TAKAYAMA TEST AS A BLOOD SPOT TEST TOOL IN BLOOD SAMPLES EXPOSED TO FRESHWATER DECOMPOSITION MEDIA

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ABSTRACT

In forensic examination, the findings on the inspection of the victim as well as on evidence in the form of spots on both the victim and the scene of the case in any amount can be used to assist the investigation process to help out in clarifying the case. The evidence, which is left behind and can be found and also examined, is blood spots. Blood spots found do not rule out the possibility to be exposed to decomposition media, in this case is water, because one of some efforts to omit an evidence is by disposing it into a watery area. Therefore, besides media decomposition exposure, the duration of exposure will also affect the results of identification of the spots findings. Water exposure as decomposition media will affect the integrity of identification of blood spots for the importance of forensic examination.

In this research, it was done an identification test of blood spot testing through a confirmation test using Takayama test for blood spots exposed to freshwater decomposition media. The research used true experimental design and analyzed by using descriptive analysis based on observations followed for 30 days.

The results of observation for 30 days serially in the control and treatment sample showed that blood spots exposed to freshwater decomposition media could still be identified as blood by obtaining hemochromogen crystals. The differences in the results of the control and treatment sample appeared with the presence of differences in color quality, namely pink hemochromogen crystals on the blood spot control and brownish yellow in the sample exposed to water, and could still be identified until exposure to water media on day 20. After day 20 to day 30 the color changed to pale yellow.

Keywords: identification of blood spots, decomposition media, Takayama test

INTRODUCTION

Unnatural death case, in this case it can include death by suicide, homicide, or accident, has occurred in all regions, including Indonesia, as a developing country. Unnatural death by alleged murder is an action to eliminate the lives of others, intentionally, planned, or unintentional. [1] In this case, it can be known based on the examination findings not only on the victim, but also the examination findings on the crime scene, as well as the examination findings of

evidence. The data from the National Criminal Information Center and the Central Statistics Agency (2013) show that there were fluctuations in the number of alleged homicide from 2006 to 2012. [2] In alleged murder activity, it does not rule out opportunity of attempts to omit evidences in order to obscure or complicate the investigation process. In this case the evidence can vary either from biological materials or other objects, either attached to the body or outside the body of the victim

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or the perpetrator, such as the objects around him. Physical evidences from body materials can be biological materials such as body fluids in the form of blood and blood spots, seminal fluid, sweat, or body tissues. Actions to omit evidences can be done in various ways including washing, disposing, burying, or destroying them. These actions will affect the process of evidence identification. A medium factor becoming the efforts to omit evidence in this case is decomposition medium, which greatly affect the success of identification. Decomposition media include land, water, and air.

A material evidence which can help the success of inquiry and investigation is the presence of blood spots. The actions of omitting evidences can be done by a variety of things mentioned above, obviously those actions can contaminate and disrupt the identification process such as discoloration in the evidences. Besides discoloration, those actions can also accelerate the process of damage of blood-forming structures and biological tissues contained inside due to lysis factor. [3] When evidences found in the form of blood spots, there is a confirmation test to identify whether the spots are true blood and where the spots come from. Takayama test is a confirmation test used to detect blood spots. Based on the research results this test can still be used to identify dried blood spots on clothing aged 20 years, and able to detect positively the presence of blood with the formation of pink crystals. [5][6] Inded, it is said that this test is able to detect the presence of blood while another confirmation test, Teichman test, shows negative results. [7] Thus, the purpose of this simple research was to find out if Takayama test could be used to identify blood spots on water-exposed cloths and find the difference of variations in the identification accuracy results based on day to day.

METHODS

This simple research is an experimental study conducted in a laboratory using randomization (*simple randomized sampling*) by using control groups. The samples of this research were 31 cloths with blood spots as much as 1 by using complete randomized design with 2 factors, namely factor I for the decomposition media from of cloths with blood spots; and factor II for the duration of exposure required in this study that is 0 day (as the control), 1 day, 2 days, 3 days, and so on up to 30 days. Each cloth was repeated 2 times. And there was a control group in which this group had 1 cloth given blood spots on it without exposure to decomposition media and was immediately examined. Therefore, the measurements examined were 64 measurements including control.

