

SHORT TANDEM REPEAT (STRS) AND MITOCHONDRIAL SEQUENCE OF TRACE DNA RECOVERED FROM EXPLOSIVE DEVICES

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We investigated the applicability of our current low copy number procedures for touch evidence to several samples of exploded material from pipe bombs provided by the Bureau of Alcohol, Tobacco, and Firearms. Explosive devices constructed from 1 ¼ inch by 5 inch steel pipe, replicating a common “pipe-bomb” design, were each filled with one of three commercially available black powders. To approximate the “handling” of the device by a would-be bomber, cells from a known donor were spotted onto each of the steel pipes and end-caps in designated areas.

A total of twenty-seven samples were collected with a cotton swab from the end-caps and pipe shafts of these devices. The DNA was extracted using Qiagen QIAamp® micro columns and eluted into fifty microliters of DNA grade water. The amount of DNA recovered ranged from 0ng to 14.7ng as determined by the BodeQuant real time PCR assay. Most of the samples showed an impressive recovery considering the exposure to elevated temperature and pressures. Only one of the samples failed to recover any DNA. Also, no inhibition was observed in the real time PCR of any of the samples. In regards to the type of powder used, the most DNA was recovered on average from the Jim Shockey Gold black powder sample, and the least from the GoEX Pinnacle sample. Averaged across all three devices, more DNA was recovered from the pipe itself (Avg. = 7.42 ng) than from the end caps (Avg. = 6.77ng).

The samples were analyzed for STR and mitochondrial analysis to determine if a DNA profile could be obtained. Three of the end-cap samples were processed for STR analysis using the Promega PowerPlex® 16 system. Two of these samples recovered full 32 allele profiles and one recovered only 7 of the 32 alleles. Eight of the remaining samples were then sequenced at the HVI and HVII mitochondrial regions. The full HVI and HVII regions were recovered for five of the eight samples. In three samples only one of the HV regions could be recovered. One sample failed to sequence across the HVI region, and two failed at the HVII region. Our investigations have shown that it is possible to recover both nuclear and mitochondrial DNA evidence from exploded pipe bombs.