A61 DNA Analysis of Improvised Explosive Devices That Employ Wireless Electronic Mechanisms for Detonation

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After attending this presentation, attendees will become familiar with the utility of analyzing electronic triggering mechanisms that may be used with improvised explosive devices (IEDs) as a means of determining the identity of the assembler.

This presentation will impact the forensic community by providing an alternative method for the investigation of IED attacks by focusing on the triggering mechanism rather than analyzing the explosive device itself.

In recent years IEDs have been used both domestically and internationally for unconventional warfare and terrorism. The means by which an IED is constructed and utilized in an attack can vary extensively. Some of the more advanced IEDs use a wireless triggering mechanism typically composed of a cell phone, two way radio, or other small electronic device that can receive a signal from great distances. Components including a touch tone circuit board, a power supply, and electrical wire are also needed to transfer the signal from the triggering mechanism to the detonator.

In past research our laboratory has examined the feasibility of obtaining a genetic profile directly from an IED following handling and detonation. Due to the poor state of DNA in shed skin cells, along with extreme temperatures of the deflagration, only highly degraded DNA is generally recovered from the resultant bomb fragments, decreasing the chance of obtaining a genetic profile of the assembler. In addition, the IED often fragments into small pieces making it difficult to collect a sufficient amount of material for DNA analysis. Focusing on the triggering device instead of the IED itself may result in increased potential for obtaining a complete genetic profile, for a variety of reasons. First, an electronic triggering device utilizes multiple components that require assembly, thus increased handling, resulting in a greater accumulation of touch DNA. Second, DNA on the triggering mechanism may not experience the same heat levels as the IED, and therefore resist degradation. Third, the triggering mechanism can separate into its individual components (wireless device, battery, circuit board, etc.), instead of fragmenting into many small pieces as does an IED, making its recovery much easier. Finally, depending on how the triggering mechanism is attached to the detonator of the IED, there can be substantial separation or obstacles between the two, resulting in decreased damage during the blast.

In the research to be presented, participants were asked to mock assemble an electronic triggering mechanism consisting of a plywood base, clamp for a pipe bomb, cell phone or two way radio, battery, circuit board, and wire. They were also asked to handle either a steel or PVC pipe (with end caps) that was used for the explosive. Pipes were filled with smokeless powder and affixed to the mock triggering mechanism. The pipe bombs were then detonated by fuse in a controlled environment, after which pieces of the mechanism were collected. DNA was removed from the individual components using a double swab technique. Following an organic extraction, the DNA was quantified and analyzed using miniSTRs. Reference samples from the volunteers were also analyzed and assignments were made blind. Preliminary results indicate the success rate of identifying an individual who handled the triggering mechanism is as high or higher than identification from IED fragments.

DNA, Improvised Explosive Device, Triggering Mechanism

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