B118 The Evaluation of New Field and Laboratory Techniques for the Recovery of Touch DNA From Handled Improvised Explosive Devices (IEDs) Rendered Safe and Post-Blast

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Learning Overview: After attending this presentation, attendees will better understand the effects of new field techniques for pipe bomb disposal on the ability to recover a Short Tandem Repeat (STR) profile from touch DNA as well as the effects of detonation of a pipe bomb on touch DNA recovery.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by informing attendees about how updated and improved field and laboratory techniques can impact the ability to recover DNA to identify individuals who assembled and/or handled IEDs.

Bombing incidents, most utilizing IEDs, account for an appreciable percentage of terrorist events across the globe. In order to counteract and prevent explosions, various methods are utilized by law enforcement in order to properly diffuse or dispose of these IEDs. In the case of pipe bombs, the explosion is caused by a buildup of pressure in the sealed pipe caused by the interior components undergoing chemical reactions with one another. To prevent this, methods are used to release the pressure build-up, therefore, stopping the explosion from occurring. However, past studies have shown that the methods utilized to render an IED safe can be detrimental to the ability to develop a DNA profile. Ideally, samples collected from the rendered safe explosives would yield touch DNA profiles left on the IEDs during assembly. As a separate issue, heat generated during deflagration can degrade this DNA again, making it difficult to determine the identity of those involved in assembly.

A new field technique utilizing a Nitro Turkey® shotgun round has been adopted by bomb squad units for the disposal of devices. In the past, both water and clay shot were used in order to try and ventilate the device. However, these methods caused the DNA evidence on the pipe to be lost or washed away to varying degrees, depending on the shot used. This study evaluated the effects of the new rendering safe technique using a Nitro Turkey® shot on the ability to recover DNA.

Pipe bombs (n=30) of various materials (PVC and steel) were rendered safe utilizing the Nitro ® shots, while an additional 15 pipe bombs of each material were assembled but not diffused. A dual swab technique using two swabs with 2% Sodium Dodecyl Sulfate (SDS) as the moistening agent was performed. Three samples were collected from each device, including separate samples from each end cap as well as the shaft. DNA was then extracted using a PrepFiler® Express BTA™ Forensic DNA Extraction Kit using an AutoMate Express™ DNA Extraction System. The DNA was quantified using a Quantifiler® Trio DNA Quantification Kit on 7500 Real-Time Polymerase Chain Reaction (PCR) System, amplified using a Fusion 6C Amplification Kit on a GeneAmp® PCR System 9700, and then genotyped using an Applied Biosystems® 3500 Genetic Analyzer. The quantity and quality of the resulting profiles obtained from the touch DNA were compared between undiffused pipe bombs and ones diffused using Nitro Turkey® shots for both pipe materials. These results will be compared to results generated in a previous study using the old rendering-safe techniques and less sensitive laboratory procedures. In addition, several steel pipes will be detonated in order to determine whether sufficient touch DNA remained on the pipe to generate an informative genetic profile utilizing either a traditional Capillary Electrophoresis (CE) -based approach or next generation sequencing using a MiSeq® FGx™ Forensic Genomics System. Preliminary data suggests that the rendering safe technique using the Nitro Turkey® shot does not have a significant impact on the amount of DNA collected from either steel or PVC pipe. This study demonstrates that newer applied laboratory methodologies and field techniques used for rendering IEDs safe may improve an analyst's ability to generate informative DNA profiles from rendered safe and conflagrated IED samples and highlights the need to continually reevaluate protocols used for genetic analysis of challenging sample types.

Forensic Science, Touch DNA, Pipe Bomb

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