



B54 Method Validation for DNA Recovery From Cartridge Casings

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The goal of this presentation is to inform attendees regarding the efficacy of two DNA extraction methods for cartridge casings, soaking and swabbing, with comparisons also made between cartridges and casings, ammunition brands, and treatment (loading) methods.

This presentation will impact the forensic science community by enhancing the small group of recent studies that have involved DNA recovery from casings and may influence attendees to take these findings back to their labs and begin the process for changing their extraction methods.

Touch DNA is gaining popularity in the forensic science community. Increased kit sensitivities and better methodologies have contributed to obtaining DNA evidence from steering wheels, firearms, and, as with the focus of this study, cartridge casings.^{1,2} Skin cells have the potential to be left behind on anything a person encounters.³ Most ammunition is loaded into a magazine by hand, so there is a chance that DNA could be left behind on the ejected casings often left at crime scenes. The main goal of this study was to validate the best method for case use by the San Francisco Police Department (SFPD) Crime Lab. Swabbing involved using a swab moistened with sterile water, followed by a dry swab. The soaking method required placing the casing itself in a tube and surrounding it with the extraction components as well as swabbing the cartridge when removed from the liquid portion.

Overall, 96 swabbed casings and 96 soaked casings were tested. The profile of the loading analyst was the only one observed, with the exception of three samples. These were treated as blank samples when calculating results. The swabbed casings returned an average of 0.788pg/ μ L of DNA, while soaked casings averaged 1.46pg/ μ L, a significant difference. The majority of profiles produced by both methods had less than five alleles with 26.04% of swabbed and 43.75% of soaked casings generating profiles. The average percentage of alleles recovered by swabbed casings was 8.93% with an increase to 14.12% for soaked casings. With the help of STRmix™ software, soaked casings also produced a greater quantity of likelihood ratios exceeding one sextillion.

Additionally, 48 cartridges were tested and proved less successful than casings with an average percent allele recovery of 3.1% in comparison to 11.5%, which was a significant difference. There was also varied success across brands and treatments. The brands tested were .40-caliber Winchester®, Remington®, Blazer®, and Speer® ammunition with normal, handled, and saliva-transferred treatment methods. The treatment methods involved grabbing cartridges directly from the storage envelope and loading (normal), licking the thumb before grabbing each cartridge and then loading (saliva transferred), and carrying the ammunition in pockets for three hours and loading (handled). The Blazer® casings and saliva-transferred treatment had the highest percent allele recoveries with 30% and 29%, respectively. Blazer® was significantly higher than all other brands. The saliva-transferred method was significantly higher than the normal and handled treatments. The lowest recovery was the Remington® brand with 1.3% and the normal treatment with 2.6%. The ejection port was also swabbed after each emptying of the magazine with the target profile observed in 41.7% of samples.

SFPD will be adopting the soaking method in their lab due to the general trend of higher success within each variable. Even though every comparison did not return a significant difference, it would be their best attempt to recover DNA. In the future, this study could be conducted with multiple loaders to see if results improve, and with more samples to increase data normality.

Reference(s):

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2. Montpetit S., O'Donnell, P. An optimized procedure for obtaining DNA from fired and unfired ammunition. *Forensic Sci Int: Genetics.* 2015;17:70-4.
3. Horsmann-Hall, K.M, Orihuela, Y., Karczynski, S.L., Davis, A.L., Ban, J.D., Greenspoon, S.A. Development of STR profiles from firearms and fired cartridges cases. *Forensic Sci Int: Genetics.* 2009;3(4):242-50.

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