Decipherment of blood stain on different cleansed or washed fabrics using Ultra-Violet technique

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Abstract- Blood is the fluid connective tissue; it contains blood cells which makes 45 percent and plasma make 55 percent of the blood. It transports the nutrients, wastes, chemicals, and gases in the organism. In forensic science blood is the most common biological fluid found on crime scene. Analysis of different aspects of bloodstains can contribute the significance in various crime cases. Generally, the perpetrator uses the various common cloth pieces to swiped the pool of blood or blood stain in the scene of crime and washed away to hide the clues which can be linked to crime with victim or suspect. Forensic scientist tries to find the best possibility method or technique to detect the latent clues of blood to fix the crime even after washing the used bloody cloth. The use of Ultra-violet light source in bloodstain analysis has focused on dried (whole) blood. Blood or bloodstain detection by UV light could provide valuable information at a crime scene. In this report, the detection of human bloodstain was evaluated using ultraviolet (UV) light at two different wavelengths on 10 different cloth fabric and cleansed conditions. This paper shows the effectiveness of the result that ultraviolet (UV) at 365 nm (UV365) appeared positively and successfully for the detection of cleansed blood stain of differently nature of fabrics. These results shows that UV light may be utilized as a simple, available, non-destructive method for blood stain detection.

Keywords: ultraviolet, blood stain, biological fluid, victim, suspect etc.

INTRODUCTION

Blood is the fluid connective tissue which is constantly circulating fluid providing the nutrition, oxygen to body and waste removal. Blood is mostly liquid, with numerous cells and proteins suspended in it, making blood "thicker" than pure water. Whole blood consists of two major fractions: a cellular portion, which is approximately 45%, and a liquid portion, plasma, approximately 55%.

Many body fluid stains are invisible, present in very small quantities or mixtures, and so identification is not always straightforward (1). Blood contains clotting enzymes function to help blood to coagulate. Numerous circumstances may influence the time of clotting and drying of blood in various environmental conditions, including blood volume, relative humidity and temperature, and surface material (2).

The bloodstain analysis is primarily done by the use of ALS for providing better visualization on certain materials; Polilight, for example, can be effective in detecting bloodstains at 415 nm, particularly those that have been cover by paint (3, 4). Springer et al. have reported detection of bloodstains was achieved by using lower wavelengths, ~266 nm for certain materials (5). As an alternative to ALS, bloodstains may be treated with certain chemical compounds such as luminol or BLUESTAR®FORENSIC to produce a blue chemiluminescence (6, 7). Ultraviolet (UV) at 365 nm (UV365) was effective in the detection of even small amounts of blood plasma and serum, compared with UV at 395 nm, said by *Kearse* (8,9,10).

These data show that experiments were performed to compare the result of the specification of light sources to reveal the blood stain that is transferred to material. The implications of these findings in blood detection and analysis are discussed (11).

BLOOD IN FORENSIC SCIENCE

1. Blood typing
2. Bloodstain Pattern analysis
3. Forensic Serology
4. DNA identification
5. Detection of Poisonous substances(12).

MATERIALS AND METHODOLOGY

Blood Sample

Human blood was obtained from healthy volunteers by the aseptic method using a Health Lancing device (SMARTCARE Precision Round Lancet Needle) fitted with a micro lancet. Blood was transferred to a 1.5 mL Eppendorf® microcentrifuge tube using a 10–100 µL Eppendorf® micropipette. The liquid blood was allowed to transfer on cloth using an Eppendorf® micro pipettor. The cloth was placed directly under the blood pool with very slight pressure. Fifteen to twenty micro litre of blood was typically used for each group (13).

Ultraviolet Light Sources

The UV light systems used in the following studies: a UVlight chamber, 254, 365 nm, Single with two UV tubes (powder coated body); a handheld professional-grade UV flashlight produces 380-385nm (nanometres) ultraviolet wavelength with 28 UV LEDs (14).

Fabrics

Specific 10 type of fabrics that were used in this study include a cotton, wool, silk, spandex, velvet, nylon, banarsi, crepe, chiffon and georgette. All fabrics were collected from the local market (15).

RESULTS

UV Decipherment of Blood Stain

As demonstrated, blood stain was essentially invisible under normal light on commemorative objects, but was revealed using UV365. A crime scene investigator can determine the specific locations of stains for collection instead of testing entire, large pieces of evidence such as a mattress, a carpet, a sheet, bedsheet, pillow, an article of clothing, etc. The dried body fluids glow under the UV light source illumination. Because nearly all body fluids are inherently fluorescent, the more powerful light source.

S.NO.	TYPES FABRIC	OBSERVATION		
	CLEANSED STAIN FABRIC	NORMAL LIGHT	UV 254 nm	UV 365 nm
1.	Cotton	+	+	++
2.	Wool	-	-	+
3.	Silk	+	+	+
4.	Spandex	+	+	++
5.	Velvet	-	-	+
6.	Nylon	-	+	+
7.	Banarsi	+	+	+
8.	Crepe	+	+	+
9.	Chiffon	+	+	++
10.	Georgette	-	+	++

Blood stain were deciphered from cotton, silk, spandex, banarsi, crepe and chiffon in normal light but under 254 nm only fabric like cotton, silk, spandex, banarsi, crepe, chiffon and georgette showed blood stain and under 365 nm all fabric showed the decipherment of blood stain easily.

CONCLUSION AND DISCUSSION

The appearance of the sample by 365 nm light may be better suited for applications where stronger fluorescence effects are desired. As demonstrated it is reported, blood was effectively detected using UV365 on a variety of materials mentioned. The violet light emitted; 365 nm light can contemplate an optimal choice where performance is of classy import.UV detection of blood stain could prove valuable in cases where a victim is moved during the survival, and the biological evidence is link to the crime scene or victim or the suspect circumstantially. The current study concluded that some stains can mimic as blood stain after treatment with cleansing agents. The study also concludes that the fabric which has absorbent surface may leave the colourless stains where UV can be more significant to decipher bloodstain in compare to different fabrics.

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