



B135 Recovering Touch DNA From Cartridge Casings Using a Method of Tape Lifting

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After attending this presentation, attendees will better understand a more effective method to recover DNA from unfired cartridge casings compared to conventional wet-swabbing techniques.

This presentation will impact the forensic science community by providing a more effective process for recovering DNA from copper and copper-alloy surfaces.

Previous studies suggested that copper-induced degradation significantly lowered the amount of DNA recovered when copper or copper alloys were wet-swabbed. This phenomenon will reduce the recovery of epithelial cells and Cell-free Nucleic Acids (CNAs) deposited on the surface of a casing when loading a gun. To overcome this issue, tape-lifting was evaluated as a method to remove cells from the surface of cartridge casings.

In this experiment, the method of tape-lifting was used to recover touch DNA from unfired brass and nickel casings. Tape-lifting prevents any interaction between the copper component of brass and the aqueous solutions. Nickel casings were used as an experimental control. To evaluate the efficiency of the tape-lifting method, multiple individuals were asked to deposit touch DNA on cleaned brass and nickel cartridge casings. Four experiments were performed. Three donors participated in all four experiments, while three other donors participated in one experiment each. The donors were asked to roll a single casing in each hand for one minute, switching the casings from hand to hand every 15 seconds in order to try to equalize the amount of touch DNA on each casing. The DNA was allowed to stand on the casings for 48 hours before collection and extraction. In cases where donors needed to provide touch DNA on more than two casings for the experiment, the second set of casings were made available to the donors one hour after their first donation in order to maximize cell shedding between donations. The DNA was collected from the casings using both wet-swabbing and tape-lifting methods for comparison. DNA extraction was performed using Qiagen® QiaAMP® DNA Investigator® Kit. Quantitation was performed using an in house TaqMan® assay targeting autosomal DNA plus an internal control for inhibition developed for the Cepheid® SmartCycler® automated real-time PCR system.

Experimental results showed that the tape-lifting method recovered significantly more DNA than the wet-swabbing method from the brass cartridge casings, while no significant difference was observed between the two methods on nickel casings. Even though the amount of DNA recovered from brass cartridge casings was improved with the tape-lifting method, it was still significantly lower than the amount of DNA extracted using tape from nickel cartridge casings. Therefore, with the overall amount of DNA recovered from nickel being higher than that recovered from brass, the results suggest that degradation still occurs even without an aqueous medium. The average amounts of total DNA collected and extracted from brass using the swabbing and tape-lifting methods were 0.03181ng±0.03905ng, and 0.09965ng±0.06456ng, respectively. The average amounts of total DNA collected and extracted from nickel using the swabbing and tape-lifting methods were 0.16060ng±0.15795ng and 0.19068ng±0.15276ng, respectively. The above calculations were based on interim results of nine replicates of brass casings and seven replicates of nickel casings for both swabbing and tape-lifting methods. To confirm sample source, STR amplification was performed using AmpFISTR® Identifiler® Plus and analyzed on an ABI® Prism 3130® Genetic Analyzer. Although STR analysis yielded partial profiles in most cases, the lowest being 2/16 loci, the highest being 16/16 loci, and the average being 9.5/16 loci, the DNA recovered from the sampled surface matched the appropriate donor.

Touch DNA, Tape Lifting, Cartridge Casings