



A74 Obtaining DNA From Spent Bullet Casings: A Review

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After attending this presentation, attendees will understand the many research approaches and techniques employed in trying to recover DNA from fired bullet casings.

The presentation will impact the forensic science community in that often the only physical evidence linking a murderer to the crime scene are spent bullet casings. Maximizing DNA recovery from such a comprised source (spent bullet casings) will aid law enforcement in identification of suspects.

Law enforcement officers have found in many cases that the sole evidence recovered at a firearm-related crime scene is spent bullet casings. Obtaining even a partial DNA profile from spent bullet casings would be of utility in eliminating possible suspects. It was previously believed that the high firing temperatures would destroy any touch DNA (tDNA) that transferred to the bullet. As reported at the 2009 American Academy of Forensic Sciences meeting, Nase *et al.* found that the time the bullet is in the firing chamber is not sufficient to destroy tDNA. The second great hypothesized obstacle was the quantity and quality of the DNA left on the casing. The Dawson-Cruz laboratory (2008) demonstrated that DNA concentration can be enhanced using both pre- and post- amplification techniques. Partial profiles can be generated using both pre and post amplification modifications.

The research scope of this talk includes demonstrating that tDNA can withstand the high firing temperatures with single shots as well as firings from an entire handgun magazine. Swabbing techniques using different swabbing matrices and a variety of surfactants (1, 2%, and 20% SDS) and alcohols, ethanol and 2-propanol, have been examined. Moreover, "target swabbing" was conducted on both spent and unfired (though handled) casings with hyper-imaging technology and locate areas believed DNA to be present. However, target swabbing via imaging instrumentation had little effect on total DNA recovered in this study. Partial profiles were generated using both pre and post amplification modifications.

Another study followed the Dawson-Cruz pre-amplification and post-amplification procedures, but used shotgun shells. The shells were used in place of hand gun casings to determine if a profile could be generated for a Pennsylvania Game and Wildlife open case involving a shotgun.

The effect of "pooling" DNA from all casings found at a crime scene is also being studied. The pooled findings from the various studies show that loading order has an effect on DNA deposition, with the first and last loaded bullets having the highest DNA concentrations. No significant difference in DNA recovery exists from firing one shot vs. an entire clip.

Currently, the determination of which of the major components of primers (antimony, barium, and lead) may be contributing to downstream inhibition in DNA processing and how much DNA is lost in the packaging of spent bullet casings.

A review of all in-house DNA recovery research spanning three years, seven interconnected studies and the published literature, will demonstrate the status of the research on obtaining DNA from used casings is currently and what techniques have been most promising.

DNA Recovery, Spent Bullet Casings, Low Template DNA