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Human Blood Identification in Crime Scene as a Forensic Clue

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التشخيص العدلي للدم البشري في مسرح الجريمة كدليل جنائي

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ABSTRACT

Background:

Blood is one of the most common clues found at crime scenes. Human blood is diagnosed according to the following context: first, the location of the blood spots, then virtual tests, then confirmatory tests. Genetic testing and serological testing are important tests in forensic medicine..

Materials and Methods:

Thirty blood samples were collected in EDTA tubes, of which 25 were collected from humans and five from sheep. This study lasted five months from 23/3 to 22/8/2022. This study was conducted at Babylon University - College of Science - Department of Biology. The aim of this study was to evaluate the Hightop kit for detection of human blood. The blood was exposed to different weather conditions. Then it was examined using this kit to determine the ability of the antigen to withstand different conditions and the sensitivity of the measurement for this kit.

Results:

The positive results of blood stains that were exposed to different weather conditions for 30 days, except for blood stains that were placed on a smooth surface, showed negative results after 10 days of exposure, as opposed to those that were buried in the soil or blood stains on clothes that endured weather conditions for 30 days..

Conclusion:

The Hightop kit is suitable in the field of forensic medicine to determine human blood that is exposed to harsh environmental conditions, as well as the ability to distinguish human blood from animal blood and its target antigen bears the weather conditions.

Key words:

Blood, Serology, Forensic, Human.

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الخلاصة

مقدمة:

الدم هو أحد أكثر الأدلة شيوعًا التي يعثر عليها في مسرح الجريمة. يتم تشخيص الدم البشري وفقا للسياق الاتي أولاً موقع بقع الدم ، ثم إجراء الاختبارات الافتراضية ، ثم يتم عمل الاختبارات التاكيدية . تعتبر الاختبارات الجينية والاختبارات المصلية من الاختبارات المهمة في الطب الشرعي..

طرق العمل:

تم جمع ثلاثين عينة دم في أنابيب EDTA ، تم جمع 25 منها من البشر وخمس عينات من الأغنام. استمرت هذه الدراسة خمسة أشهر من 3/23 إلى 2022/8/22. أجريت هذه الدراسة في جامعة بابل - كلية العلوم - قسم الأحياء. كان الهدف من هذه الدراسة هو تقييم طقم Hightop للكشف عن الدم البشري. تم تعريض الدم لظروف جوية مختلفة . ثم فحص باستخدام هذه العدة لتحديد قدرة المستضد على تحمل الظروف المختلفة وحساسية القياس لهذه العدة.

النتائج:

أظهرت النتائج الإيجابية لبقع الدم التي تعرضت لظروف جوية مختلفة لمدة 30 يومًا باستثناء بقع الدم التي وضعت على سطح أملس اظهرت نتائج سلبية بعد 10 أيام من التعرض عكس التي كانت مدفونة بالتربة او البقع الدموية على الملابس التي تحملت الضروف الجوية مدة 30 يوما

الاستنتاجات:

من نتائج تبين عدة Hightop مناسبًا في مجال الطب الشرعي لتحديد دم الإنسان الذي يتعرض لظروف بيئية قاسية و كذلك لها القابلية لتميز الدم البشري عن الدم الحيواني و المستضد الهدف لها يتحمل الظروف الجوية.

الكلمات المفتاحية:

الدم ، الأمصال ، الطب الشرعي ، الإنسان.

INTRODUCTION

Blood is one of body fluid that is found in criminal scene. Identification human blood to distinguish it from other substance that like blood very important in investigation. Identification of human blood may be useful for solving many problems in criminal investigation. Blood evidence uses in DNA analysis and DNA fingerprint. The human blood has high resistance to degrative agent (sun light, UV, chemicals and high temperature) more than other body fluid. Blood has large amount of DNA that useful when evidence that found in criminal science very small amount. Most criminal case include blood evidence[1].

There are many tests applied on blood evidence such as DNA analysis, colorimetric assays and serological assays. Blood evidence can be used in homicide, suicide and sexual assault to distinguish between guilty from innocent person. also, blood test can be performed at criminal scene . Blood Stain Pattern Analysis (BPA) can be provide useful information about crime and how crime accrue. Blood stain age estimation helpful to determination time elapsed after the crime also used for determination injury age that contribute to solved many problems that facing investigator[2].

Confirmatory assays are more specific for the (hHb) in question. These assays are helpful to identify human blood with higher specify than presumptive assays that may be show false positive . A reddish-brown stain that examined by visual examination is usually tested by using presumptive assays. If the result of the presumptive assay is positive, the stain is then further analyses by Confirmatory assays. This approach indicates the presence of blood. Confirmatory assays are performed when a sample has to be identified as blood. Additionally, the human or

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animal origin of blood evidence can be determined if necessary [3].

