FEATURES OF DETECTING AND SEIZING TRACES OF BIOLOGICAL ORIGIN DURING THE INVESTIGATION OF CRIMINAL OFFENSES

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Abstract. Develop an integrated methodological approach to conducting a forensic examination to identify micro quantities, micro traces, contact traces of biological origin using modern molecular genetic methods. In the process of committing a crime, the offender is in direct contact with the body of the victims, their clothing, and other objects of the environment, resulting in visible and invisible (latent) traces. The complexity of the complete destruction or falsification of traces of biological origin increases the proportion of these traces in the system of physical evidence. Used for identification purposes, this evidence is most reliable and significant both in exposing reasonably suspects and in establishing non-involvement in the crimes of innocent persons. The widespread introduction and application of methods to identify and investigate visible and invisible (latent) DNA-containing traces will lead to an increase in the disclosure of grave and especially grave crimes, including the disclosure of crimes of past years. Mastering and improving this area of research is one of the highest priorities of the forensic genetic examination.

Keyword: identification, traces of crime, evidence, forensic medical examination..

Personal identification in forensic practice today goes to a new level thanks to the advent and implementation of modern molecular genetic technologies and DNA research methods, which, due to their high specificity and sensitivity, make it possible to effectively identify a person by micro-traces of biological origin, such as blood, saliva, sperm, other excretions of the human body contained in micro trace, as well as biological material of contact traces.

Today, the task of identifying a person by micro-footprints and contact tracks is one of the main problems of modern forensic science. Improving and increasing the efficiency of identification methods is of significant interest to the judicial and investigative authorities.

Over the past ten to fifteen years, both foreign scientists and Ukrainian experts have been solving this problem. The prerequisites for this were the discovery and implementation of new technologies, in particular, capillary electrophoresis systems based on the detection of fluorescently labeled amplified DNA fragments, the development of more sensitive multiplex genotyping systems for chromosomal microsatellite loci.

Since 2010, the staff of the Department of Forensic Medicine of Odessa National Medical University, forensic experts of the Department of Forensic Molecular Genetic Examinations of the Odessa Regional Bureau of Forensic Medical Examination, has been conducting research work, the purpose of which is to develop methodological approaches for a comprehensive study of microprints of biological origin on material evidence [1, P. 224-247.].

In a series of our works on this problem, to solve expert problems in the study of single cells, an algorithm was developed and proposed for a comprehensive study of micro trace of biological origin on material evidence. The essence of the complex research algorithm is to conduct the sequential stages of the forensic medical examination of material evidence using modern forensic cytological and forensic molecular genetic methods. An important conclusion follows from our results: with the current arsenal of forensic genotyping methods for chromosomal STR loci and for reliable typing, genetic material contained in at least fifty cells must be amplified [2, P. 24].

In continuation of the research work on the identification of micro-footprints, we proposed several methodological approaches for a comprehensive stepwise study of biological traces, including the use of serological, cytological and molecular genetic methods.

The ability to identify micro-traces at the level of several tens of nuclear cells will allow to solve most of the expert tasks that the investigation poses to forensic genetic experts.

Forensic investigative practice shows that in most cases the criminal makes attempts not to leave visible (noticeable) marks on objects, clothes, instruments of crime or destroys the traces of his presence. In this aspect,

our priority is an effective process of searching, seizing, preserving and researching the discovered biological material on material evidence.

In many cases, the only and main biological object of identification significance is micro-footprints and contact traces in which there are cells with nuclei (nucleated cells) containing DNA, as well as free-lying DNA, suitable for obtaining a DNA profile and, accordingly, identification.

Modern ideas about the possibilities of DNA analysis for forensic purposes for the identification of microprints and contact traces are based on scientific theoretical and practical developments in the field of forensic medicine, molecular biology and forensics.

A modern forensic molecular genetic examination is an expert study of micro quantities, micro-traces and invisible (latent) traces of biological origin. To establish the DNA profile (genetic profile) of microquantities and micro-traces, biological material in the amount of 15-20 cells is currently required.

A retrospective analysis of the data from the work of the Department of Forensic Molecular Genetic Examinations of the Odessa Regional Bureau of Forensic Medical Examination on the structure of the studied biological objects in the period from 2008 to 2018 shows that the percentage ratio of the studied biological objects for the analyzed period changes towards an increase in the study of microquantities and microgeneses blood, saliva and sperm from 10-15% to 25-30%, a similar trend is observed for invisible contact (latent) traces from 1% d about 7-10%.

