A189 DNA Recovery From Fired and Unfired Cartridges

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The goal of this presentation is to show the extent of DNA degradation on fired cartridges and whether sufficient DNA can be recovered from a fired cartridge in order to obtain meaningful DNA typing results.

This presentation will impact the forensic community by providing new insight to the evaluation and analysis of evidence collected from a shooting scene. Often, investigations involving shootings do not result in the recovery of a firearm or a suspect may not be tied to a scene or a victim by traditional means. In this case, any cellular material deposited on ejected cartridge cases during the process of loading and handling the firearm may be capable of providing additional investigative information if DNA can be extracted from the cartridge. Despite problems with stochastic effects and allelic dropout, laboratories with the capability of typing low copy number DNA continually provide evidence that DNA profiles can be obtained from "touch" samples.

DNA quantities from various sources were placed on cartridges and swabbings of test areas were taken before and after firing. A percent loss of DNA was determined on each cartridge using an *Alu*-based real time quantitative PCR assay for human DNA. In the initial stages of this study, 37 neat blood samples (2ul volume) yielded a mean DNA quantitation value of 4.63ng/uL recovered before firing and a mean value of 0.14ng/uL after firing, showing a 97% loss of DNA. Data obtained utilizing 12 blood sample diluted 1:10 (2ul volume) recovered a mean DNA quantitation value of 0.35ng/uL before firing and 0.20ng/uL after firing, showing a 45% loss. In addition, samples were typed using PowerPlex®16 (Promega), and the number of alleles lost during firing were determined for each cartridge.

There are many factors which may influence the ability to detect DNA from an ejected cartridge casing. This includes the weapon type, ammunition used, caliber of the weapon used and the temperature within the firing chamber. Within the firearm any DNA adhering due to the handling of the magazine and loading the cartridges may be subjected to an array of temperatures which may degrade and denature any DNA originally present. The possible role that each of these factors play in the degradation of DNA during the firing process will also be discussed.

Successful DNA recovery may also be dependent on the location of the cartridge sampled as well as the medium used for swabbing. This study investigated several extraction techniques as well as various swabbing substrates in their ability to collect DNA from low copy samples. Previous research has determined that a polyester felt, used in place of a cotton swab for recovering DNA, works efficiently when employing a low copy number extraction protocol. The optimal extraction technique combined with an effective swabbing substrate allows for greater recovery of DNA samples of small quantities.

Preliminary results suggest that the small number of epithelial cells deposited through transfer and touch may produce genetic DNA profiles attributable to an individual. The recent advances in DNA technology and the immense growth of forensic science have allowed DNA samples such as these to become a more important source of physical evidence.

DNA Recovery, Fired Cartridges, Low Copy DNA

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