

A Comparison of the Luminol and Blue Star Blood Reagents in Detecting Blood in Soil Nearly Four Years After Deposition

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Introduction

The authors have reported previously on the use of the Luminol reagent to detect blood in soil up to two years following deposition of the blood (1,2). Recently, one of the authors (Gabel) inquired about a revisit to the research site to further test the study grids with both the Luminol and Blue Star reagents. The initial study began in October of 2004. A total of six 2' x 2' grids were created in which 500ml of blood was poured in an "X" pattern. The original study was designed to last two years, the results of which were previously published (2).

The study area is located on the Highlands Ranch Law Enforcement Training Facility in Douglas County, Colorado (USA). The site is described as gently rolling hills of Gambel oak (*Quercus gambelii*) at an elevation of approximately 1830m (6000 ft.) above seal level. The specific study site is located on a hilltop with full exposure to the elements. The local weather has been extremely hot of late. The Denver Metro area experienced 23 consecutive days of 90 degree (Fahrenheit) temperatures, the longest recorded in over a century. Additionally, the Winters have seen record snowfalls for the past two years. In fact, the Winters of 2006 and 2007 rank as the snowiest consecutive years in the recorded history of the state according to the Colorado Climate Center.

Project Description and Results

The authors visited the site on the evening of August 3, 2008. The conditions were partly cloudy with no breeze. The soil and vegetation were very dry. The soil of the study area showed visible signs of soil cracking and weathering (Figure 1). The authors utilized a commercial Luminol reagent kit as well as the Reagent Blue Star. Grid units #4, #2 and #1 were sprayed. The soil in grid unit #1 had been previously disturbed to test the depth of the Luminol reaction. A small trench approximately 7" in depth was dug and refilled nearly two years earlier.

Initially, only a very small area of reaction in grid #2 was visible. No reaction was seen in the other grid units tested. Approximately ½"-1" of soil was then scraped from each of the grid units. Grid #1 was sprayed with the reagent Luminol first with a strong and immediate reaction of blue/green chemiluminescence (Figure 2). The grid was then sprayed with the Blue Star reagent with a similar immediate and strong reaction. Grid #2 was sprayed first with the Blue Star reagent. The reaction appeared "weaker" than expected (Figure. 3). The grid unit was then sprayed with the Luminol reagent with an immediate and brighter reaction. One of the authors (Shimamoto) observed that the Blue Star reagent appears to have a weaker reaction on porous items than non-porous items (non-published).

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Grid unit #4 was sprayed with only the Luminol reagent with an immediate and strong blue/green chemiluminescence (Figure 4).

Additionally, the authors applied both reagents from a spray bottle to the areas around the testing grids without seeing any false-positive reaction. The authors also scraped an area of dirt adjacent to the testing grids and applied the Luminol reagent with no false-positive reaction. The area and depth of the scraping was approximate to the areas scraped in the testing grids.

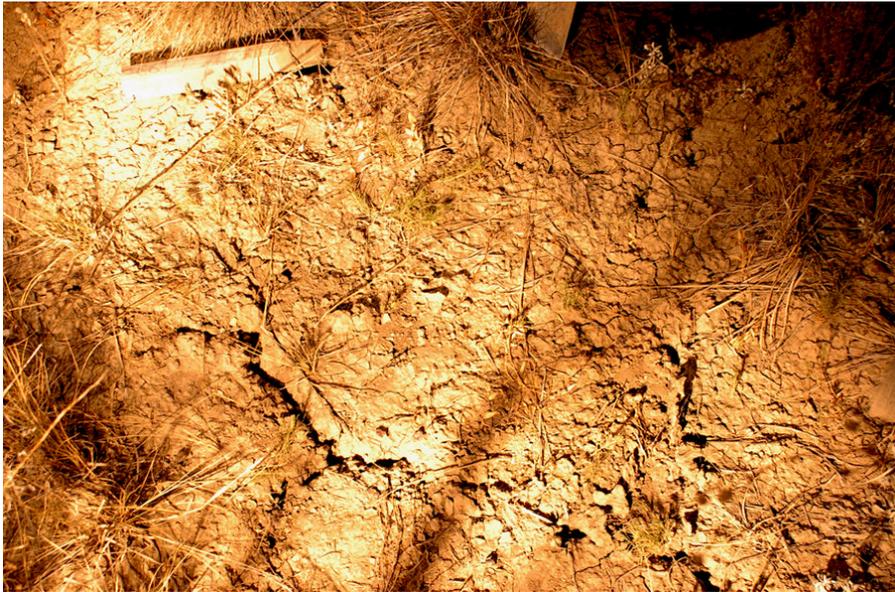


Figure 1. View of cracking and weathering of site.



Figure 2. Area of grid # 1 sprayed with Luminol.



Figure 3. Area of grid # 2 sprayed with Bluestar® followed by Luminol.



Figure 4. View of grid unit #4 sprayed with Luminol.

Discussion

The results of this experiment effectively demonstrate that latent blood can be detected in soil four years after deposition. We compared both the Luminol and Blue Star reagents and found that each reagent performed well, although the Luminol reaction seemed brighter. One limitation of this method is the need to scrape the top protective layer of soil to expose the reaction area. This may make initial identification more difficult and require more effort to prepare the search areas. However, the use of properly trained cadaver dogs may help identify potential search areas thereby limiting search times. Another drawback is that no usable DNA profile could be developed from any sample collected from a site this old. However, the value of this procedure is in identifying the area of blood loss which may be contiguous to other valuable evidence such as cartridge casings or expended bullets.

The identification of a blood pool may also be valuable to investigators in verifying statements or providing an investigative lead to a potential suspect. It is the authors' sincerest hope that other investigators will conduct similar experiments in their areas to test the effects of varying soils, precipitation, bloodstain patterns, and reagent formulas on this process. Additionally, investigators are encouraged to revisit old crime scenes to test these reagents as well. Obviously, one should select scenes for which there is good photographic documentation to verify the search site and compare the reaction area. Reports of such findings will undoubtedly broaden our understanding of the reaction dynamics and help refine our strategies for utilizing this procedure to its maximum potential.

References

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