A55 Recovery of Contact DNA from Handled Handguns

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After attending this presentation, attendees will gain knowledge of the locations on handguns where DNA is most likely to accumulate and therefore most conducive to maximizing the chances of generating a DNA profile. The number of alleles detected from a controlled study of five different areas of three popular handguns, namely the grip, the slide, the magazine lips, the safety/slide release, and the trigger are presented. Post-PCR purification of low yield samples to enhance the quality of the fluorescence signal is also addressed.

This presentation will impact the forensic community by demonstrating the areas most likely to produce detectable amounts of human DNA material during the collection of biological evidence from firearm evidence such as handguns. The information in this study will also help law enforcement and DNA examiners address the question of whether it is better to first send a firearm for DNA analysis or fingerprinting. The increased chances of DNA recovery associated with preserving such evidence and the precautions that must be taken when handling handguns found at crime scenes will assist criminal investigations especially in unsolved cases. Deciphering the genetic profile associated with handled areas on a handgun may link a suspect to a crime scene and provide valuable information to criminal cases.

Varying success rates have been reported for the retrieval of contact DNA from handled objects. It is of interest to investigate and to understand factors that improve the recovery of DNA from handguns. In this study, three commonly recovered handguns, a Smith & Wesson 9mm, a Sig Sauer® 9 mm, and a High Point 40 SW-B were subjected to a controlled study of DNA recovery following limited handling. Five different areas were swabbed from each gun: the grip, the slide, the safety/slide release, the trigger, and the magazine lips. Negative and positive controls were also collected from each handgun.

The guns were swabbed prior to any testing as a positive control. To collect negative control samples, the handguns were first cleaned with 10% bleach followed by 95% ethanol and then swabbed. Subsequently, the handguns were handled for two minutes by a single person, who loaded each gun and fired 3 rounds prior to collecting test swabs. DNA extraction, quantitation and amplification were performed using a low- yield Chelex procedure, the Quantifiler® Human DNA Quantification Kit, and the AmpfℓSTR Profiler Plus DNA Typing Kit. Capillary electrophoresis was prepared by mixing 1µL of amplified product with 9µL of Rox size standard - formamide mixture followed by injection of the samples for 10 seconds on an ABI 3100-Avant.

The resulting profiles showed that the grip, the slide, and the safety/slide release represent the best areas for collection of DNA material. The 9mm Smith & Wesson produced the highest number of alleles when the grip of the gun was swabbed, most likely due to its rubberized texture, while the Sig Sauer® and the High Point were characterized by a high number of alleles at the slide and the safety/slide release areas, respectively. Surprisingly, the trigger did not yield positive test results for two of the three guns. These results suggest that the best areas for collecting DNA from a handgun will vary depending on its design and operation. Peaks were observed in negative control samples from two of these guns. This observation suggests that some surfaces in these guns are difficult to clean, even with bleach, suggesting that it is possible to obtain DNA from handguns even if they have been cleaned.

Post-PCR purification of the amplified products using a modified Microcon-100 procedure with an elution volume of 25µL and 3µL of injected product led to a two to three fold increase in the number of alleles detected from the test samples. This technique allows visible "under threshold" peaks to be resolved above threshold level. The value and limitations of post-PCR purification for recovery of low yield samples will also be discussed.

Contact DNA, Handguns, Post-PCR Purification

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