B108 Genetic Identification of Improvised Explosive Device Assemblers

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After attending this presentation, attendees will become familiar with best methods for obtaining genetic evidence from detonated pipe bombs and other types of improvised explosive devices. Attendees will also learn the most effective technique of analyzing DNA obtained from these devices.

This presentation will impact the forensic community and/or humanity by increasing the understanding of what happens to DNA on improvised explosive devices after they have detonated, and how it can be used to identify those who assembled them.

This presentation will include information regarding the collection and analysis of DNA from detonated improvised explosive devises (IEDs). The goal of the research is to determine the most effective way of identifying the person or persons involved in assembling an IED.

The detonation of an IED produces very high temperatures. These temperatures, in combination with the general nature of the genetic material from shed skin cells, result in highly degraded DNA. As a result, earlier research showed that it is very difficult to obtain full STR profiles on DNA isolated from detonated pipe bombs.[1] Therefore, mitochondrial DNA (mtDNA) analysis was undertaken. Subjects were asked to mock assemble pipe bombs for a short period of time, after which they were taken to a safe facility and detonated. The DNA was isolated from the resultant shrapnel, quantified using real time PCR, amplified, and the mtDNA sequence determined. Based on the sequencing results, eighteen of the thirty eight samples could be assigned to a single donor and seven more could be assigned to a subset of three possible donors, while only twelve bombs could not be assigned to any individual. These results demonstrate the value of mtDNA analysis for suspect identification.

Although mtDNA analysis is valuable, it is not individualizing as evidence, hence nuclear DNA testing is preferred in many instances. Owing to the earlier results with full length STRs, mini-STR profiling was attempted on detonated bombs in an effort to develop a CODIS profile. Another technique which can be applied to degraded nuclear DNA is single nucleotide polymorphism (SNP) analysis. This technique looks at many single nucleotides where polymorphisms are known to occur. Because only a single nucleotide is observed, the fragments of DNA utilized do not need to be large. This presentation will show results of the various techniques that can be used to analyze DNA to identify assemblers of pipe bombs.

Finally, although pipe bombs are the most common type of IED in the US, there are an increasing number of other types of IEDs that are being utilized. One of the simplest and most common is the use of high explosives in an otherwise unsuspicious container such as a backpack or canvas bag. The use of these devises poses new questions with regards to the collection and analysis of DNA from such surfaces. Unlike pipes which are made of smooth, impermeable materials, backpack and bags are often made of rough, porous fabric. This presentation will include the techniques which are most successful for obtaining DNA from surfaces such as these after the explosion has occurred.

Reference:

[1] Esslinger, K.J., Siegel, J.A., Spillane, H., Stallworth, S. (2004) Using STR Analysis to Detect Human DNA from Exploded Pipe Bomb Devices, *J.Forensic Sci.,* 49(3):481-484.

DNA, Improvised Explosive Device, Pipe Bomb

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