A45 Optimizing Human Semen Stain Detection Using Fluorescence

Kelly Conroy, BS, San Jose State University, Forensic Science Program, 1 Washington Square, 508 MacQuarrie Hall, San Jose, CA 95192; and Steven B. Lee, PhD, San Jose State University, 1 Washington Square, MacQuarrie Hall 521, San Jose, CA 95192*

After attending this presentation, attendees will become more familiar with the abilities and limitations of current forensic alternate light source methods and filter glasses currently used to screen sexual assault evidence samples as a presumptive test for semen stains. The attendees will then gain additional knowledge on the fluorescent excitation and emission wavelength combinations that have been newly developed that have shown potential in enhancing visual detection of semen stains on different fabrics.

This presentation will impact the forensic science community by increasing viewer's knowledge of semen stain detection. In addition, the results of the study indicate the need to conduct further research in semen stain detection. The combinations of new excitation wavelengths with emission and blocking filters may impact the forensic community by enhancing the detection of semen stains and thus increasing the ability to process sexual assault evidence.

Human semen fluorescence has been observed for many years and is currently used as a presumptive screening test in forensic laboratories. The purpose of this project is to improve the visual detection of semen stains on different types and colors of fabrics with new combinations of different wavelengths of fluorescence using a standard forensic alternate light source (ALS), coupled with new fluorescence filters. As the detection of semen stains is one of the first steps in sexual assault evidence processing, the ability to locate these stains is important in order to obtain more probative evidence.

To establish a baseline for the project, a four year old positive control sample of semen deposited on a white tissue was examined under the Spectrum 9000, a forensic ALS, at six different discrete excitation filter settings. The stain was then viewed through various long pass, short pass, and band pass filters covering a range of wavelengths as well as yellow and orange goggles (480nm long pass, 545nm long pass respectively). The samples were photographed and observations were made on the visibility of the stain, taking into account amount of stain visible, relative brightness of the stain, contrast of the stain with the background, and the ability of the camera to record the stain.

Photographic documentation and visible qualitative evaluation of preliminary results indicate excitation wavelengths include 570nm, whereas previous reports listed the excitation range of semen as being from 300-500nm. Fluorescence emission filters in the 510-590nm range allow the stain to be easily detected by the eye of the observer. Since there was fluorescence observable at lower wavelengths that are blocked by the orange goggles commonly used in forensic laboratories, there is potential for capturing more of the visible fluorescence by the use of unique band pass filters. The results establish a baseline for a white substrate for the project, and the photos taken of the stain through the various filters will be analyzed using image analysis software to determine quantitatively if the unique combination of fluorescence and discrete filters selected increase the ability to detect semen stains as compared to methods currently employed in forensic biology laboratories.

Future areas for research include utilizing the band pass filters that have been identified during the baseline tests to evaluate semen stains of various amounts deposited on various substrates after varying time intervals of storage to determine the effectiveness of the newly identified filters with relatively fresh stains versus those stored over time. Preliminary work highlights the appearance of a broader than previously thought excitation range for human semen.

Semen Stains, Alternate Light Source, Fluorescence

 ** Presenting Author*