



## RESEARCH ARTICLE

# THE APPLICATION OF LUMINOL FOR LATENT BLOOD IN CRIME SCENE

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### ABSTRACT

One of the most important pieces of evidence on crime scene is the blood stains which may not always be visible. Used for revealing invisible blood stains, Luminol makes contributions to resolution of criminal cases.

In this study, three different cases were examined in the City of Samsun, Turkey, and remarkable results have been revealed. Two cases happened in the year of 2008 and the other one in 2009. In the two cases, Luminol revealed how a criminal act was actually committed and confirmed the statements of suspects and witnesses. In the other case however, the Luminol contradicted the suspect's statement and proved that the criminal act was actually done by the suspect. All of these three cases have revealed the importance of blood stains during a crime scene investigation.

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### INTRODUCTION

Used in revealing invisible blood stains, Luminol was first developed in 1937 by a German scientist, Walter Specht. It consists of 5-amino-2,3-dihydro-1,4-phthalazinedione, and can be used after it is mixed with sodium carbonate (Brenner, 2000; Newton, 2007). The mixture should be used right after it is ready for use, or it will lose its features. It reacts with the iron in blood and produces a short-term bluish glow (Gunn, 2009: 49). The place where Luminol is to be applied must be dark (Seddon and Pass, 2009; Middlestead and Thornton, 2010). Before it is applied, a pre-examination may also be performed with alternative light sources, which might help determining the area where Luminol is to be applied (Miranda *et al.*, 2014). The floor should be photographed before and during the application of Luminol (James and Edel, 1992). All crime scene examination units have Luminol and it is preferred as it is effective and easy to apply (James and Edel, 1997). The luminol does not destroy the bloodstains where it is applied. It allows for DNA examination, as well (Santos *et al.*, 2009; Passi *et al.*, 2012). Luminol reacts to some substances other than hemoglobin (such as turnip, parsnip, and horseradish) and it is pressurized by other substances (tea, wine), one should be careful while applying it (Bancirova, 2013; Quickenden and Creamer, 2001). In some studies, it has been found that even a piece of cotton clothing, which was washed ten times in the washing machine with regular detergents, reacted positively when Luminol applied (Castello *et al.*, 2009a). However, the bleach, used for cleaning blood

stains and the temperature of the water might affect the application of Luminol. After a while, when the environment gets dry, it will suffice to remove this effect (Castello *et al.*, 2009b; Castello *et al.*, 2012). When Luminol applied by an experienced expert, negative effects are removed and real reactions with blood can be determined (Barni *et al.*, 2007; Peschel *et al.*, 2011). Considering the health risks that Luminol bears, one should use mask, gloves, glasses and protective clothing (Larkin and Gannicliffe, 2008).

### MATERIAL AND METHOD

The study used the Nite Site™ 16 oz Kit, which is commercially produced by Lynn Peavy Company. It included two containers, A and B. Container A contains a mixture of 5-amino-2, 3-dihydro-1, 4-phthalazinedione free acid (Luminol) and sodium carbonate. Container B contains sodium perborate tetrahydrate (Evidence Processing and Instruction Manual, n.d.)

As specified in the manual, the kit was prepared just before the application. Firstly, distilled water was added into container B and was stirred for 3 minutes until the powder solution dissolved completely. Then, the container A was transferred into the container B and was stirred for 30 seconds (Evidence Processing and Instruction Manual, n.d.).

During the preparation of the mixture, the environment was ventilated depending on the warnings in the data sheet.

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Protection measures were taken before the mixture is applied at the crime scene, such as wearing nitrile gloves, tyvek overalls, protective glass and mask(LP Nite-Site Kit Safety Data Sheet, 2014:3). A Nikon D40X camera (1600 ISO)was used for photographing. Before the application, the environment was turned into pitch dark, followed by the application of mixture onto the probable crime scene floor, where the glowing was expected. The blue fluorescence, which came out after the application, was photographed by using a tripod. The samples for DNA analysis were collected from the areas of floor where blue fluorescence reaction happened.

## RESULTS

### Case 1

In early morning hours of March 2008, a male body on a grassy area in a shanty town of the Turkish City of Samsun was found and reported to the police. The police arrived at the scene, examined the body that belonged to a male aged around 28-30, 175-180 cm of height, 75-80 kg of weight. None of the personal belongings such as ID card, wallet, or mobile phone was found on the body. A thorough examination of the body revealed that he had been seriously tortured with sharp objects as there were a lot of scars and incisions around the body. The slain had his clothes on but not the shoes nor the socks. It was highly likely that the victim had been thrown away from a vehicle. It was determined that the crime scene was not the current place where the body was found.