Thus, the use of modern molecular genetic methods at this stage in our laboratory conditions, with the available equipment and reagents, is justified and advisable only when creating a new integrated methodological approach for conducting a forensic medical examination in order to identify microprints and contact traces. Moreover, the development of effective and new methodological approaches aimed at studying these biological traces on physical evidence requires the participation of specialists in the field of forensic medicine and forensic science.

In the process of committing a crime, the criminal directly contacts the body of the victims, their clothes, and other objects of the environment, as a result of which visible and invisible (latent) traces are formed. The complexity of the complete destruction or falsification of traces of biological origin increases the proportion of these traces in the system of material evidence. The evidence used for identification purposes is most reliable and significant both in exposing the justifiable suspects and in establishing non-involvement in the crimes of innocent people.

The forensic examination of the material evidence is sent to the things of the suspect, the victim, objects, instruments of crime.

From the point of view of a forensic medical examination, traces formed by blood, sperm, sweat, saliva, and vaginal discharge may be found on the body of a suspect, victim, clothes, and other objects. Identified traces of biological origin carry significant search and evidence after the study.

Visible traces - often formed by blood, less often sperm, saliva, vaginal secretions and other secretions. A trace is considered to be visible, which can be directly perceived by vision, even if for this it needs to be illuminated at an appropriate angle, including under various lighting conditions in the visible region of the optical spectrum. The amount of biological material for DNA analysis - the number of nucleated cells in such traces is almost always enough to conduct a fruitful examination in order to identify a person.

Interest for the investigation and significance in this regard are invisible traces.

An invisible trace is a trace that cannot be directly perceived by vision, and which must be detected using physical and chemical methods. Invisible (latent) traces are in most cases micro-traces and trace amounts of blood, sperm, saliva, as well as contact traces that contain epithelial cells and other DNA sources. The number of nucleated cells and DNA in such traces is almost always calculated in tens of cells, which sharply limits the range of molecular genetic studies.

Other sources of DNA are “free-lying” DNA or extracellular DNA. This conditional “appearance” of DNA is determined in a variety of extracellular fluids of the body, including: plasma, serum, urine, saliva, and even spinal cord fluid. It has been established that “free-lying” DNA is found in extracellular fluids in the form of structures such as microbubbles, microparticles, apoptotic bodies, exosomes, histone complexes, and virtosomes. The cDNA values were determined in healthy donors, which range from 10-100 ng / ml. Apparently, the cvDNA family in the body should include: cellular and mitochondrial DNA from somatic and tumor cells undergoing apoptosis and necrosis; DNA from erythroblasts, the nuclei of which are enucleated during the process of differentiation into red blood cells, DNA from lymphocytes during their apoptotic death after stimulation, DNA of embryos in the mother’s blood, bacterial and viral DNA. It is assumed that, normally, the main source of cDNA are hematopoietic cells, cells of the immune system. [3, p. 399].

Thus, the proof of the actual presence of “free-lying” DNA or extracellular DNA and the possibility of its efficient (successful) typing is the fact that if the result is negative for the presence of nucleated cells during a forensic cytological examination of micro-traces and / or contact traces A DNA profile of the biological trail under investigation should be established.

Traditional approaches to the study of material evidence are their total study using forensic immunological (serological) methods and forensic cytological (microscopic) methods in accordance with the Ministry of Health of Ukraine Order No. 6 (On the development of the shipboard medical service of Ukraine. The order of the Ministry of Defense of Ministry Health of Ukraine, dated 17 September 1995, No. 6 Registered in the Ministry of Justice of Ukraine, 26 Liplin, 1995, N 248/784). This applies to both visible and invisible tracks.

The study of micro-traces, micro-quantities and contact traces of biological origin is carried out by forensic experts in the Department of Forensic Cytology. The tasks that the cytological experts pose as a consequence: establishing the nature of the trace - the presence and affiliation of blood cells, sperm, saliva, in some cases organ-tissue affiliation and the presence of nucleated cells suitable for DNA analysis.

In cases where the investigator does not provide data for a localized search for traces of biological material, in the laboratory, a study of the whole subject is carried out, which is especially difficult in cases of searching for micro-tracks and contact traces on large objects presented for research, with sizes from 50.0 cm and more for example, boxes for packing bulky items, cars, etc., and vice versa, the total study of cartridges packed in boxes, boxes, etc. The tactics of research and search for traces are as follows: Redmet conditionally divided into zones - areas with area dimensions from 5,0h5,0 cm, more experts preparing cytological preparations stained them, their microscopically examined in accordance with the tasks. The imperfection of this method is obvious: in an attempt to increase the likelihood of finding biological traces with cells, an expert cytologist is faced with the problem of overconsumption of expensive reagents and the cost of expert time, as a result of which the examination time can be objectively prolonged, most often with low efficiency.