In this simple research the blood spots immersed by water as decomposition media were followed for 30 days and examined serially started from twenty minutes after treatment, 24 hours, 48 hours, to 720 hours. The expected result was the longer immersion in water, the less crystalline formed and more difficult to identify. And this treatment would be compared to the

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control namely blood spots on the cloth in which after 30 minutes of blood droplets it was directly examined by Takayama test to see whether there was crystal or not. The result was positive if there were pink crystals and repeated with the condition if the crystals were formed in the both treatments.

IThe samples were made by dropping 1 drop of blood equivalent to 0.05cc (taken from volunteers who had expressed willingness) on a piece of cloth which had been provided as wide as $100cm^2$ as many as 63 samples (including repetition and 1 control sample). Then the samples were placed in the open air, 1 sample as the control and 62 sampled were immersed in water as decomposition media. On day 0 Takayama test examination was conducted which was after 30 minutes of treatment and the next day in the range of 24 hours to 720 hours by looking at the shape of the crystal under a microscope. The examination was done by repeating respectively 2 times in each sample with positive conditions if pink crystals were formed in all repetitions, and negative results if the crystals were formed only on one of the repetition and not pink.

The data obtained at Takayama test were positive (+) or negative (-) and descriptive analysis was performed.

RESULT and DISSCUSSION

The results of Takayama test through a 1000x magnification microscope examination showed the presence of a hemochromogen crystal form as a reaction between blood and Takayama test reagent. On the control, the pink crystals were formed, and in the treatment of water immersion, hemochromogen crystals were formed with brownish yellow color.
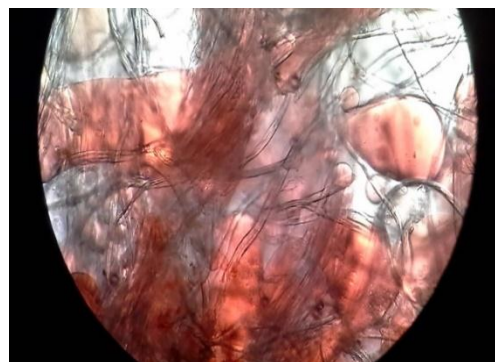

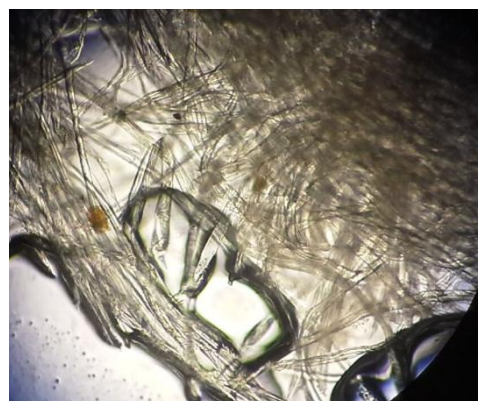**Figure 1**. The pink hemochromogen crystals in the control

Figure 2. The brownish yellow hemochromogen crystals in the water

After 30 days of observation in the sample with treatment in the form of water immersion for 720 hours. After Takayama test, the results remained positive with the difference in color quality obtained. The change in color quality can be seen in Figure 3.
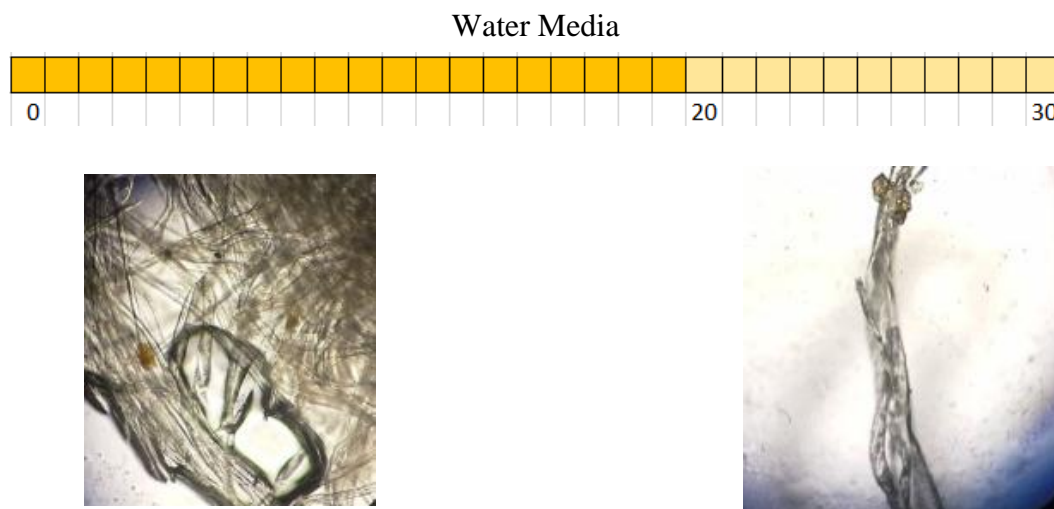
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Figure 3. The Illustrations of color quality change based on time

