A135 mRNA Decay in Biological Fluids in Order to Establish an Estimation of How Long a Stain Was Deposited at a Crime Scene

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After attending this presentation, attendees will understand the molecular basis of mRNA degradation in blood and saliva stains, specifically in regard to 5'- or 3'-end degradation.

This presentation will impact the forensic science community by confirming the stability of mRNA in body fluid stains and substantiating its utility in identifying the source of those stains. The major objective of the study was to quantify the mRNA degradation in body fluid stains, particularly 5'- and 3'-end degradation. Not only does this allow researchers to select the most stable portion of the message for identification, particularly useful in highly degraded samples, but the patterns of postmortem RNA degradation might also help in determining how long a stain has been present at a crime scene. By studying the dried stain on a molecular level, it may be possible to estimate the time frame of when a stain was deposited at a crime scene.

Classical forensic analysis relied on serology and biochemical tests to identify body fluids left at a crime scene. More recently; however, fluid identification has been abandoned as the focus has shifted to the use of DNA analysis for identification of the individual who deposited the fluids. Choosing one type of analysis over another is necessitated by the fact that forensic samples are usually small in volume and size and, therefore, can only be subjected to one test. DNA may be useful at determining who left a biological stain, but gives no indication as to what the origin of that stain was. More and more scientists are seeing the value in body fluid identification and are looking at ways to revitalize this aspect of crime scene analysis. Due to this, a mRNA profiling method has been developed and can be carried out in conjunction with DNA profiling so both the individual and the body fluid can be identified simultaneously. mRNA is useful in body fluid identification because it is expressed in a tissue specific manner, with a different subset of mRNAs produced in each body fluid.

The initial phase of this study used primers designed specifically for housekeeping and fluid-specific genes to ascertain mRNA decay in blood and saliva stains incubated at various temperatures and for various periods of time. The majority of the genes studied were detected in both blood and saliva for up to one month at 37ºC, although housekeeping genes appeared to be more stable than fluid specific genes. The follow- up study focused only on degradation over time and used real-time PCR and primer sets designed to amplify the ends of the mRNA to assess the amount of 5' and 3' message remaining in deposited samples. It was found that end stability also appears to be gene-specific and similar in both body fluids studied. All housekeeping genes showed 5' stability, while all fluid-specific genes showed 3' stability.

mRNA, mRNA Stability, Real Time PCR

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