The body was identified through finger prints analysis, and then his relatives were contacted by the police. The statements of the relatives helped identify the suspect whose house was searched and visible blood stains were found. The suspect's car was also seized and searched.



**Figure 1** Vehicle that is used to carry the victim



**Figure 2** Visualization of Luminol reaction

Because the car had been completely washed, there were not any visible evidence on it. In case the victim might have been transported with that vehicle, Luminol was applied onto the car. It revealed the blood stains in dragged form on the edge of the left door and on the left part of the rear seats of the car. By the application of Luminol, the case was resolved and elucidated.

### Case 2

In March 2008, it was reported to the police that one of their relatives had been missing for a few days in the Carsamba district of Samsun City, Turkey, and might have gone to his girlfriend's house. The police went to the lady's house and she admitted that she had killed him in the house. However, after the examination in the house, there could not be found any evidencethat support her claim. The suspect stated that they had broken the body into pieces and thrown it into a river. The place, where the body was claimed to be thrown, including the river, was searched by the divers. However, the relatives of the victim claimed that the suspect was not the real killer, who only tried take the responsibility on herself. Upon this claim, the suspect's house was searched with Luminol and it revealed that there were actually a lot of blood stains on the sofa in the sitting room, on the floors of the corridor, toilet and bathroom. These findings confirmed the previous statements of the suspect and rebutted the claims of the relatives.



**Figure 3** Luminol reaction on sofa



**Figure 4** Luminol reaction on floor

After the examination in the house, the divers made another search in the region where the river joined the sea, and they found a piece of body of the victim. So, the case was resolved completely with the application of Luminol.

### Case 3

In April 2009, a woman called the police and said he had found her husband dead in the house. The crime scene examination showed that the victim, aged 70, was actually hit on the head with a hard object in the living room and then dragged into the bathroom. The only suspect was his wife, and there was not any evidence. The police suspected that the body might have been dragged into the bathroom by the spouse herself, all of her clothes were subjected to luminol application. After the application, a blue fluorescence glow in circular shape was detected in the front center part of one of her upper body clothes in the wardrobe. According to this finding, the shape of this glow matched exactly to the shape of the upper part of victim's head. Thus, the suspected wife was arrested. The suspect did not admit her crime, however, she could not explain and disprove the circular blood stain on her clothes, either.



Figure 5 Suspect's clothes



Figure 6 Luminol reaction on suspect's clothes

## DISCUSSION

Blood stains, found in crime scenes, can make significant contributions in solving crime cases such as homicide (Nilsson, 2006). In this study, Luminol method was introduced as how they were used to reveal the cases that do not have any visible evidence. The perpetrators cleaned the crime scene in all three cases, which definitely prevented the blood stains to be found. In this study, Luminol was applied when the floors were dry. However we do not know how the crime scenes had been cleaned. In the applications, it was found out that Luminol reacted positively when the bloodstains were cleaned and got dry (Gross *et al.*, 1999; Nilsson, 2006; Castello *et al.*, 2009b; Castello *et al.*, 2012). Therefore, the experts should wait until the surface got dry.

The main purpose of the crime scene is to set up the triangle amongst the case, perpetrator and victim (Gardner, 2005). In order to establish this triangle, this study focused on the two benefits of luminol. One of the benefits is that Luminol confirms the statements of suspects and of the witnesses and it

complements the other evidence. The second benefit is, it directly helps with the identification of perpetrator and contradicts the suspect's statement.

An important issue in application of Luminol is to take personal protective measures (Larkin and Gannicliffe, 2008). Gloves, masks and overalls, which are amongst the standard tools of any crime scene unit, will suffice as the protective equipment. In addition, ventilating the crime scene will reduce the harmful effects.

Blue fluorescence glow, which comes out with application of Luminol, should be photographed in order to be accepted as a piece of evidence in courts. Luminol, when applied in spray form, will give out a blue glow for some time (30 seconds) and then it will extinguish. When it is re-applied, it re-glow but its strength reduces, which is why it should be photographed right away when it is at its best form (Miranda *et al.*, 2014). Tripod should be definitely used and video-recording should be made in the night mode with a high ASA setting. Otherwise a good view may not be obtained. Luminol glow may be the only evidence the police may have, especially when they were not able to obtain a DNA sample.

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