A60 DNA Analysis of Biological Material on the Adhesive Surface of Electrical Tape Recovered From Post - Blast Pipe Bomb Fragments

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After attending this presentation, attendees will understand the two main objectives of this work. First, the results of a comparison of multiple methods to extract DNA from the adhesive side of electrical tape will be presented. The most efficient method was then used to successfully extract and analyze DNA from the adhesive surface of electrical tape from post-blast pipe bomb fragments.

This presentation will impact the forensic community by discussing another DNA analysis tool for identifying the manufacturer of a pipe bomb by analyzing the post-blast fragments.

The purpose of this study is to investigate the feasibility of analyzing DNA recovered from biological material deposited on the adhesive surface of electrical tape used in the construction of a pipe bomb. Previous research has demonstrated the ability to obtain DNA profiles from the outer surfaces of end cap and pipe nipple fragments from post- blast pipe bombs. Another material commonly used when constructing pipe bombs is electrical tape. Oftentimes, nails or other shrapnel may be taped to the outside of the device or the tape may be used to hold the fuse or wires in place. Biological material deposited on the adhesive surface at each end of the tape as the tape is applied to the device could directly link the assembler of the device to the device post-blast. The chance that the biological material recovered from the adhesive surface of the tape was deposited by a person unrelated to the construction of the device or by multiple individuals is relatively small. Furthermore, the biological material is protected from the products of combustion and other potential environmental insults that may be encountered during and after deflagration of the device.

This study was divided into two parts. The first part of this study investigated various methods to recover and purify the DNA from biological material deposited on the adhesive surface of the electrical tape. Ten different methods were examined and compared. These methods included the use of different types of swabs, solvents, and various extraction methods. The most efficient method involved the use of a foam swab moistened with an adhesive remover solvent to collect the biological material followed by an organic extraction using a centrifugal filtration device to concentrate the DNA.

The next step in the study was to test the effectiveness of the selected method on post-blast fragments. Six pipe bombs were constructed with PVC components and four pipe bombs were constructed with galvanized steel components. Aliquots of a cell suspension were dried overnight on the adhesive surface of electrical tape. The tape was then wrapped around each of the devices. Aliquots of the cell suspension were also placed in marked areas on the exposed pipe nipple and allowed to dry. A separate PVC and steel device were similarly prepared to be used as controls. All of the devices, except the controls, were then deflagrated in a controlled manner and the fragments were recovered. Three of the PVC devices and one of the steel devices were highly fragmented and the tape recovered was not amenable to further analysis.

At the laboratory, the cell spots on the adhesive surface of the electrical tape were collected using a foam swab moistened with an adhesive remover solvent and extracted following an organic extraction method. The DNA was concentrated, as necessary, using a centrifugal filtration device. The cell spots on the exposed surface of the pipe nipple were collected using a cotton swab moistened with deionized water followed by a dry swab. The swabs were then extracted using a commercially available DNA extraction kit. The concentrations of human DNA in the extracts were determined using real-time PCR. STR amplification was performed using a commercially available multiplex amplification kit and the fragment separation/detection was achieved using capillary electrophoresis.

Two main conclusions can be drawn from this study. The use of the foam swab moistened with an adhesive remover solvent to collect the biological material followed by an organic extraction is an effective method of recovery of DNA from the adhesive surface of electrical tape. Second, a significantly greater quantity of DNA can be recovered from the adhesive surface of the electrical tape compared to biological material deposited on the exposed surface of the pipe bomb.

DNA, Pipe Bomb, Electrical Tape

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