B44 A Comparison of Genotyping Success of Cotton and FLOQ™ Swabs on Casings Using Direct Polymerase Chain Reaction (PCR)

Natalia Czado, MS, Fayetteville State University, Fayetteville, NC 28303; Stephen D. Towery, Fayetteville State University, Fayetteville, NC 28301; Yolonda B. Miller, Fayetteville, NC 28304*

Learning Overview: After attending this presentation, attendees will have a better understanding of the differences in genotyping success rates of different swab materials in direct PCR reactions used to obtain DNA from brass casings.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by assisting labs in the determination of how best to obtain and analyze DNA from brass casings and similar substrates.

Often, casings recovered from crime scenes involving firearms will have potential touch DNA evidence of the perpetrator or owner deposited on them. Traditional methods of DNA processing are time-consuming and expensive and rarely generate successful and reliable profiles from touch DNA samples.[1-3] One method to overcome this obstacle is to subject the substrate or swab directly to an amplification reaction, through a process known as direct PCR. Direct PCR has been shown to successfully yield DNA profiles from casings.[4] However, genotyping efficiency among different swab types on unfired casings using direct PCR has not been examined.

In this study, swabs composed of different materials were compared to determine which performed better when direct PCR was used on mock 9mm brass firearm cartridge samples. For the study, 15 9mm brass cartridges were sterilized under ultraviolet light for a minimum of 24 hours. After sterilization, 1µL of female control DNA (9947A diluted to 1ng/µL) was added to each cartridge case and allowed to dry. One set of five cartridges was swabbed using COPAN® microFLOQ™ Direct swabs, following the manufacturer's collection protocol. The second group of five cartridges were swabbed using COPAN® 4N6FLOQSwabs™, according to the manufacturer's protocol. The final five cartridges were swabbed using traditional cotton-tipped applicators following the same protocol as the 4N6FLOQSwab™ samples. The entire swab portion of the microFLOQ™ Direct swabs, and 3mm cuttings of the 4N6FLOQSwabs™ and cotton applicators were added to PCR reactions. All samples were amplified using the Identifiler™ Plus PCR Amplification Kit and genotyped on the 310 Genetic Analyzer using GeneMapper™ V 3.2.1 software. None of the samples resulted in complete DNA profiles. Most samples recovered no allele peaks, with only six samples successfully detecting 3–9% of concordant alleles.

Though microFLOQ™ Direct swabs were expected to outperform the other swab types, their small surface area may not have recovered enough DNA to overcome copper inhibition. This study suggests that swab type is not the most important factor in determining genotyping efficiency from these types of samples. Instead, future studies should examine ways to decrease copper inhibition in order to increase the amount of DNA recovered and amplified from brass casings before determining if a difference in genotyping success exists among different swab materials.

Reference(s):

1. Horsman-Hall, Katie M., Yvette Orihuela, Stephanie L. Karczynski, Ann L. Davis, Jeffrey D. Ban, and Susan A. Greenspoon. Development of STR Profiles from Firearms and Fired Cartridge Cases. *Forensic Science International: Genetics* 3, no. 4 (2009): 242-50. doi:10.1016/j.fsigen.2009.02.007.
2. Montpetit, Shawn, and Patrick O'Donnell. An Optimized Procedure for Obtaining DNA from Fired and Unfired Ammunition. *Forensic Science International: Genetics* 17 (2015): 70-74. doi:10.1016/j.fsigen.2015.03.012.
3. Thanakiatkrai, P., and B. Rerkamnuaychoke. Direct STR Typing from Bullet Casings. *Forensic Science International: Genetics Supplement Series* 6 (2017). doi:10.1016/j.fsigss.2017.09.058.
4. Jennifer E.L. Templeton et al. Direct PCR Improves the Recovery of DNA from Various Substrates. *Journal of Forensic Sciences* 60, no. 6 (2015): doi:10.1111/1556-4029.12843.

Direct PCR, Swab Types, Casings

*Presenting Author