A182 Detection of Burnt Bloodstains Using Light- Emitting Enhancement Reagents

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The goal of this presentation is to show how three different light- emitting blood enhancement reagents: Luminol, Bluestar©, and Hemascein™ compare with respect to their ability to detect liquid blood, untreated bloodstains, and bloodstains subjected to simulated fire conditions. Attendees will learn how the three reagents differ in both the magnitude and duration of light emission when testing these types of blood samples.

This presentation will impact the forensic science community by discussing the complex nature of arson-homicide scenes, which pose a significant challenge to both crime scene investigators and forensic scientists trying to locate and identify biological evidence such as bloodstains in the fire debris. The availability of a quick and easy screening test that selects only relevant bloodstains can reduce the number of samples selected for DNA typing analysis, thereby reducing analytical time and cost.

Investigators and forensic scientists employ a variety of blood screening tests in an effort to find the presence/absence of blood at a crime scene. Color-based blood screening tests, such as the Kastle-Meyer test, are conducted on any stain which visually appears to be blood in origin. Only those stains which test positive are collected for subsequent laboratory tests. However, when the perpetrator has purposely cleaned up the scene in order to remove any blood evidence, sensitive light-emitting
prepared from 1:10 to 1:10,000, and 25 ul of each dilution were mixed
with 2 ml of reagent for analysis on the fluorometer.

To determine whether or not the reagents could detect burnt blood, bloodstains of approximately 2 x 2 cm, were prepared on glass microscope slides using 5 ul of a 1:10 canine blood dilution. The resulting bloodstains were exposed to the direct flame of an alcohol fire for one to five minutes. The burnt stains were removed using a cotton swab moistened with distilled water and the cotton tip was agitated in 2 ml of test reagent for analysis on the fluorometer. Light emissions were monitored and recorded for 5 minutes for each of the test conditions.

The results showed that both Luminol and Bluestar© performed equally well when the limits of detection of liquid blood were compared. Light emissions above background were detected with test samples from the 1:10,000 dilution of blood. Light emissions were strongest during the first 30 to 90 seconds, decaying to near background levels at the end of the five minute assay period. The Hemascein™ reagent exhibited a limit of detection of only 1:1000, however, strong and continuous light emissions were observed over the entire five minute testing period.

With burnt blood samples, Luminol exhibited weak light emissions with only the one minute burn sample, whereas Bluestar© emitted light with the one, three, and five minute burn samples. The Hemascein™ reagent yielded maximum light emission values similar to that of Bluestar© for each of the timed-interval burn samples. However, Bluestar's emission decayed rapidly, whereas light emissions from the Hemascein™ reagent were stable over the five minute assay period.

By comparing the light emitting properties of Luminol, Bluestar©, and Hemascein™ in a quantitative manner, it was determined that Bluestar© and Luminol exhibited the greatest sensitivity with liquid blood samples. With burnt bloodstain samples, both Hemascein™ and Bluestar© detected bloodstains that had been exposed to the direct flame of an alcohol fire for up to five minutes. However, Hemascein's™ light emission was stable over the entire assay time. Although both Bluestar© and Hemascein™ successfully detected burnt bloodstain samples, the research indicates that Hemascein™ would be the reagent of choice for the detection of burnt bloodstains at arson-homicide scenes.

Luminol, Bluestar©, Hemascein™

 ** Presenting Author*