"The term "forensic serology" has usually been used to refer to the identification and individualization of biological evidence, counting all the tests associated with the evaluation and typing of biological evidence in forensic matters. The word "serology" derivative from serum, the portion of blood comprising antibodies. Blood ABO grouping was long the only method of individualization biological evidence. Strenuously, the terminology used it to define these actions has changed and possibly become a bit confusing. Identification of blood stain is necessary to distinguish between human and animals' bloodstain. Whether blood is of Human or Animal Origin This includes Serological Testing of blood. Various methods in use are gel diffusion, antiglobulin consumption test, isoenzyme methods and precipitin electrophoresis[4],[5].

"Many traditional assays are used in criminal science are immunological assays that are based on specific antigen - antibody reaction. The oneStep ABAcard-HemaTrace test is an immunochromatographic strip test for the identification of (hHb). If sample consist (hHb), it will association with a mobile monoclonal anti-(hHb) antibody in the strip of test. Any antigen - antibody complex formed then travels through a porous membrane to the test zone. When the (hHb) concentration is more than a minimum of identification limit "0.05 µg/ml", the pink dye converts to visible in the test zone [3]. The oneStep ABAcard-HemaTrace test have highly sensitive, convenient, and fast test for the identification of (hHb) both in the laboratory and at forensic scenes" [6].

The aim of the current study to determine sensitivity of Higtop kit to human blood that exposure to different environmental condition, and measurement tolerance of human blood antigen to different environmental condition.

Materials and Methods

1. Blood Sample Collection

Blood samples were obtained from twenty-five healthy unrelated humans aged between (20-40) years. Blood samples were drawn by trained clinic nurse working for Main Blood Bank in Adiwaniya city /Adiwaniya Teaching hospital. Animals blood sample were taken from five healthy sheep that brought to veterinary hospital in Adiwaniya city for vaccine purpose. All samples were collected in EDTA tube. Study continued five months from 23/3 to 22/8/2022. This study was carried out at Faculty of Science, University of Babylon. The substrates used in currant study were porous substrates cotton clothing and soil non- porous substrates marble floor and knife.

2. Control Samples

Negative control was all experiment components excepting blood, that replaced with distilled water. Positive control was all experiment components excepting the treatment blood with chlorin, exposure blood to weather conditions and exposure blood to heat.

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3. Exposure Blood to Weather Condition

Identification human blood stain on different surface after exposure it to weather condition with different period time 10 days,20 days and 30 days. The surfaces that used in this experiment was clothing, smooth surface such as knife and soil. Animal blood sheep used for comparative with human's blood. One ml of blood was added for each surface. The surfaces were exposure it to weather condition then examined by Hightop fecal occult blood kit. The sample abstracted by kit buffer. The extract of sample performed by mix small part of a swab or a stain with buffer then loading the mixture sample- buffer into the sample well. This assay is considered invalid if the line of control zone not observed. A result can be read after 10 min [7]. the experiment was shown in figure (3-5). The expected results were:

Stains were prepared on different fabrics like Cotton cloth. Half meter of cotton clothing was used. By micropipette added 1ml blood to make stains. Three stains group marked each group consist three human blood stains and three animal blood stains. Blood stains groups was named group one, group two and group three group one remains under weather condition ten days then examined. Group two examined after 20 days. Group three examined after 30 days. The examine procedure performed by cut stain by scissors about 1cm2 and put it in kits buffer for 5 min with mixed then added three drops from mixture to chromatography cassette wall and wait for 2 min and result recorded.

Half meter of marble was used. By micropipette added 1ml blood to make stains. Three stains group was making each group consists three of human blood stains and three animal blood stains. Blood stains groups was named group one, group two and group three group one remains under weather condition ten days then examined. Group two examined after 20 days. Group three examined after 30 days. The examine procedure performed by blood stains was transfer by moist swap and put in kits buffer for 5 min with mixed then added three drops from mixture to chromatography cassette wall and wait for 2 min and result recorded.

One kilogram of sand soil was used. The soil put in clean dish. By micropipette added 1ml blood to make stains. Three stains group marked each group consists three of human blood stains and three animal blood stains. Blood stains groups was named group one, group two and group three group one remains under weather condition ten days then examined figure (3-4). Group two examined after 20 days. Group three examined after 30 days. The examine procedure performed by transfer blood Stains with soil about 1 cm3 by clean spoons and put in kits buffer for 5 min with mixed then added three drops from mixture to chromatography cassette wall and wait for 2 min and result recorded.

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Results and Discussion

The positive results of blood stains that were exposed to different weather conditions for 30 days, except for blood stains that were placed on a smooth surface, showed negative results after 10 days of exposure, as opposed to those that were buried in the soil or blood stains on clothes that endured weather conditions for 30 days as shown in table 1 ,2 and 3 .

Table 1 Exposer of blood stain on clothing surface to weather condition with different period time.

