A154 Raman Spectroscopy Offers a Great Potential for Non-Destructive Confirmatory Identification of Body Fluid Traces

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After attending this presentation, attendees will have a better understanding of body fluid identification range of problems and advantages of Raman spectroscopic method as compared to conventional forensic methods employed for the identification.

This presentation will impact the forensic science community by providing information about a novel method of the fast nondestructive confirmatory identification of body fluids found at a crime scene.

The identification of traces of body fluids discovered at a crime scene is a major part of forensic investigation today.[1] The three most common fluids found are blood, semen, and saliva. Several methods are currently used to distinguish one from another. Blood can be presumptively tested using different color spot tests; these tests are destructive to the sample and can also yield false positives. Semen can be presumptively tested using destructive presumptive and confirmatory tests. However, saliva, has no confirmatory tests. Most presumptive tests can be performed in the field, but some sample preparation, such as extraction, is often necessary. Most confirmatory tests must be done in the laboratory. The main problem with these tests is the destruction of the sample. The forensic community is in great need of a reliable, non-destructive, on-field method for identification of all common body fluids.

Raman spectroscopy is a technique increasing in popularity among the different disciplines of forensic science. Some examples involve the identification of drugs, lipsticks, fibers, paint, and ink. The theory behind Raman spectroscopy is based on the inelastic scattering of low-intensity, nondestructive laser light by a solid, liquid or gas sample. Very little or no sample preparation is needed, and the required amount of material tested with a Raman microscope can be as low as several picograms or femtoliters. A typical Raman spectrum consists of several narrow bands and provides a unique vibrational signature of the material. Typically, nonresonance Raman spectroscopic measurements do not damage the sample. The stain could be tested on the field and still be available for further use in the laboratory for DNA analysis. A portable Raman spectrometer is a reality now that should allow the identification of body fluids at the crime scene.

The development of a new method for identification of body fluid traces using Raman spectroscopy combined with advanced statistics is reported.[2,3] Dry traces of semen, vaginal fluid, sweat, saliva, and blood were analyzed using confocal Raman microscopy with a 785-nm excitation.[4-6] Dry samples of these body fluids are intrinsically heterogeneous. A library of multidimensional Raman spectroscopic signatures that allowed differentiating the traces of body fluids with high confidence was developed. In addition, traces of human and animal blood could be distinguished.[7,8] Overall, this preliminary study demonstrates the great potential of Raman spectroscopy for nondestructive, confirmatory identification of body fluids for forensic purposes.

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