The blood spots on cloth immersed in water showed positive results since the crystals were found up to 720 hours with a color quality change from brown to yellow which was consistent from the examination at 30 minutes (hour 0), 24 hours to 456hour (19 days), and had a change turning to pale yellow at 480 hours (20 days).

DISCUSSION

This simple study was carried out to find the ability of Takayama Test to identify blood spots on water-exposed cloths and find variations in the results of the identification accuracy based on day to day. The treatment given in Takayama Test was in the form of heating of samples which had previously been dropped by mixed reagents and Benedict glucose and pyridine on the glass objects which had been prepared. If the heme had been heated by using pyridine in alkaline conditions with the addition of a little sugar, it would form a pyridine ferriprotoporphyrin crystal with pink color. [7] The resulting pink

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color was obtained from the reaction of ferrous iron hemoglobin when it encountered pyridine. [8] The sensitivity of this test was 0.001ml of blood or 0.1mg of hemoglobin. The negative results did not necessarily indicate the absence of blood, it could be due to technical errors. Blood spots could still be detected positively until the age of 20 years [6].

In the Masao Takayama's main research, he had conducted a research about blood spots exposed to the air, and in this experiment he wanted to do it with exposure to other decomposition media namely by being immersed in the water. The conclusion drawn by Takayama is that if pink crystals are formed, there will be blood spots on the site, but in this research it was found that the crystals' color formed in the three media is different. This causes the negative positive parameters of Takayama Test change, initially pink crystals, the formation of crystals only is caused by the three colors of these crystals cannot be standardized. The possibility of

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differences in the results of crystals formed due to exposure to water is caused by the hypertonic atmosphere facilitating the change in the blood becomes more quickly constricted and crenated. [9] After being followed for 720 hours random blood samples it was obtained brownish yellow crystals on the day 1 and changed on the day 20 to pale yellow. It is very possible that the crystal discoloration indicates the start of decomposition activity occurring in blood tissues. Takayama test experienced a decrease in identification power but was still able to identify blood spots on the fabric for 720 hours.

From this experiment it found that color differences had been found on the examination day 0 (30 minutes) after treatment. In the control it was found pink crystals and in the treatment it was got brownish yellow to pale yellow crystals on the 720 hour examination, so it can be said that Takayama test could still be used to confirm the presence of blood spots. The separated problem or, it can be said, limitation of this research is because there is no preliminary research which can show the positive scale of this Takayama test on other decomposition media other than air (on water or soil media), there is no standardized results of Takayama test which have been obtained from other media. The implication of this preliminary simple research is that Takayama test can be used to confirm the presence of blood spots until the examination for 720 hours. This is corroborated in theory which states that Takayama test can still be used to identify blood spots while another test namely Teichman test has shown negative results. Therefore, Takayama test has an accurate level which is still high in the age of long blood spots, especially on air decomposition media. [7] Based on these results, this test can be used for technical applications in forensic examinations to secure evidence which is to maintain the authenticity of evidences the form of blood spots which will show results in line with the expectations when the evidence storage is carried out at room temperature and exposed in the open air.

CONCLUSION

Takayama test can be used to identify blood spots on fabrics which has been exposed to water decomposition media for up to 720 hours. There are differences in the crystals' color quality in the periods of 0-456 hours and 480-720 hours and if it is compared to the control on blood spots on fabrics dried in the air. Qualitatively it shows that Takayama test can still be used to identify blood spots exposed to decomposition media.

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