Time / Sample (replicate)	10 days		20 days		30 days	
	Positive %	Negative %	Positive %	Negative %	Positive %	Negative %
Human blood 3	**3 100%**	**0.0 0.0%**	**3 100%**	**0.0 0.0%**	**3 100%**	**0.0 0.0%**
Animal blood 3	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**
Positive control 3	**3 100%**	**0.0 0.0%**	**3 100%**	**0.0 0.0%**	**3 100%**	**0.0 0.0%**
Negative control 3	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**

Table 2 Exposer of blood stain on smooth surface to weather condition with different period time.

Time / Sample (replicate)	10 days		20 days		30 days	
	Positive %	Negative %	Positive %	Negative %	Positive %	Negative %
Human blood 3	**3 100%**	0.0 0.0%	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**
Animal blood 3	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**
Positive control 3	**3 100%**	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**	0.0 0.0%
Negative control 3	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**	0.0 0.0%	**3 100%**

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Table 3 Exposer of blood stain on soil surface to weather condition with different period time.

Time Sample (replicate)	10 days		20 days		30 days	
	Positive %	Negative %	Positive %	Negative %	Positive %	Negative %
Human blood 3	**3** **100%**	0.0 0.0%	**3** **100%**	0.0 0.0%	**3** **100%**	0.0 0.0%
Animal blood 3	0.0 0.0%	**3** **100%**	0.0 0.0%	**3** **100%**	0.0 0.0%	**3** **100%**
Positive control 3	**3** **100%**	0.0 0.0%	**3** **100%**	0.0 0.0%	**3** **100%**	0.0 0.0%
Negative control 3	0.0 0.0%	**3** **100%**	0.0 0.0%	**3** **100%**	0.0 0.0%	**3** **100%**

Identification of human blood stain was exposure to weather condition with different period time. The clothes also effects the penetration of blood stain [8]. The study was examining blood under weather condition until thirty days. The result was observing positive until end study that mean human blood antigen activity remain under weather condition when blood stain deposit on clothing surface more than thirty days table (4-5) This is in line with previous research that has been referred to positive results for blood on cloth were observed the following sampling day at day 30 by use OBTI kit [9]. Same result was noted by [10]. The statistical analysis result presented there was no significant between the result of exposure blood stain to weather conditions for 10 days and positive control by comparing elapsed period time to observed the positive results for each. The longest period of time elapsed to observed the positive results was 37 sec in blood stain that exposure to weather conditions for 30 days when positive control observed positive result after 22 sec. Animal blood sheep used for comparative with human's blood. All result of sheep blood was negative that's same result of previous research by using ELSIA assay [11].

Identification of human blood stain was exposure to weather condition with different period time. Smooth surface kind of the surfaces that not allow the absorption of blood inside. The study was examining blood under weather condition until thirty days. The result was observing positive until ten days but when examined after 20 days was observe negative result this is in line with previous research that has been referred to results of ABO grouping identification test of blood samples on rusted Iron Surface extracted through normal saline solution was positive until 13 days. then observe negative in 14 days[12]. That mean human blood antigen activity remain under weather condition when blood stain deposit on smooth surface about ten days, that is agree with previous study that said "Exposure to direct sunlight, extreme temperature and other natural conditions yield changes that reduces the possibility of successful identification of the blood stain" [10]. After ten

days the blood stain separated than surface by wind and blood stain not attached strongly on smooth surface so all result after ten days observes as negative table (4-6). The statistical analysis result presented there was no significant difference between the result of exposure blood stain to weather conditions for 20 days and 30 days each them was give negative result. By comparing elapsed period time to observed the positive results for each period. The longest period of time elapsed to observed the positive results was 82 sec in blood stain that exposure to weather conditions for 10 days when positive control observed positive result after 24 sec. Animal blood sheep used for comparative with human's blood.

Identification human blood stain was exposure to weather condition with different period time. soil surface kind of the surfaces that allow the absorption of blood inside it. The study was examining blood under weather condition until thirty days. The result was observing positive until end study that mean human blood antigen activity remain under weather condition when blood stain deposit on soil surface more than thirty days' table (4-7). After deposit blood stain on soil the soil will absorption it. The result was observing positive until end study that mean human blood antigen activity remain under weather condition when blood stain deposit on soil surface more than thirty days that agree with previous research that said dried blood stains those kept at room temperature, 40 °C and 37 °C does not loses antigen activity up to two years'. The statistical analysis outcome presented there was no significant between the result of exposure blood stain to weather conditions for 20 days and 30 days by comparing elapsed period time to observed the positive results for each period. The longest period time elapsed to observed the positive results was 49 sec in blood stain that exposure to weather conditions for 30 days when positive control observed positive result after 22 sec. Animal blood sheep used for comparative with human blood this is in line with previous research [13].

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Conflict of interests.

All the principles permitted by the College of Science at the University of Babylon were followed, and ethical abuse was also avoided, as permission was taken from the donors before conducting the experiment, and the waste was destroyed in a scientific and healthy manner so as not to affect the environment or the vital system in general.

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