B64 A Sticky Situation: How Adhesive Collection of Fibers Affects Analysis

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After attending this presentation, attendees will understand how the use of tapes as a collection method could negatively impact the comparison of fibers.

This presentation will impact the forensic science community by explaining the effect of adhesive tape collection on common fiber analytical techniques. The outcome of this study will be the creation of a standardized methodology for forensic fiber collection using tape.

This study focuses on three techniques commonly employed in the analysis of fibers: fluorescence microscopy, Microspectrophotometry (MSP), and Fourier Transform Infrared (FTIR) spectroscopy, along with stereomicroscopy and polarized light microscopy. These techniques were utilized to examine contamination issues by the adhesive on fibers exposed to a variety of collection tapes.

In this study, four adhesive types were chosen: water-soluble trace evidence tape, Post-it® adhesive, fingerprint tape, and duct tape. These are commonly available products to crime scene investigators or tapes commonly found in crime scenes. Both natural and man-made fibers were selected for testing to provide a wide diversity of different morphological and chemical matrices for exposures to the adhesives. The fibers tested against each adhesive included cotton, wool, polyester, and nylon.

For fluorescence microscopy, four filter cubes were used with an Olympus® BX51. A scale of brightness was created to compare the fluorescence of each sample. The MSP data was gathered by a CRAIC™ MSP AX10 and analyzed by comparing the spectra in the Ultraviolet (UV) and visible region. A Nicolet™ FTIR with a Continuum Microscope was used to collect the FTIR spectra through the infrared to near visible wavelengths. A baseline analysis was made for each of the fibers and each of the adhesives (the controls). Then, the fiber was placed on the adhesive and removed again and the combination of fiber and adhesive was analyzed (combination fibers).

The fibers taken from the adhesives revealed contamination for most of the combinations. Results disclose changes in fluorescence, both enhancing and quenching, especially in the fingerprint adhesive and the trace evidence tape. For MSP, there were distorted peaks on the combination fibers compared to the control fiber. These peaks matched with the adhesive control, demonstrating that the contamination on the combination fibers comes from the adhesive from which the fiber is collected. The FTIR spectra for some contamination fibers revealed a mixture of peaks from the fiber control and the adhesive control.

These results establish the need for caution when using tape to collect fibers and when retrieving fibers from adhesives found in a crime scene. When comparing two fibers, the possibility of adhesive contamination must be recognized and, if possible, an analysis of the adhesive conducted to compare the spectra. Using the least-contaminating adhesive for collection is the most effective way to compare two fibers in these analyses.

Fibers, Tape Collection, Trace Evidence