B9 Touch DNA Recovered From Fired and Unfired Shotgun Shells

Anthony J. Saitta, 57 Guernsey Lane, New Milford, CT 06776; and Peter R. Valentin, MSFS, University of New Haven, Forensic Science Dept, 300 Boston Post Road, West Haven, CT 06516*

After attending this presentation, attendees will better understand the potential implications of touch DNA as it relates to cartridge casings and the impact of the firing process on the ability to recover DNA.

This presentation will impact the forensic science community by providing statistical data from a well-controlled experiment, thus increasing the information gathered on the applications of touch DNA. With more sensitive DNA testing, this information will help redefine the areas and objects that can be tested for DNA.

Over the last decade, major advancements have been made in the field of touch DNA recovery; however, some challenges still exist. In particular, the recovery of touch DNA from firearm cartridge casings has long been regarded as a difficult task with minimal yields expected. This project was designed and conducted to generate valid statistical data on the recovery of touch DNA from both fired and unfired shotgun shells. Modeled after similar experiments, the goal of this study was to expand the data gathered on touch DNA and its applications. This study hypothesized that there would be a higher yield of DNA recovery from plastic shotgun shells than from metallic pistol or rifle cartridge casings. Based on the principles of organic compound interactions, fingerprint oil is expected to adhere better to the low-density polyethylene of the shotgun shell compared to metals such as brass or copper, thus leaving behind more skin cells to be collected and DNA to be extracted. Additionally, it was hypothesized that the unfired shells would yield a higher recovery of DNA, as they were not exposed to the extreme heat generated during the firing process.

In this experiment, 90 12-gauge shotgun shells were collected and examined for the presence of touch DNA. Three participants each loaded and fired 15 rounds, then loaded and ejected 15 rounds without firing. The shells were loaded each time in groups of five, carefully ejected directly into pre-labeled evidence bags, and immediately sealed. Under sterile laboratory conditions, all samples were swabbed using the double-swabbing method: one sterile cotton swab wet with sterile water, followed by one dry sterile cotton swab. These swabs were then extracted using a QIAGEN® Investigator® extraction kit, followed by 40 cycles of Polymerase Chain Reaction (PCR) amplification. After quantification, approximately 17.78% of the unfired samples and 18.60% of the fired samples extracted and quantified yielded sufficient DNA for a partial or full profile. Results of a previous project stated the recovery rate of DNA from brass casings, both fired and unfired, was approximately 36%, while nickel-plated pistol cases only yielded 12%, fired and unfired. Therefore, the results from this study, revealing approximately 18.2% recovery from plastic shotgun cartridges, provides a valuable contribution to the investigation of touch DNA recovery from firearm cartridge casings.

This study gathered controlled statistical data on the recovery rate of touch DNA from fired and unfired shotgun shells, increasing the knowledge of touch DNA and its new potential areas for testing.

Touch DNA, Shotgun, DNA

*Presenting Author