



D33 Non-Destructive DNA Collection From Handled Documents Using an Electrostatic Detection Device

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The goal of this presentation is to determine if general use of an Electrostatic Detection Device (EDD) on handled documents could be used to collect touch DNA from paper documents in a non-destructive manner.

This presentation will impact the forensic science community by showing the potential of an electrostatic detection device in the lifting of touch DNA from handled paper documents with a statistically significant difference between substrate types.

Evidence collected for forensic testing can be defaced or even destroyed by the collection processes, reducing the integrity of the evidence and creating artifacts that could impact downstream analyses. An example of destructive testing is the collection of touch DNA from handled paper documents using a standard swabbing method. The purpose of this study was to determine if the general use of an EDD on handled documents could be used as a means to collect touch DNA from paper documents in a non-destructive manner. An EDD apparatus uses a charged Polyethylene Terephthalate (PET) sheet and is commonly used by document examiners to develop imprinted writing and fingerprints on paper documents without the direct treatment of the document itself. The question was raised if DNA deposited onto paper documents could be lifted by the PET sheet of the EDD apparatus.

Fingerprints from three donors were deposited onto five different paper document substrates: copy paper, newsprint, cotton (resume) paper, magazine print, and currency. Fingerprints were deposited onto each type of substrate on separate days in order to regenerate similar touch conditions. Each document substrate was subjected to processing for fingerprints using an EDD. As a control, an additional fingerprint collection of each substrate was cut from each document. The cut samples were subjected to the same conditions and processing as the test samples. Post collection, the substrates were visually inspected for damage. Cutting of substrates resulted in visible substrate defacing; however, the substrates collected by the EDD did not have any visible defects. Post processing, the PET sheet of the EDD was inverted and samples were collected from locations where fingerprints were visualized using a moistened cotton swab.

All samples were extracted (Silica Particle), quantified, concentrated, amplified for Short Tandem Repeats (STRs), and analyzed in accordance with approved laboratory procedures. All samples quantified below the detectable threshold of the system. Therefore, sample extracts were concentrated from 50uL to 5uL and amplified using the highest quantity of template useable by the STR amplification kit. The end result was the identification of 11 full profiles and 27 (out of 75) useable profiles (above 62.5% of profile resolved).

In addition to the ability to generate useable profiles, this collection technique presented two interesting variables: there was correlation between percent profile detected and donor, and also a correlation between percent profile detected and paper substrate types. Variation between donors was expected due to the difference between individuals and their ability to shed DNA. Between substrates, there was a statistically significant difference between all five substrates. Cotton paper returned the highest quantity of profile averaging of 81% across all donors, with other substrates significantly lower: copy paper: 48%; magazine print: 32%; newsprint: 45%; and, currency: 36%. In comparison to cut samples, the EDD device collection was similar and in the instance of cotton paper, more effective than cut sampling.

This study has shown the potential of an EDD device in the lifting of touch DNA from handled paper documents with a statistically significant difference between substrate types. This technique also leaves no visible defacing on the document and does not interfere with downstream questioned document analyses, greatly impacting the forensic community at large

Touch DNA, Questioned Documents, Evidence Collection