B25 Identification of Improvised Explosive Device Assemblers Using MiniSTRs

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After attending this presentation, attendees will understand how miniSTRs and mtDNA can be used to identify individuals that handled an improvised explosive device (IED) prior to its detonation.

This presentation will impact the forensic community by providing a greater understanding of the nature of DNA obtained from detonated pipe bombs as well as the best approach to take when using genetic material to identify the handlers of IEDs.

The detonation of an IED produces very high temperatures, which, in combination with the general nature of DNA from shed skin cells, means that only degraded DNA is likely to remain on the resultant bomb fragments. Further, because the bomb surface has only touch DNA, low copy number (LCN) techniques must be utilized during analysis. Previous research has employed STR[1] and mtDNA[2] analysis to identify the handlers of pipe bombs. The rate of obtaining an STR profile was very low, while increased success was garnered using mtDNA. Unfortunately, although obtaining a mtDNA profile is valuable, it is not individualizing evidence, hence nuclear DNA testing is preferred in many instances. The development of miniSTR primers has provided a novel tool with which to amplify degraded DNA.

In the research to be presented, 17 volunteers were asked to handle two sets of pipe bomb components; one was made of PVC pipe and the other of steel. Prior to handling, the bomb components were soaked in bleach and subjected to UV irradiation to ensure that any DNA previously deposited on the pipes would not be detected during downstream analyses. Pipe bombs were filled with smokeless powder and a fuse was used as the initiator for the device. The bombs were detonated in a safe facility and all remaining fragments were collected. DNA was isolated using the double swab technique. Following an organic extraction, DNA was amplified using two sets of miniplex primers: miniSGM[3] and miniNC01.[4] Because the DNA was LCN, reactions were performed in triplicate, and only alleles that appeared in at least two of the three tests were considered for the purposes of identification. Reference samples from the volunteers were processed using the same primer sets and assignments were made based on blind analysis of matching alleles. In tandem, mtDNA analysis was performed by sequencing the hypervariable regions. The success rate of identifying the assemblers of the IEDs using miniSTR analysis was compared to the success rate using mtDNA. Finally, the overall success rate using the techniques in combination was computed. In addition, success rates from the PVC pipe bombs were compared to those from the steel pipe bombs to determine if a difference in bomb making materials can result in varying rates of identification success.

References:

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.

2 Gehring, M.E., (2004) Master's Thesis, Michigan State University.

3 http://www.cstl.nist.gov/biotech/strbase/miniSTR.htm

4 Coble, M.D. and J.M. Butler. (2005) Characterization of New MiniSTR Loci to Aid Analysis of Degraded DNA. *J Forensic Sci*., 50(1):43-53.

MiniSTR, Improvised Explosive Device, Low Copy Number DNA

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