A131 Assessing DNA Quality and Quantity From Cadaveric Blood Stored on Untreated Blood Cards: The Impact on Short Tandem Repeat (STR) Quality and the Utility of Variably Amplified Markers for the Individual Estimation of Trihybrid Ancestry and Admixture Proportions

Frankie L. West, PhD, Cullowhee, NC 28723; Bridget F.B. Algee-Hewitt, PhD, Stanford University, Stanford, CA 94305*

Learning Overview: After attending this presentation, attendees will have a better understanding of storage options for cadaveric blood samples.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing detailed information on the quality of DNA provided by storage on blood cards of cadaveric blood samples for STR typing.

Blood cards are widely used for long-term body fluid (e.g., blood, saliva, etc.) storage for DNA analysis. They are especially useful for DNA sample collection at forensic anthropology research centers, given their straightforward handling and sampling protocols, stability in ambient temperatures, small storage footprint, and minimal financial investment. However, little is known about the long-term value of blood cards in forensic anthropological research and forensic genetic casework. This study explores the quantity and quality of DNA extracted from postmortem blood samples, in terms of DNA preservation and STR typing success. Collected as part of a body donation program workflow, these blood samples were taken upon donor intake and stored on FITZCO® untreated (non-FTA®) blood cards. The study evaluates these cards in terms of DNA preservation and typing success and tests the effect of age of the blood card versus their success in amplification of STRs. As the gold standard in forensic genetics, STRs are used for forensic identification and as potential markers for global ancestry and admixture estimation. Degraded samples, including those stored on blood cards, can result in reduced STR markers sets and, in turn, compromised analyses. This study assesses these blood cards, therefore, with special consideration given to profile matching for positive identification and ancestry estimation for biological profile estimation.

In this study, the degree of DNA degradation is quantified in terms of both the amount and fragment sizes of the individual templates, testing for disagreement in genetically determined and reported sex, and evaluation of the forensic genetic typing potential of the DNA by evaluating Combined DNA Index System (CODIS) profiles generated for each case using evidence of allelic drop/in out, degradation curves, and relative fluorescent units as assessment criteria for 20 blood card samples. This study analyzes the impact of the DNA template on ancestry and admixture estimation, offering insights into the impact of degradation on population identifiability.

While STR profiles were successfully generated for most samples, the results indicate length of storage and time interval between date of death and sample collection have an impact on DNA quantity and quality of DNA, in terms of typing success. There is a statistically significant decrease in Relative Fluorescent Unit (RFU) values with increasing time interval between date of death and collection, indicating degradation in the blood card samples related to the postmortem interval prior to sample collection. The STR profiles generated were used to estimate ancestry and admixture using the software program STRUCTURE, demonstrating utility of the markers beyond individual identification purposes.

DNA, STR Typing, Blood Cards