E58 A Follow-Up Study: Recovery of "Touch" DNA From Selected Firearms Using the Single 4N6FLOQSwabs™ Method

Maher Noureddine, PhD, ForensiGen LLC, PO Box 250, Oak Ridge, NC 27310; and James A. Bailey, PhD, Minnesota State University Mankato, 8418 New Sandy Hill Church Road, Bailey, NC 27807*

After attending this presentation, attendees will be familiar with collecting DNA samples from firearms and the feasibility of detecting "touch" DNA using a single-swab method.

This presentation will impact the forensic science community by demonstrating that the single-swab method is effective in collecting "touch" DNA samples from individual areas on rifles and handguns, a process that can help preserve evidence and minimize the generation of artificial and useless DNA mixtures.

The recovery of biological evidence in the form of "touch" DNA samples from firearms is of tremendous value to forensic investigations and the criminal justice system. As with any DNA sample presumably left on a surface through contact with the epidermis, the quantity and quality of DNA recovered from firearms can vary greatly due to factors such as the physiology of the handler/shooter, the frequency of handling and cleaning the surfaces of the firearm, the type of firearm, the number of contributors and sample collection methods. For several years, the double-swab method has been utilized by many laboratories for collecting DNA evidence from a firearm. Typically, a wet swab is first used to hydrate and collect a portion of the biological material, followed by a dry swab to collect as much of the remaining sample as possible. This swabbing technique will often be coupled with swabbing multiple surfaces from the firearm followed by combining the wet and dry swabs in a single extraction, maximizing the amount of DNA sample available for typing. While these approaches can maximize the quantity of total DNA collected from a firearm, the primary disadvantage is the creation of swabbing-mediated mixtures of DNA samples from multiple surfaces of the firearm. Such mixtures can obscure single-contributor profiles that can be present on certain surfaces of the firearm but not others, thereby rendering any DNA data from that firearm inconclusive or useless for any comparison, even for the legitimate exclusion of true non-contributors. A previous study, demonstrated that useful DNA profile data can be obtained by single-swabbing certain parts of a pistol and a set of ammunition. This study evaluates the single-swab method for the recovery of "touch" DNA samples from individual areas on four different rifles (.45 cal. Commando Mark III, .223 cal. Colt® AR-15, 7.62×39mm AK-47, and .223 cal. Ruger® M-14), one shotgun (12-gauge Remington® Mod. 870), and eight different handguns (.40 caliber Smith &Wesson® Mod. 4006, 9mm Glock® Mod. 17, 9mm Beretta® Mod. 92-F, 9mm Browning® Hi Power, .50 cal. Smith &Wesson® Mod. 500 revolver, .45 cal. Smith & Wesson® revolver Mod. 625, .357 cal. Smith & Wesson® revolver Mod. 66, and .22 cal. Smith & Wesson® Mod. 617 revolver). All firearms, belonging to the same right-handed owner/shooter, were swabbed for DNA using the COPAN® crime scene 4N6FLOQSwabs™ that were pre-wetted with 15uL of sterile water. Individual swabs were extracted using the COPAN® Nucleic Acids Optimizers (NAO), a semi-permeable basket that retains fluid until centrifuged with the PrepFiler Express™ on the AutoMate Express™ DNA Extraction System by Thermo Fisher. DNA was quantitated using the Quantifiler® Human DNA Quantification Kit by Thermo Fisher. The AmpFℓSTR® Identifiler® Plus PCR Amplification Kit by Thermo Fisher was used for DNA amplification. The amplified fragments were separated on the Applied Biosystems® 3130 Genetic Analyzer by Thermo Fisher and the data analysis was performed with GeneMapper® ID-X v1.4. DNA profiles attributable to the owner/shooter were obtained from all the firearms tested. The data reflect the distribution of biological

material found on specific areas of four rifles, one shotgun, and eight handguns tested. Furthermore, localized area swabbing of all firearms revealed, at least in part, single or predominant contributor DNA profiles that could have been otherwise obscured through multi-area swabbing. Therefore, in order to maximize biological evidence preservation and the chances of recovering valuable fingerprint evidence from the same firearm, practitioners are urged to consider using the single 4N6FLOQSwab™ technique for collecting "touch" DNA evidence from specific areas on firearms as an alternative method to the multi-area double-swabbing method.

Touch DNA, Firearm Swabbing, DNA From Firearms