E44 Use of Infrared Photography to Document Bloodstains in Fire Scenes

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After attending this presentation, attendees will understand the effectiveness of Infrared (IR) photography when used to detect, visualize, and document bloodstains in fire scenes.

This presentation will impact the forensic science community by providing a comparison of the effectiveness of two non-destructive techniques (white light and IR photography) when employed to visualize and document bloodstain patterns in crime scenes where fire artifacts such as soot obscure valuable evidentiary material.

Soot deposition and other fire-related artifacts can obscure bloodstains to the point where they are difficult to identify with the naked eye. Due to the obstruction, additional methods of locating and documenting bloodstains need to be evaluated.

It is often difficult to detect bloodstain patterns on dark surfaces due to the lack of contrast. IR photography has been used to detect bloodstains on dark surfaces (fabrics) because infrared light (700nm-1,500nm) is absorbed by blood, providing contrast between the blood and the background surface; however, there are no reports in the literature on the use of IR photography to detect bloodstains covered by soot in fire scenes. This study evaluated and compared the ability of both white light and IR photography to visualize soot-covered bloodstains.

This research was conducted at the Alcohol, Tobacco and Firearms National Academy located on the Federal Law Enforcement Training Center, GA. Gypsum board (drywall) was installed on the inside of each of three concrete burn cells. This transformed each burn cell into a 9' x 13' room with an 8' ceiling. Therefore, each burn cell was both the crime scene and the room of fire origin. The following surfaces were utilized on each 13' wall in each burn cell: dark gray paint, white paint, bare gypsum board, laminate flooring, and patterned wallpaper. Each 13' wall was divided into upper and lower sections 4' off the floor. Two volunteers donated blood via venipuncture. Cast-off, transfer, and impact spatter bloodstains were deposited on each surface type in both the upper and lower sections for a total of 30 bloodstains/wall and 60 bloodstains/cell. All bloodstains were then photographed using white light photography. TRUFuel Engineered Fuel and Oil® products were used as the accelerants and the fires were suppressed using water. Each cell burned between two and two and one-half minutes at temperatures ranging between approximately 800°C and 900°C. After each burned cell cooled to safe temperatures, photographs of the bloodstains were accomplished with white light photography. Next, all bloodstains were digitally captured using a Foster+Freeman Crime-lite® 82S IR Forensic Light Source with an attached IR-sensitive camera which displayed live images on a computer. Lastly, representative bloodstains were photographed using a full-spectrum modified Nikon® D300 equipped with a Nikkor 60mm micro lens and Peca® 904 IR band pass filter.

Post-fire, all but one bloodstain was detected with the naked eye, oblique white light, Crime-lite®, white light photography, and IR photography. The blood stains were covered with soot but not completely obscured. The visible stains deposited on the light surfaces (white paint and gypsum board) were more easily identified than those deposited on the dark gray paint. In both the white light and IR photographs, the bloodstains appeared darker than the background surface (despite the color). Both the wallpaper and laminate flooring (secured to each wall) were significantly altered due to the high temperatures. Only a few blood drops were visible on the remnants of the laminate flooring and it was not possible with either type of photography to determine from which type of stain the drops originated. On the wallpaper, it was not possible to determine the location of the blood. While there were areas on the remnants of the wallpaper that may have been blood, neither type of photography allowed a conclusive determination.

The results of this study show that white light and IR photography performed equally well when documenting bloodstains after fire when the stains were still visible to the naked eye. Under the conditions of this study, IR photography provided the same level of detail for bloodstains already identified by white light photography. In future studies, it would be beneficial to further explore the effectiveness of IR photography to detect bloodstains when they are completely obscured by soot.

Infrared Photography, Bloodstains, Fire Scene

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