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Some Considerations Regarding the Forensic Research of Human Blood Traces

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ABSTRACT: We can say that as long as the crime is committed by a single participant, namely the perpetrator, directed against social values, for example: aggravated theft, destruction of objects that are not in his patrimony, fraud, blackmail, etc., and the victim does not have direct contact with the perpetrator, we cannot raise the issue of the appearance of the probative substance, namely human blood. From the point of view of specialists, on the spot, human blood can be found in various physical properties. For the beginning, the rule of time is applied, so that if the committed deed did not exceed a maximum of 24 hours, then the blood can be found in liquid state being easy to take. On the other hand, if the 24-hour deadline has been exceeded, forensic scientists can find traces of solid blood, of course, this will not prevent the specialist from taking the evidence found.

KEYWORDS: evidences, blood, forensic, technology, laser method, biological, DNA, chemical

Introduction

Worldwide, over time, many forensic specialists have faced thousands of cases, among the most common being: murder, rape, kidnapping, suicide, etc. and all this could be solved by the evidence left behind, which sooner or later led to the solution of the mystery.

Any act committed by a human being entails a series of evidences, traces, no matter how small, which, with the help of the equipment and the team of criminals, reveal hidden secrets of the cases, such as: *how was killed? Is it the victim's handwriting on the "goodbye" note? Has the victim used an object at the crime scene in the last hours?* etc. However, forensic scientists find in the places where the crimes took place, various objects or substances that are used as evidence in the investigators' files.

As a result, in this paper, I have chosen to talk about the most influential evidence, which has led to the resolution over time of thousands of cases, namely: human blood. So we understand that this evidence has today become as simple to say as it is difficult to analyze and identify. Human blood is rich in chemical, physical and biological properties and the main organic molecule is human DNA. This substance is a complex element among criminals, because we are not talking about a simple red stain found at the crime scene, but much more. The notion of complexity of this substance starts from the theory counterclockwise, from the simple biological analysis that represents the final phase in the probationary stage to the identification of the blood stain made as such by a forensic specialist, which represents the beginning of the sampling technique. The importance of this notion is given by the probative substance itself, because due to its physical properties it is easily or not noticed at the crime scene, namely: first of all, time must be taken into account, because with its passage, the blood acquires different colors, which makes it difficult to identify, for example: in the case of an alcohol addict, the blood will have a darker color, close to the narcotic substance consumed, or on the contrary a much darker color; in addition to color, another important aspect, which time reflects on the blood, would be its liquid or solid state.

Finally, the technique of taking human blood is a simple one, namely, with the help of a stick of different sizes, having at one end a sanitary ware coating, the forensic scientist

touches by light rubbing the surface of sanitary ware with the surface on which it is located. The substance in such a way that the blood is absorbed by it, if it is found in a liquid state or an attempt is made to moisten the cotton wool so that it subsequently takes on the color of the blood taken, in the case of dry blood. Finally, the stick is kept in a test tube, sealed according to the procedure in force and transported to the laboratory for analysis, the place where the gender of the perpetrator or victim will be determined, in the absence of the corpse, chronic diseases if they are suffering from them, its gene, an important aspect in the case of investigators and implicitly of criminologists. The human substance found at the crime scene is used as a key element in the prosecutors' files, a fact with which they can easily accuse in court and at the same time win the case.

Forensic considerations on the properties of human blood

For a start, we can say that as long as the crime is committed by a single participant, namely the perpetrator, directed against social values, for example: aggravated theft, destruction of objects that are not in this patrimony, fraud, blackmail, etc., and the victim does not have exactly direct contact with the perpetrator, we cannot raise the issue of substantial evidentiary occurrence, namely human blood.

Definitely that each crime has different complexities, so we can deal with a qualified theft, for example: the perpetrator enters the victim's house at midnight by burglary and can start the theft operation, later being uncovered by mistake of the owner who turned on the light in the living room, which led the perpetrator to kill him with a knife or gun, as appropriate. In such cases, we therefore have the probative substance. And substance can materialize on the objects that surround the crime scene, being belonging to both the perpetrator and the victim. However, human blood can materialize either excessively, and here we are talking for example: in the case of a murder, the victim suffers a severe hemorrhage and in the meantime he is late as a murderer, leaving visible traces with the naked eye next to criminals to carry out actions of forensic evidence. The second aspect refers to the moment when the probative substance is not visible to the naked eye, as for example, in the case of a division, the author has made clean "visible" in such a way that I might not know that in that a murder was committed in the room, and as such, the criminals use the UV lamp, the human blood finally showing itself in places that are difficult to notice.

A criminal activity produces changes in the environment, visible or in a latent state, which are called traces. the discovery and interpretation of traces are essential and undoubted activities for the identification and unmasking of criminals (Cârjan and Chiper 2009, 103).

From the point of view of specialists, on the spot, human blood can be found in various physical properties. More precisely, for the beginning, the rule of time is applied, so that if the committed deed did not exceed a maximum of 24 hours, then the blood can be found in liquid state being easy to take. On the other hand, if the 24-hour deadline has been exceeded, forensic scientists can find traces of solid blood, of course, and this will not prevent the specialist from taking the evidence found. To be appreciated in this context is the materialization of human blood, namely that it, regardless of the states of aggregation encountered, it appears in the light of the UV lamp. From the point of view of the color palette of the blood, appreciated that here too the rule of time applies, as follows: in the first case, it can be found bright red, and in the second case it can be found under cherry color, or cherry black, in cases of crimes committed and discovered after a long time.

