A152 The Evaluation of Six Different Matrices for the Collection of Touch DNA

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After attending this presentation, attendees will gain an understanding of the ability for various matrices to collect touch DNA from a variety of surfaces.

This presentation will impact the forensic science community by demonstrating that the DNA yield, determined by RT-PCR quantification, and STR profile quality, determined by capillary electrophoresis, can be significantly impacted by the swab matrix and collection method selected.

Touch DNA samples from crime scenes are frequently collected by law enforcement agencies around the world. These samples inherently contain less genetic material as compared to other biological stains (i.e., blood and seminal fluid). The ability of one swab matrix to collect even a few cells more than another could have a substantial impact on the generation of a complete STR profile.

The collection of genetic material from a surface is only a subset of the overall process. Collecting significantly more genetic material from a surface is beneficial only if the cells are subsequently released from the collection matrix, lysed during the extraction procedure, and purified for downstream applications. The size, shape, composition, and hydrophilic/hydrophobic properties of each matrix play an integral role in a swab's ability to collect and successfully release a touch DNA sample for DNA purification.

This study tested six (n=6) different matrices for Touch DNA evidence collection which were cotton, foam, rayon, knitted polyester, woven polyester, and glass fiber.

Similar to the types of samples that may be encountered during routine evidence collection, a variety of surfaces were evaluated during this study. Flat surfaces such as vinyl and composite wood paneling tiles were evaluated. Curved or fabric surfaces such as a polyvinyl chloride (PVC), knitted gloves, and polypropylene rope were also selected for evaluation. Aside from testing various surfaces, multiple other variables were also studied to determine the impact, if any, on each swab matrix's ability to collect a sample. These variables included multiple methods of swabbing (wet vs. dry collection), different wetting agents (DNA Grade Water vs. Isopropyl Alcohol), the number of swabs used for collection (one vs. two), and the analyst collecting the sample.

During this study, volunteers (n=2-5 depending on the surface) were asked to apply either fingerprints or handprints, handle objects ,or wear gloves at various time intervals over the course of several days. After all samples were deposited, the surfaces were collected and swabbed using each of the six matrices.

Experimental design of this study was controlled as much as possible. Surfaces were cleaned and stored in a controlled area prior to and after sample deposition to limit the possibility of exogenous DNA. Volunteers deposited samples on surfaces within specific dimensions to control the area of sample collection. In addition, control swabs were utilized throughout the study to assess the difference in genetic material deposited on each surface by either the right or left hand.

Data analysis and comparison were aided by the statistical calculations computed using the JMP® Design of Experiments software. The statistical calculations focused on DNA yield and the resulting STR profile with normal amplification parameters.

The results from this study will demonstrate that the difference in DNA yield from samples deposited by the right or left hand were not statistically significant, at a given time point, allowing for paired sample analysis. This study will also demonstrate that statistically significant differences in DNA yield can be obtained through the use of different swab matrices. The resulting differences in DNA yield subsequently affect the ability to obtain a complete STR profile.

Woven polyester, glass fiber, and knitted polyester displayed statistically significant differences compared to the other swab matrices tested in terms of yield or STR profile. Depending on the surface to be sampled, wetting agent utilized, and method of collection, an analyst may find it advantageous to explore nonstandard swab matrices in order to achieve a higher yield of DNA and a more complete genetic profile.

Touch DNA, Swab Matrices, Collection Technique

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