



Questioned Documents Section – 2006

J23 Visualization of UV Pepper Spray Using a Video Spectral Comparator

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This poster will explain the importance of using an alternate light source to visualize various pepper spray residues that contain an ultraviolet dye. Pepper spray is a non-lethal chemical agent often used in riot control, personal self-defense and by an attacker to subdue a victim. The active ingredient in pepper spray is capsaicin. Some manufacturers have also added a UV dye to the spray. Knowledge of the presence of this dye on a suspected perpetrator will greatly facilitate the investigation.

This poster will impact the forensic community and/or humanity by educating investigators about an alternate method to screen for pepper spray residue that have the UV component. Because they are in virtually constant use for drug analysis and toxicology, criminalists may have limited access to instruments like GC/MS and HPLC. An alternative method must be developed and used in order to locate the spray. Every Questioned Document Section in a forensic laboratory has either a video spectral comparator or an instrument that closely resembles its capabilities. Therefore, any investigator should be able to locate an ultraviolet dye on an article of clothing.

Various swatches of clothing, different colors and types, were sprayed with different self-defense sprays and observed using a Video Spectral Comparator [Foster & Freeman Ltd, UK (www.fosterfreeman.com)]. Pepper spray residue was extracted from the swatches and a GC/MS was used to confirm the presence of the capsaicin and UV dye. These materials were then washed with laundry detergent and observed again using the VSC without specialized equipments. Previous reports have shown that the concentration of the active ingredient, capsaicin, is greatly reduced after washing. However, the UV dye remained and fluoresced while using the Video Spectral Comparator. As long as the UV dye is initially present in the self-defense spray, it could be used as a marker due to its resilience to washing.

In addition, a Direct Analysis in Real Time (DART) ion source combined with a mass spectrometer was used to sample various self-defense sprays on different baseball hats. The results were available within seconds and there was no need for any kind of sample preparation or chromatography. The Video Spectral Comparator located the fluorescent dye residues from the pepper spray. The correct area of the hat was placed in front of the DART and within seconds the mass spectrum for capsaicin, dehydro-capsaicin, and the dye, BBOT, was identified. This type of evidence would stand up to the closest scrutiny in court and only took a few minutes to obtain.

The finding of pepper spray residues on evidence items may substantiate resistance if used by an assault victim, show premeditation if used by an assailant, or may corroborate a law enforcement officer's claim of first attempting non-lethal methods to subdue a subject. The Video Spectral Comparator allows an investigator to locate fluorescent pepper spray residue quickly and without chemically altering the forensic evidence. Although any source of UV light or ALS can detect fluorescence, the Video Spectral Comparator's wide selection of excitation wavelengths, filters, and signal integration times permit it to discriminate between the fluorescence produced by the dye, BBOT, and other sources of fluorescence.

Self-Defense Spray, Video Spectral Comparator, Ultraviolet