



### **A57 The Analysis of Various Types of Cotton and Polyester as Swabbing Mediums for Low Copy Number DNA Recovery**

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After attending this presentation, attendees will understand how to optimize low copy number (touch) DNA recovery from smooth, non-porous substrates by determining the most effective swabbing medium.

This presentation will impact the forensic community by proposing a more efficient swabbing medium than the commonly used cotton swab to prevent loss of DNA during the collection process.

Previous research performed by the authors suggested that a cotton swab was not optimal in swabbing low copy number DNA samples. Furthermore, this research demonstrated that cotton and polyester in the form of swatches have a preferential ability to remove DNA from glass substrates as compared to the other fabrics tested in the study. These fabrics included nylon, wool, acrylic, and a polyester swab. This previous research also utilized an extraction protocol for samples with lower concentrations of DNA.

This study focused on four different studies that deal with testing different types of polyester and cotton for DNA recovery. Three of the studies utilized ten different types of cotton and ten types of polyester to determine the solvent conditions that are most conducive to the highest DNA recovery possible. Saliva was used as a source of epithelial cells to determine which characteristics of the fabrics attributed to the ability or inability of the fabric to recover DNA from a smooth, non-porous substrate. For each of these studies, thread count, fabric weave, orientation of the weave, electrostatic charge, polarity of the solvent and molecular properties were noted. Smaller quantities of DNA that are more representative of low copy number DNA samples were utilized to mimic case work samples.

Case work samples were mimicked by moistening the twenty fabrics with sterile water and swabbing a neat and 1:100 dilution of human saliva on a glass substrate to compare DNA recovery. A second part of this study focuses on the influence of electrostatic charge on each of the cotton and polyester fabrics. This study was carried out the same as the moistened fabric study using the same saliva sample, except that the fabrics were not moistened with any solvent. A third study focused on employing a solvent with a different polarity to moisten the fabric to determine if the polarity of the solvent influences DNA recovery using the same saliva sample.

The fabric samples were extracted using a low copy number DNA extraction and quantified using a human-specific *Alu*-based real time quantitative PCR assay. Raw quantitation values in ng/uL were obtained for each of the samples. Statistical analysis was used to determine if there was a significant difference between the concentration of DNA recovered for the fabrics comparing different solvents.

The most effective combinations of fabric and solvent determined from the first three studies was used to perform a fourth study utilizing touch DNA. The samples collected for this study were fingerprints on glass surfaces, mimicking case work touch DNA samples.

Results of the study show that cotton woven fabrics with a low thread count have a preferential ability to recover low concentrations of DNA. Molecular interactions between the solvents, the cell membrane, and the fabrics confirm these results and can aid analysts in choosing effective fabric swabbing mediums for the recovery of low copy number and touch DNA evidence.

#### **LCN DNA, Fabrics, Swabbing Mediums**