B87 When Are Variations in Duct Tape the Result of True Differences? A Cautionary Tale

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After attending this presentation, attendees will understand two scenarios in which observed variations between duct tape samples were evaluated independently and produced different conclusions regarding an association. This information may be helpful in interpretation of a comparative duct tape analysis and in assessing the significance of those results.

This presentation will impact the forensic science community by increasing knowledge of the variation that can occur between mass-produced materials, specifically those manufactured by the same producer using similar technologies. The effect these results may have on association/discrimination criteria will be discussed.

Duct tapes are a type of trace evidence commonly encountered in North American forensic laboratories. Techniques used to analyze duct tapes can readily discriminate different products, even those from a single manufacturer. Even minor physical (e.g., backing film thickness) or compositional (e.g., intensity variation in filler components) differences may be justification to discriminate tapes.

In this presentation, differences observed in the Fourier Transform Infrared (FTIR) spectroscopy data of duct tape samples manufactured by the same company will be discussed.

In the first example, results of a duct tape homogeneity study will be presented in which samples taken from different sections of the same 60-yard roll were determined to be statistically different; however, these differences were not considered to be significant when spectral overlays were evaluated by a trained forensic examiner. Rather, it was determined that sample thickness differences were likely to be the cause of the differences that were reported by the statistical analysis.

The second example arose from a commercially available proficiency test in which an adhesive residue sample was compared to two partial rolls of duct tape. According to information later obtained from the test provider and the tape manufacturer, these rolls were different products manufactured by the same company but marketed to different do-it-yourself home goods stores using different labeling. The rolls were readily distinguishable by film thickness, a parameter not able to be assessed for the adhesive residue. Therefore, the examiner compared the residue to both rolls using the analytical suite routinely employed for duct tape comparisons: physical characteristics, FTIR, Scanning Electron Microscopy with Energy-Dispersive X-ray Spectroscopy (SEM/EDS), and X-Ray Diffraction (XRD). Based on this testing, the adhesive composition of both rolls and the adhesive residue sample were concluded to be analytically indistinguishable by the examiner. Minor intensity differences in the FTIR data between the two rolls were noted and attributed to possible sample thickness variation in sampling. After the results were submitted, the test provider reported that the residue was attributable to only one of the submitted rolls.

The examiner submitted the test samples to the tape manufacturer for analysis and assessment. Subsequent discussions indicated that the observed intensity differences may have been the result of a different processing method, which could explain the differences in the FTIR data as true concentration differences.

It is anticipated that the results of this study might serve as a cautionary tale regarding the interpretation of any possible differences in manufactured, mass-produced materials. This discussion illustrates the need to better define the association/discrimination criteria that should be used in comparative duct tape analyses. The samples discussed in these examples were all pristine cuttings from new rolls of duct tape. Evidentiary duct tape samples have varying conditions and degrees of cleanliness, which would further factor into assessing the significance of any possible differences.

The language used to report the association/false inclusion will be provided to further illustrate how the use of qualifying statements, interpretation models, and justification for the strength of an examiner's reported opinions are necessary and beneficial to the process of interpreting a comparative analysis report.

Duct Tape, Variation, Interpretation

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