A16 Successful Extraction of DNA From Paper Currency

Genevieve L. Ferguson, BSc, Archeology and Forensic Laboratory, University of Indianapolis, 1400 East Hanna Avenue, Indianapolis, IN 46227; and Christine Halling, BS, Kristin Fenker, BS, and Krista E. Latham, PhD, University of Indianapolis, Biology Department, 1400 East Hanna Avenue, Indianapolis, IN 46227*

The goal of this presentation is to demonstrate to attendees the possibility of an additional source of analyzable nuclear DNA in a forensic context, namely paper currency. In addition, it will showcase the importance of small pilot studies in advancing forensic science research.

This presentation will impact the forensic science community as it introduces a previously unexplored source of analyzable nuclear DNA, in the form of U.S. paper currency. Low quality and quantity DNA is associated with crime scene evidence; it is important that all potential sources of analyzable DNA be investigated in a laboratory setting before valuable biological evidence is potentially destroyed in unfruitful attempts at producing a genetic profile.

Previous studies investigating the primary transfer of analyzable DNA from an individual to an inanimate item have neglected to consider paper currency as a potential source of DNA in a forensic context. Publications concerning paper currency and illegal actions focus mainly on drug contamination, specifically the extraction of narcotics such as cocaine. DNA recovered from crime scenes is subject to degradation from many different contaminants. As such, all possible sources of viable DNA must be investigated. The direct contact that is required for paper currency use, in addition to its high frequency in society, creates an obvious source for collection and association within a forensic investigation. The goal of this research project was to conduct a pilot study that explored the possibility of extracting and analyzing viable DNA from United States (U.S.) currency.

This pilot experiment was designed in two parts: (1) to explore the possibility of actually obtaining nuclear DNA from paper currency that is able to be successfully amplified via the polymerase chain reaction (PCR); and, (2) to compare DNA recovery in relation to variability among the bills by a comparison of DNA quantity and quality. Bill variability includes wear and creasing with samples being taken from a worn area, an unworn area, and the center crease of the bill. DNA quantity was evaluated by amplicon intensity on an agarose gel and DNA quality was assessed by PCR amplification success. The preliminary test on a single U.S. one dollar bill revealed successful PCR amplification targeting the HUMTHO1 locus. The HUMTHO1 locus was selected for this study because of its inclusion in the Combined DNA Index System (CODIS) and thus has a direct applicability to forensic investigations. The study was then expanded and eleven U.S. one dollar bills were taken directly out of circulation and swabbed for potential analyzable DNA in three areas (worn, unworn, and center crease). PCR amplification of the HUMTHO1 locus was successful for all the samples. Comparison of samples retrieved from an unworn bill and a worn bill suggest that worn bills may have higher concentrations of donor DNA as exemplified by differences in amplicon intensity on an agarose gel. Differences also appeared between the samples obtained from creased areas versus flat areas of eight different bills (four bills with center creases and four flat). Samples taken from flat areas produced brighter bands when viewed under ultraviolet lighting than those taken from along a centerfold. This study suggests that it is possible to extract viable DNA from U.S. paper currency; however, the yield may vary depending on the condition of the bill and the area sampled.

DNA Extraction, Paper Currency, PCR Amplification

 ** Presenting Author*