Another aspect to consider regarding the aggregation states of the blood is its bio-chemical properties. This raises the issue of the risks to which forensic scientists and biochemists are exposed in police laboratories, in substantial evidentiary cases infected with incurable viruses, we mention here: HIV, hepatitis B and C; but nevertheless, specialists use the responsibility of protective equipment.

Over time, many analysts have raised the particularly substantial problem of evidence in the case of its materialization, for example: a crime committed in a home where the owner and pet, respectively, the dog, and following the attack by the perpetrator, the owner is killed in the room on the floor, and this dog is stabbed on the stairs, dying in a pool of blood at the entrance to the house, the threshold slightly. Subsequently, the author hides the body of the owner and the dog, making himself invisible, no longer having time to clean up the blood left.

And here the problem arises that the first step that forensic scientists will take is to take blood samples in front of the house, then from the rest of the house, and so the dilemma arises when it is not known exactly whose blood it is, *a blood animal or is it a human blood?* In this case, many specialists answered that the difference between human and animal blood is made by substantial conditions found at the crime scene and implicitly measuring the trajectory of the drops but also the spot patterns (Smith and Liesegang 1996).

The clarification of certain problems depends on the way in which the judicial body discovers and removes biological traces from the crime scene, in this case blood traces, depends on the clarification of some essential problems related to the criminal act, especially to the persons involved in its commission (Buzatu 2013, 66).

Technology applied in data collection of human blood by the method of sol-gel transition and drying

We are in the 21st century, so technology is constantly evolving, not only in large companies but also in forensic institutions around the world. In other words, if in the first part of the paper we discussed the properties of human blood, in this part I decided to present the method of its analysis, through sol-gel transition and drying in order to collect data.

From a chemical point of view, the blood is in a solid state (dry) its analysis is done with the help of a phase-like system such as a gel that has both liquid and solid properties. In order for the properties of the gel to take effect, approximately half of the probative substance is removed by evaporation so that the particles present vary according to their volume fraction. The literature on aggregation states, respectively the solid states of blood, presented at a time, before the mentioned method, the fact that this drying of the substance was reduced from the point of view of aggregation, so the new method was appreciated.

The method of transition through sol-gel and drying is manifested by going through different stages as follows: for the beginning the body volume of the substance decreases losing volume and size due to the evaporation effect. At a critical point, the substance becomes rigid, and the reduction process ends, but the evaporation process does not lose its properties. This process of evaporation, which is emphasized, has its place of action inside the system, a small liquid part being isolated in the pores, subsequent to this process being attributed the process of diffusion of vapors to the outside. Therefore, the process of drying the gels is completed but also divided into several stages. A study conducted in 1986 by Dwivedi showed that the process of drying gels of different thicknesses, alumina, focuses on the loss of its mass compared to the passage of time. Thus, in the case of the probative substance under discussion, namely human blood, it has been shown by the specialist that 23% of the initial mass is slightly dry, this process going through the following stages:

First, this method focused on a constant rate period (CRP) where it was shown that the loss of gel volume is directly proportional to the volume of liquid evaporated, and at the end of the stage a critical point is reached that can cause the gel to crack due to contraction stop. Following the reaction of the critical point, the gel may initially suffer a slight rate of decrease (FRP1) in which the liquid reaches the partial pores empty, followed by a second decrease in rate (FRP2) corresponding to the drying stage. Finally, the evaporation takes place inside the probative substance, the blood, the liquid diffusing to the surface in the form of vapors, a new

state of its emergence. In conclusion we can say that this method is interesting regarding the analysis of solid (dry) blood (Smith, Nicloux and Brutin 2020).

Laser method in data collection of human blood - RAMAN spectroscopy

In this part of the paper, I decided to analyze the applied technical method of the chemist Igor Lednev, which is based on Raman spectroscopy. Specifically, the laser was designed for the dry blood sample taken by criminals sent to the crime scene. If we ask ourselves how this laser works, well, the solid blood sample is placed under the brightness of the laser thus measuring its interactions with the substance.

In this case, we cannot speak of a sample that resembles the analysis of a fingerprint for example. The results of this method are instantaneous, the sample not being damaged, and can be reused for future tests. In the study conducted by the specialist, it was shown that spectroscopy in combination with Fourier-infrared by total attenuated reflection (ATR FT-IR) was tested on a sample of human blood and animal blood. We thus return to the first part of the paper, the same problem is highlighted, the fact that with the naked eye, the two substances, although distinct from a bio-chemical point of view, seem to be identical, but due to this new technological method we succeeded in a 100% to determine exactly what human blood is and what animal blood is (Lednev, Sdvizhenskii, Asyutin and Tretyakov 2019).

Conclusions

In my opinion, human blood remains the most important substance of evidence, being among the only evidence that can present a high percentage in identifying the offender. In terms of blood collection and analysis technology, technology is constantly evolving, not only in large companies but also in forensic institutions around the world, it has been 100% possible to determine exactly what type of blood is.

A study conducted in 1986 by Dwivedi showed that the process of drying gels of different thicknesses, alumina, focuses on the loss of its mass compared to the passage of time. Thus, in the case of the probative substance under discussion, it was shown by the specialist that a percentage of 23%, and all this thanks to modern forensic technology.

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