

**DETECTION OF BLOOD USING "LUMINOL" and CHEMILUMINICENT PHOTOGRAPHY.**

USE: LUMINOL processing of items where it is suspected blood has been removed by cleaning or otherwise washed away. Also, screen testing of suspected stains for field determination of blood.

DEFINITIONS:

**LUMINOL-** A chemical mixture used in locating, screen testing and visualization of suspected stains for the presence of blood.

**CHEMILUMINICENT PHOTOGRAPHY-** The photography method used in recording luminicent reactions to chemical interaction. In the LUMINOL process it records the bluish/green glow given off from a reaction to blood stains.

CRIMINALISTICS APPLICATION:

Blood is the most common type of evidence resulting from violent crimes; it may be deposited at the scene, on a weapon, in a vehicle, or even on the perpetrator himself. Because blood is so highly visible, the perpetrator will often attempt to remove blood from incriminating locations. Furthermore, the circumstances of the crime itself may result in blood being deposited in small or invisible amounts (a small amount tracked across a floor). As a result, the technician is often confronted with a potential crime scene in which little or no blood is visible and which by nature cannot be transported to a laboratory. A convenient, sensitive, and NON-DESTRUCTIVE preliminary test for blood which can be used to scan a large area is needed for such situations, one that meets all of these criteria is the LUMINOL test.

A chemical mixture of LUMINOL reacts with blood to emit a fairly intense bluish/green light (or glow). The LUMINOL test is especially valuable in forensic applications because it:

- 1) Is very sensitive in its reaction. (1:10,000 parts of blood reliably, and, 1:100,000,000 parts occasionally detected)
- 2) Is relatively specific for blood (false reactions with copper, brass and some metals, and, some vegetation)

- 3) Allows a rapid search of large areas (rooms, vehicles, clothing, etc..) since it is applied with a sprayer, enabling the location of suspected blood residue that is otherwise undetected or undetectable. This includes evidence of cleaning (wipe marks, foot tracks etc..)
- 4) is NON-DESTRUCTIVE and does not interfere with subsequent tests (positive areas or items may be removed for later more specific tests in the laboratory).

Often in violent crime investigations, the pattern of blood residue is as or more important than the blood itself. Fortunately, due to the nature of the LUMINOL reaction, a permanent record may be maintained. Although the amount of light (or glow) produced by the reaction is relatively faint, it may be recorded photographically. One limitation of the LUMINOL test is that it must be performed in almost total darkness. Using high speed photography with exposures that range from 15-30 seconds, a very usable image will be obtained for study of the blood patterns and court presentation.

MATERIAL NEEDED:

- 1) One or more hand pump sprayers for applying the LUMINOL reagent.
- 2) Mixing graduates (3) with a minimum of 750ml.
- 3) Chemicals: LUMINOL/ SODIUM CARBONATE/ SODIUM PERSORATE/ WATER.
- 4) Adjustable camera with normal lens having a minimum aperture of f2.8.
- 5) Kodak Tri-X film
- 6) ACUFINE film developer and other standard process black & white chemicals.
- 7) Tri-pod, cable release, stop watch.
- 8) Flashlight,
- 9) Material to cover windows (darken room)
- 10) Blood evidence collection material for removing suspected stains with positive reaction.

TESTING PERCEDURE:

With the LUMINOL chemical mixed (see mixing procedure) and placed inside the spray bottle, the room darkened, camera assembled and ready, and evidence collection material all assembled, you are ready to process a large area for suspected blood evidence. The chemicals should be mixed just prior to their use as they have a very short life span. The camera should be pre-focused on the area to be processed as focusing cannot be done in the dark. The exposure will be at f2.8. (wide open) for about 20 seconds. The only way to get an accurate exposure is by "gut reaction" rather than exact light measurement.

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A word of caution in the photography, process a small area at a time (apx 3 sq ft.) as the recording on film will be the strongest from that distance. Two photos should be taken when a reaction is found, one under normal lighting conditions to show the condition of the item, and the second using the CHEMILUMINICENT photo technique. Also, try to keep the film plane parallel to the object as the depth-of-field is very small with f2.8.

