A137 The Utility of Raman Spectroscopy of Blood Samples for Forensic Applications

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After attending this presentation, attendees will understand the biochemical principles of Raman Spectroscopy for biological fluids, as

proposed for use in forensic body fluid detection and identification. This will include a review of the current and relevant literature, as well as results of recent research.

This presentation will impact the forensic science community by providing a balanced exploration of the utility of Raman Spectroscopy in forensic serological analysis, in the field for crime scene applications, as well as in the laboratory.

Recent reports have shown that Raman Spectroscopy can be used in forensic science to identify blood and other body fluids. Raman Spectroscopy is a very sensitive technique that is often used in forensic laboratories, mostly to analyze textiles and paints, but it has been seldom used to analyze blood and body fluids for forensic applications. Very recent experimental work, however, has shown that Raman Spectroscopy may be able to identify and discriminate between body fluids, to distinguish colored stains from blood residues, and to possibly discriminate between blood of different species. Because of these findings and to the recent development of hand-held and portable Raman Spectrometers, Raman field analysis of body fluids could soon become a reality.

To move the field out of the experimental arena and into validation for use in casework, several parameters must be investigated in order to establish reliable protocols. Raman scattering from human blood was investigated as a function of parameters that are relevant for field forensic analysis, such as excitation wavelength, age of samples, influence of substrates, and sample dilution. The scattering probability of green light

nm) was found to be higher than that of red light (632.8 nm) and UV light (325nm He-Cd laser). Additionally, the relative intensities of peaks arising from oxyhaemoglobin and ferrous ions that depend on sample age, fluorescence, or Raman scattering from fabrics prevent meaningful analysis of blood samples in certain instances. Relative differences in the amount of peaks can be found between fresh venous blood and the same sample retaken an hour after drying. Samples can be measured with a maximum dilution of approximately 1:250 (for an excitation power on the order of 2 mW measured at the sample plane). The sensitivity of Raman scattering to diluted blood allowed for measurement of blood reconstituted from fabrics, thereby alleviating issues related to fabric luminescence and scattering.

Thus, Raman scattering has a sensitivity comparable to many presumptive tests for blood, such as luminol, phenolphthalein, leucomalachite green, blood strips, and the forensic light source tests. These tests are highly sensitive (up to 1:5,000,000 dilutions can be measured in forensic laboratories), but in the field a cotton swab test is generally employed, which can only measure dilutions on the order of 1:100-1:250. Because of the sensitivity of Raman scattering to diluted blood, a protocol for the reconstitution of blood from fabrics can be established. Contrary to other published reports, results in this laboratory indicate that reconstituted blood alleviates issues related to fluorescence and scattering from fabrics and is vastly preferable to analyzing the stain *in-situ*. These findings will prove important in determination of utility and in the preparation of protocols for the field analysis of samples. **Blood Detection, Raman Spectroscopy, Biospectroscopy**

 ** Presenting Author*