F12 Utilization of Infrared Photography to Detect and Document Gunshot Powder Residue on Clothing: A Comparative Study

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After attending this presentation, attendees will understand the benefits of using a digital (infrared conversion) camera compared to a standard digital camera to detect and document Gunshot Residue (GSR) patterns on dark and multicolored clothing as well as other parameters essential for a close-range, shooting incident reconstruction.

This presentation will impact the forensic science community by indicating the best non-destructive test for examining GSR and for accurately documenting photographically the bullet entry hole in dark, multi-colored clothing. This is difficult to accomplish with a standard digital camera sensitive to the spectrum of light ordinarily "visible" to the sensor (Complimentary Metal-Oxide Semiconductor (CMOS) or Charge Coupled Device (CCD)) in digital cameras. This will be the first time quantitative data was obtained for Infrared (IR) detection of GSR particles on dark, multicolored cloth fabric substrates and close-contact muzzle-target distances.

The purpose of this study was to compare the effectiveness of a Nikon® D7000 IR camera in detecting and documenting GSR to that of a standard Nikon® D7100 Digital Single-Lens Reflex (DSLR) camera on dark or multicolored clothing. This study will examine three variables for comparison between the images produced by the two cameras: (1) number of particles counted; (2) diameter (mm) of the GSR pattern; and, (3) the bullet entrance hole diameter (mm) on the clothing. Ten different types of fabrics (substrates) will be used as well as one control substrate (white cotton shirt). A GSR pattern was created on three samples from each substrate, at the distances of 6″, 9″, and 12″ in order to produce shooting incident reconstruction standards. Results were analyzed by an independent-sample *t*-test to determine if the IR camera provided a statistically significant difference (p value< 0.05) in the three ranges analyzed compared to the DSLR camera.

This study indicated there were no significant differences observed in the number of particles visualized/counted between the IR camera and the DSLR camera images; however, there were significantly larger diameters of the entrance holes and the GSR residue fields using the IR camera compared to the standard DSLR camera.

Effective documentation of GSR patterns can lead to the exploration and possible determination of muzzle-to-target distances involved in a crime scene shooting incident reconstruction. Considerations should be made to utilize an IR camera whenever possible for possible expert firearm examiner testimony in the courtroom, especially in close-range shooting incidents.

Firearms Evidence, Gunshot Residue (GSR), Infrared (IR) Photography