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Short Communication

An effect of dry and moist condition on blood stained forensic samples

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Abstract

Investigations done in a laboratory specially, the cases where biological fluids are being used, helps a great deal in investigating crime. For instance, blood which is a crucial biological fluid serves as most prevailing evidence linked with the majority of criminal cases. The blood serves as an important tool in illuminating crime case investigation, but criminals can hide valuable evidence like blood stained clothes and thereby hindrance the analysis of crime. The present study was carried out at Regional Forensic Science Laboratory, Indore on blood stained exhibit kept at different environmental conditions. The observation shows that, ideal blood samples (without any contamination) show blood grouping result still six months kept in dried condition, whereas under moist conditions, the blood samples show blood grouping up to three months. On the contrary, blood sample of forensic cases investigated, show positive blood grouping results up to three months under dried condition and less than a month under moist condition. The present study focuses on how the differences occur when a blood stained exhibit is kept in varied condition keeping in view the environment and time. It is important that the blood stains should be carefully collected and properly preserved at crime scene, so that it can result in better judgment in court of law.

Keywords: Biological fluid, Blood, Blood stains, Dry and moist conditions.

Introduction

Blood plays a pivotal role by being an important tool in analysis of crime. The various forms in which blood occurs at crime scene are blood stained clothes, liquid blood on floor or wall or adhered to soil and any other objects[1]. Bloodstain evidence is of prime concern in various cases, especially those for violent crimes[2]. Forensic scientist are looking forward to determine the age of blood stains, so that it may provide valuable information in determination of the time elapsed between incidents, such as accidents or violent crimes and in reconstruction of the event timeline[3,4]. As blood forms an interface in linking crime with circumstantial evidence, thereby, helps in providing valuable information to solve the case[5]. Selection of illegitimate methods of blood sample collection may lead to obliteration of prime evidence thus selection of sample is totally dependent on how samples are being collected and preserved[5,6].

In many crime scenes, blood found[7] on fabric material of either suspect or victim serves as important evidence in crime case investigation. Blood is mostly found in the form of dried blood stains[8]. In dried blood stains, the red blood cells are haemolysed and thus the grouping becomes difficult[9]. However, the blood group antigens are present even in the haemolysed cells and ABO antigens maintain their property of combining with specific antibodies for a substantial period of time[8]. This property serves as an important facet in determination of ABO blood grouping. Various environmental parameters[10] like heat, temperature[11] moisture etc affect the morphology and antigenicity[12] of Blood stains found on fabric. It is therefore, necessary to determine the effect of time lapse and environmental conditions affecting blood stains on the fabric material.

The present study is thus, undertaken to determine the effect of temperature and ageing of blood stains on forensic material, important in solving forensic case work.

Materials and methods

The present study was carried out at Regional Forensic Science Laboratory (RFSL), Indore, Madhya Pradesh, for a period of eight months.

In this study, the blood sample, taken from the District Hospital, Indore, was spread on the cotton gauge piece of 2”x2” size. The samples were prepared by spreading 3ml of blood (known group) on cotton gauze piece with sterile disposable syringes. The blood spreads uniformly over the surface of gauge piece and get absorbed. On the other hand, the forensic sample (cotton fabric with blood stains on it) was selected from the cases received at RFSL, Indore. The extract from the blood stained fabric (forensic sample) was spread on cotton gauge piece as mentioned above.

The presence of blood was detected by benzidine test. The species was determined with the help of radial diffusion on gel plate and blood group was identified by using adsorption elution method[13,14].

The experiment was carried out at two different environmental condition viz. dry condition i.e. 25°C in BOD incubator and moist condition i.e. 4-8°C in refrigerator for a period of eight months. The cotton gauge piece with known blood stain and forensic sample blood stains were kept at different environmental conditions. The dry condition was maintained by keeping the fabrics at 25°C temperature, wrapped in brown paper, whereas the moist condition was maintained by keeping the sample in petriplate with moistened filter paper and kept in refrigerator. The experiment was carried out for eight months and the results were noted after every two weeks.

Results and discussion

In the present study, the known blood samples and forensic sample were exposed to different environmental condition. The blood group on fabric of forensic sample taken for study was determined by adsorption elution method. The blood samples (taken from the District Hospital, Indore) was spread over gauge piece and the results of blood grouping i.e. clumping of cells were noted after every 2 weeks. Similarly, the results of grouping were recorded for blood stains of forensic sample. Both these samples were exposed to dry and moist environmental conditions. The positive result is denoted as clear clumping (+++) while weak clumping or no clumping is demarked as inconclusive (Inc) and negative (-) result respectively[5].

The results observed under dry and moist conditions are described in Table-1.

The result shows that the known blood sample without any contamination gives positive results up to about six months (24 weeks) kept in dried (25°C) condition and thereafter the results were inconclusive and negative. In moist (4-8°C) condition it gives positive results upto12 weeks and thereafter the results were inconclusive and negative. On the contrary, the forensic samples of cases investigated under dried condition gives positive result up to 12 weeks and gives inconclusive results upto 16 weeks and no clumping of blood cells seen thereafter, while under moist condition, it shows positive result for just 2 weeks i.e. less than a month.

Discussion: Blood and its stains are important evidence in crime case investigation[15]. Blood found at crime scene can be found in traces, but its potency remains high if properly preserved. There are various factors on which blood stain examination depends such as presence of moisture, exposure to sunlight, methods of preservation, conditions of preservation, time interval till examination of stains etc. The present study was carried out to visualize the effect of ageing in blood stained forensic samples. It was well observed in the study that moist conditions adversely affect fabric stained with blood. The moisture supports fungal growth leading to contamination and loss of antigenicity, thereby affecting clumping of blood cells. It was also observed that dried condition best suits the blood stained fabric to give good results even after a long time gap. Thus, proper preservation of samples is very necessary so that appropriate results could be produced to help in criminal justice system.

Table-1: Dry and moist conditions.

Time in weeks	Known blood stained sample		Forensic blood stained sample	
	Dry condition (25°C)	Moist condition (4-8°C)	Dry condition (25°C)	Moist condition (4-8°C)
2	+++	+++	+++	++
4	+++	+++	+++	Inc
6	+++	+++	+++	-
8	+++	++	++	-
10	+++	++	++	-
12	+++	+	+	-
14	+++	Inc	Inc	-
16	++	Inc	Inc	-
18	++	-	-	-
20	++	-	-	-
22	+	-	-	-
24	+	-	-	-
26	Inc	-	-	-
28	-	-	-	-
30	-	-	-	-
32	-	-	-	-

Note: +++/++/+ = degree of clumping i.e. very good, good and average respectively, Inc. = inconclusive i.e. weak clumping and (-) = negative i.e. no clumping.

Conclusion

Thus, it can be concluded from this study that blood stains should be dried properly before packing of forensic exhibits. The blood stained clothes should not be sealed in moist condition, as moisture allows the growth of microorganisms that can destroy or even alter the evidence, thereby making blood grouping difficult. Proper collection and preservation of exhibits is thus of prime concern for forensic investigation.

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