Quantitative Analysis of the DNA Loss in the Collection and Packaging of Spent Bullet Casings

Amanda J. Yeagley, BA & Lisa Ludvico, PhD
Duquesne University- Forensic Science and Law Program, Pittsburgh PA 15219

When spent bullet casings are the only item that links the perpetrator to the crime scene, it is imperative to obtain all possible DNA from the casings and to prevent loss due to the packaging.

This study examines packaging via coin envelopes along with three different collection methodologies that may have an impact on the amount of DNA left on the bullet casings. The different methods examined are picking up the casings with a gloved hand, pen-dowel technique, and using tweezers, N=60; 20 per technique.

The controls used in this experiment were magazine-loaded but unfired bullets. The bullets were handled and collected in the same manner as fired bullets. All casings and packaging envelopes were swabbed using single swab technique and distilled water on a 100% cotton swab. DNA was extracted from swabs using the Qiagen Mini Amp kit. Samples were quantified using real time PCR.

Introduction

Recently, M. Goray, et al. (2011) has demonstrated that DNA is lost with the collection and packaging of evidence at a crime scene. However, spent bullet casings were not examined in this study and in some cases, spent bullet casings are the only item that links the perpetrator to the crime scene. Therefore, it is imperative to obtain all possible DNA from the casings and to prevent loss due to the collection and packaging of the casings.

Many pieces of evidence found at a crime scene are packaged and transported to the laboratory to undergo DNA analysis. It is vital to preserve all pieces of evidence during packaging and transportation, especially when handling evidence containing small amounts of DNA, such as spent bullet casings. The amount of DNA retrieved is at times critical when attempting to obtain a genetic profile, especially from low template DNA (LTDNA). The purpose of this research is to determine the amount of DNA that may be lost in the packaging of spent bullet casings.

Local law enforcement agencies use two types of packaging for transport of bullet casings found at crime scenes: coin envelopes and pill boxes. This study examines packaging via coin envelopes, and a companion study examines pill boxes to determine if either packaging method is less susceptible to DNA loss. The variable of loading order was controlled by randomizing the collection procedure.

Results

The quantity of DNA recovered from the spent bullet casing was compared to the amount of DNA recovered from the envelope that packaged the corresponding bullet casing.

Conclusion

This experiment has shown that there is a loss in DNA from the collection and packaging of spent bullet casings. Overall, there is a greater loss when spent bullet casings are picked up with a gloved hand compared to a dowel rod or tweezers. There is also a great loss of DNA from the envelope when a gloved hand is used. Loss due to packaging of spent bullet casings may also be due to how they are handled after packaging.

The future direction of this study would be to genotype the samples and obtain a full genetic profile from the DNA recovered from the spent bullet casings. A greater sample size will be used to fully compare the collection methods, the loss due to packaging, and the comparison of loading number with the amount of DNA recovered from the spent bullet casing.