With all material assembled, you are ready to proceed. The LUMINOL is sprayed lightly on the object in question being carefull not to cause the solution to run. The room lights are turned off (either befor or after spraying) and any reaction is then noted. Within the first few seconds of seeing a reaction, a pre-focused apx 20 second camera exposure is made. Notes should be taken of the visual reaction, location, time etc.. when ever a positive reaction is found. With all data recorded and the lights turned back on, samples may be obtained from the positive areas by swabbing the spot with a pure cotton swab. Several samples should be taken, along with a control dry swab, and a control swab wet with the LUMINOL reagent.

Often, a large area can be pre-tested by a very light spray of LUMINOL in order to locate positive reaction areas, then the above process can be set-up and used to record the reaction by a second "normal" spraying.

After the item(s) or area has been processed & photographed, the samples obtained should be forwarded to a forensic serologist for more exacting tests. It is also a very good idea to have a forensic serologist present durring the LUMINOL testing. This persons background is valuable in interpreting the reaction obtained, and better qualified to collect samples that he/she will test further.

The film taken in the CHEMILUMINICENT PHOTOGRAPHY is then processed by pushing the Tri-X film to a speed rating of 2400 ASA. Successful results have been obtained using a developer called "ACUFINE" for pushing the film speed, then completing the process as normal film is developed (stop, fix, hypo clear, wash & dry). Printing the negatives obtained has been successfully done with "Polycontrast RC paper with a #3 filter.

CHEMICAL MIXING DATA:

LUMINOL; (5-amino-2,3-dihydro-1,4-phthalazinedione or 3-aminophthalhydrazine)

Working reagent; 0.5g of Luminol  
25.0g of sodium carbonate  
3.5g of sodium perborate  
in 500ml of water.

The shelf life of the working reagent is VERY short and must be used within an hour or two of mixing. The solution can be pre-assembled in two parts by mixing 250ml of water with the Luminol & Sodium Carbonate, and in another container mix 250ml of water with the Sodium Perborate. With the two solutions stored in separate containers the shelf life is extended to about three weeks. When ready for use, mix the two solutions together 1:1.

Supplier: Aldrich Chemical Supply Co.  
Milwaukee, Wisc 53233.

VWR Scientific Co.  
Kansas City, Mo

FILM PROCESSING DATA:

Tri-X film rated at i.e. 2400 asa. Film is developed in "ACUFINE" film developer at 70<sup>o</sup>f/ 16 min (starting guide, may need adjustment) Film is "stopped, fixed, hypo-cleared, washed and dried normally. Omaha Police use of this technique used 120 size film in a Mamiya M-645 camera, 80mm f2.8 lens with very good results. Judging negative density is very difficult in this technique because the only density on the film should be the chemiluminescent reaction (dark on film, light on the print), the field in the negative will be totally clear, making it very hard to cut negatives.

REFERENCES:

Omaha Police RB# 86868M, Homicide of Ann & Tina SPEESE 1-2-1980 search of 9505 Holmes Plaza #2 using the above technique to search for blood evidence.

R.A.Zweidinger, L.T. Lytle and C.G. PITT, Journal of Forensic Science., 18, 296 (1973)

L.T. Lytle Ph<sup>d</sup>., D.G. Hedgecock B.A., Journal of Forensic Science., Dec 1977

## CHEMILUMINICENT PHOTOGRAPHY OF INVISABLE BLOOD STAINS

## LUMINOL TESTING FOR BLOOD

## QUICK REFERENCE GUIDE

LUMINOL..... A chemical used in the screen testing of blood stains. Its used in TOTAL darkness and will react to blood with a bluish/green glow, this glow can be photographed.

## CHEMILUMINICENT

PHOTOGRAPHY.. The photography used in recording the luminicent glow or reaction given by chemicals.

FORMULAS: Luminol/ 5-amino-2, 3-dihydro-1, 4-phthalazinedione  
or, 3-aminophthalhydrazide

Mixed with/Sodium carbonate and sodium  
perborate in water.