A57 A Comparison of the Extraction of Buccal Cells From DNA Collection Cards Using Magnetic Bead and Organic Extraction Methods

Jacquelyn M. Jenkins, PhD, and Jason G. Linville, PhD, UBOB 210, 1530 3rd Avenue, South, Birmingham, AL 35294; and Alison S. Ethridge, MSFS, Sue Rogers, MSFS, Angelo Della Manna, MSFS, Alabama Department of Forensic Sciences, Birmingham Regional Laboratory, 2026 Valleydale Road, Hoover, AL 35244*

After attending this presentation, attendees will have a basic understanding of the potential application of a magnetic bead extraction procedure in a DNA databank setting with respect to the analysis of challenging known samples.

This presentation will impact the forensic science community by providing data that can be used when choosing an extraction method for DNA collection cards that are considered challenging samples. A comparison of a magnetic bead extraction method with an organic extraction method will allow forensic analysts to evaluate the efficiency, suitability, and practicality of both methods for use in a DNA databank laboratory.

DNA must be extracted from the protected environment of cells and separated from other cellular material in order to obtain a genetic profile. The quality and quantity of DNA obtained from the sample determines the level of success in obtaining a complete profile, therefore the efficiency and sensitivity of the extraction method employed is extremely important.

DNA cards are commonly used in forensic DNA laboratories as a method for the collection and storage of samples collected using a buccal swab. Most often, a genetic profile can be obtained from these samples by adding a punch of the DNA collection card directly to the amplification tube. Occasionally, amplification using this method fails. Organic extraction is the method the Alabama Department of Forensic Sciences (ADFS) DNA Databank employs when dealing with challenging samples on DNA cards from convicted offenders. However, even with the use of an organic extraction method, some samples still fail to yield a complete genetic profile. A low quantity of DNA present on the card is thought to be one of the primary underlying reasons for the failure to obtain a full profile.

Extraction methods utilizing magnetic bead techniques have been developed to improve the overall yield of DNA isolated from both routine and challenging forensic samples, as well as enhance the concentration and purity of the DNA. Validation studies of magnetic bead kits have demonstrated that the DNA yields were equal to or better than those obtained from other methods, the kits were able to efficiently remove PCR inhibitors during the extraction process, STR profiles generated from extracted DNA were complete and conclusive, and automation of these techniques is possible. While these magnetic bead kits have been proven to recover DNA from a variety of samples, recovery of buccal cells from DNA collection cards has not yet been demonstrated.

The goal of this study was to evaluate the efficiency of a magnetic bead extraction method to recover DNA from DNA cards impregnated with buccal cells and provide a complete genetic profile. Anonymous DNA samples were provided by the ADFS DNA Databank and consisted of DNA collection cards containing buccal cells. Study samples previously had undergone three unsuccessful attempts to amplify DNA on the DNA card as well as at least one attempt using an organic extraction method. All samples used in this study were considered challenging forensic samples.

A magnetic bead extraction kit was used to extract DNA from the samples. If enough of the sample remained, an additional organic extraction was performed. The protocol currently in use by the ADFS DNA Databank, which is proprietary, was followed for the organic extractions. The extracted DNA was quantitated using real-time PCR and STRs were amplified. The performance of the magnetic bead extraction kit and the organic extraction method was compared.

DNA Extraction, FTA Cards, Databanking

 ** Presenting Author*