A68 Optimizing DNA Typing From Fired Shell Casings

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After attending this presentation, attendees will have been informed about maximizing DNA quality and yield, minimizing PCR inhibition, and what DNA typing methods work best on spent shell casings

This presentation will impact the forensic science community by establishing how best to isolate, purify, and analyze DNA from fired shell casings that may have originated from criminal activity.

Firearms are commonly used in crimes in the United States, but when investigators arrive at a crime scene, often the only evidence of firearm use is empty shell casings. Upon collection, shell casings may be processed by the latent print unit, however, attempts to recover prints are generally unsuccessful. Because of this, in the past few years researchers have started to examine the utility of DNA profiling from spent shell casings.

Cells/DNA may be deposited on the surface of a cartridge as it is loaded into the chamber; however, a cartridge is likely to be handled for only a short amount of time resulting in limited DNA deposition. Previous research has shown that it is sometimes possible to obtain a partial STR profile from DNA found on fired shell casings, although success rates have been low, and PCR inhibition was often problematic. Given this, optimizing the methodologies for obtaining and analyzing DNA from fired shell casings is critical. Considering the minute amount of DNA left on a casing, and that such DNA is likely to be degraded due to the heat that is characteristic of firing a weapon, it is important to optimize the quality and quantity of DNA recovered, and to analyze it in such a way so as to maximize the chances of obtaining probative information.

In the research presented, conducted as a blind study, volunteers were asked to load a gun magazine, as well as provide a buccal swab. The magazine was then loaded and the gun fired by a trained professional until the magazine was empty. The shell casings were collected, swabbed, and DNA purified using multiple methods, including phenol-chloroform and commercially available extraction kits. DNA yields were compared via real-time PCR. DNA typing was performed using commercially available STR kits, as well as mitochondrial DNA analysis. Profiles were developed both singly and through a consensus profile technique, in which results from all casings from a gun were considered collectively. The accuracy of these results was then determined through comparison to the profiles obtained from the buccal swabs. Taken together, this research shows what methods are best used to retrieve DNA from fired shell

casings, along with what DNA analysis techniques produce the most data on the individual who loaded the weapon.

DNA From Fired Shell Casings, Mitochondrial and Nuclear DNA Analysis, Cartridge Casings

 ** Presenting Author*