varying points in the degradation process. Bloodstain samples of different ages were examined in order to establish useful ratios for fresh and increasingly aged samples, up to an age of three years.

The increasing use of quantitative PCR and the ability to simultaneously extract DNA and RNA from forensic samples may allow this technique to be utilized as a reliable bloodstain age predictor in crime laboratories, alongside standard DNA profiling protocols.

Bloodstain Aging, RNA Degradation, qPCR

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