E21 A Follow-Up Study: Recovery of "Touch" DNA From Cleaned Pistol and Ammunition Surfaces

Maher Noureddine, PhD, 5687 Wolf Ridge Court, Oak Ridge, NC 27310; and James A. Bailey, PhD, Minnesota State University Mankato, 617 Chestnut Street, Wilmington, NC 28401*

After attending this presentation, attendees will be familiar with collecting DNA samples from firearms and ammunition and with the impact of cleaning a pistol and ammunition for the detection of residual DNA from a single shooter.

This presentation will impact the forensic science community by describing a pistol and ammunition cleaning method, the effect of cleaning on distribution of DNA profiles on different pistol parts and ammunition, and the implications for a method of universal firearm swabbing.

The quantity and quality of DNA recovered from firearms can vary based on many factors such as the type of firearm, frequency of handling and cleaning surfaces of firearms, cleaning method, physiology of the handler, number of contributors, and downstream testing methods. It is exceedingly difficult to account for such complex variables in any experimental design. In order to provide meaningful guidance to criminal investigations, testing complex variables must be coupled with a comprehensive understanding of the mechanisms by which DNA gets deposited on firearms as well as removed from firearms. A previous study found that full DNA profiles of the shooter can be recovered from swabbing a pistol fired and stored without cleaning for a period of two weeks before swabbing. This study evaluates whether a pistol, which has been in ordinary use, can still yield DNA profile information following one round of thorough cleaning. This study also evaluates whether a single interaction between the shooter and the cleaned pistol will result in a detectable difference in the level of DNA found on the pistol.

A 9mm Smith & Wesson® Model 5906 pistol was handled and fired by one right-handed shooter. After cleaning and storage for a period of two weeks, it was swabbed. The same male subject who fired the pistol removed ten 9mm full metal jacketed cartridges from a new unopened box of American Eagle® ammunition, loaded a full magazine, then inserted and ejected the magazine into the pistol. The pistol, magazine, cartridges, and ammunition box were cleaned using sterile tissues pre-wetted with a cleaner (CLOROX® Clean-Up®), followed by cleaning with sterile tissues pre-wetted with 75% ethanol. Various pistol surfaces, empty magazine surfaces, ammunition, and the ammunition box were then swabbed for DNA. The pistol was given to the shooter who loaded the magazine with the ten cleaned cartridges, the shooter inserted the magazine into the pistol (slide was not retracted), and held the pistol for a period of one minute, simulating an imminent firing posture with his finger touching the trigger. Following this interaction, all surfaces were swabbed again for DNA. All samples and appropriate controls were collected using the COPAN® Crime Scene 4N6FLOQSwabs™ that were pre-wetted with sterile water. DNA samples were extracted using the COPAN® Nucleic Acids Optimizers (NAO), a semi-permeable basket, which retains fluid until centrifuged with the PrepFiler® Express™ on the *AutoMate Express*™ DNA Extraction System. DNA quantitation was performed using the Quantifiler® Human DNA Quantification Kit. The AmpFLSTR® Identifiler® Plus PCR Amplification Kit was used for DNA amplification, the fragments were run on the Applied Biosystems® 3130 Genetic Analyzer, and the analysis was performed with GeneMapper® ID-X v1.4.

Partial Short Tandem Repeat (STR) profiles were detected on the cleaned pistol, magazine, ammunition box, and cartridges; however, the identity of the shooter could not be determined from the majority of partial STR profiles due to potential low-level DNA contamination. A noticeable improvement in the STR profile data was observed on certain parts of the grip and magazine after the shooter handled the pistol once following cleaning. Improvements were not found on the trigger, slide release, frame, hammer, and cartridges.

This study demonstrates DNA profile data can be detected on certain parts of firearms and ammunition after undergoing one round of surface cleaning. Practitioners are cautioned that universal surface swabbing of a firearm might not be as effective as swabbing separate areas. While universal surface swabbing can maximize the amount of total DNA collected, the probative value from such samples can diminish due to the possible creation of artificial mixtures that can render any profile data from a firearm useless.

Touch DNA, Cleaning Firearms, Firearm DNA

*Presenting Author