Target robots. The aim of our work was to develop a comprehensive methodological approach for conducting a forensic medical examination with the aim of identifying micro quantities, micro trace, contact traces of biological origin using modern molecular genetic methods.

In this case, the innovation in conducting a forensic examination of material evidence is the application of an integrated approach using the basics of trasology, forensic medicine, forensics, situational (situational) analysis to search for and remove microquantities, micro-traces, contact traces of biological origin. The next stage is the establishment of the nature and species of biological material using special tests based on immunochemical analysis, followed by the establishment of a DNA profile of these traces.

Materials and research methods. To date, forensic experts who study material evidence with traces of biological origin using molecular genetic methods, in their special activities, are guided by methodological recommendations published in 2012 ("Victoria DNA analysis in forensic examination of speech evidence and examination special fatherhood (motherhood, childbearing) ", methodological recommendations, Kyiv, 2012, 32 pp.). These recommendations do not fully reflect the current aspects of the forensic medical examination. In connection with these, it is necessary to develop methodological approaches for conducting a forensic medical examination in order to identify micro quantities, micro trace, contact traces of biological origin using modern molecular genetic methods.

The concept of a comprehensive methodological approach is the systematization of modern scientific ideas about biological traces of various nature, the specifics of biological objects (small size, invisibility, unstable structure, combination with traces of a different biological origin, destruction under the influence of environmental conditions (changes in humidity, light, temperature) with taking into account knowledge and concepts in the field of forensics, biology and forensic medicine.

The first stage of the forensic medical examination of material evidence is directly related to the search and detection of trace amounts, micro trace, contact traces of biological origin.

Search and detection of visible (obvious) micro-quantities and micro-traces of blood, sperm and saliva on material evidence in laboratory conditions practically does not cause difficulties with a well-developed algorithm for finding traces and the availability of appropriate material and technical support.

The algorithm for the search for visible (obvious) micro-quantities and micro-traces of blood, sperm and saliva is based on determining the tactics of the study in accordance with the data obtained during the study of the materials of the criminal case, namely the protocol of the inspection of the scene, the photo-table of the inspection of the scene, the protocols of interrogations of victims, suspects, witnesses; opinions of the expert of the forensic medical examination of the victims, the accused and other persons; conclusions of the expert of the forensic medical examination of a corpse in cases of violent crimes. On the basis of the obtained evidence, various situations are modeled (a situational analysis method) by the possible mechanism for the formation of specific or alleged traces and their likely presence on a specific material evidence. Next, the search and detection of traces is carried out in accordance with the developed research tactics - the algorithm.

To search for trace amounts, micro-traces, contact traces of biological origin in laboratory conditions, we recommend using expert light complexes that are designed to detect hidden traces on physical evidence, for example, Lumatec Superlite S04, Lumatec, (Germany), Crime-lite ML2 Serology "," Foster + Freeman Ltd. ",

(Great Britain), or similar budget production systems in China. These devices allow you to search for hidden and washed traces of blood, sperm, saliva, sweat on any surface, including textiles.

Considering that any item seized during the inspection of the scene of the incident can be material evidence with traces of biological origin, and the detected biological traces are a potential object of a forensic molecular genetic examination, when searching for traces, one should give preference to gentle methods for detecting micro-traces, it is advisable to use modern emitters with a wavelength of at least 350 nm, failure to comply with this condition leads to the destruction of the irradiated DNA and its unsuitability for further DNA research.

After the discovery of biological traces, the next step is the removal of trace amounts and micro-traces of blood, sperm and saliva from material evidence in laboratory conditions. The stage is carried out in accordance with the standard forensic procedure for working with micro-traces: flushing, cutting out a trace with a carrier. Micro-traces should be washed off smooth, trace-sensitive surfaces and other objects, carriers using special swab probes, brushes for examining MP and removing biological material or special kits for collecting evidence, for example, the SafeDry Evidence Collection Kit or its analogues.

The next stage is the establishment of the nature and species of biological material using special tests based on immunochemical analysis. To establish the nature in laboratory conditions and the dependence on expert tasks and the properties of biological traces (size, influence of external conditions, etc.), we recommend using immunochemical tests for express diagnostics of biological traces, such as SERATEC® HemDirect (Germany) for Amylase Test blood (Germany) for saliva, PSA Semiquant (Germany) for sperm.

In 2016-2017, we carried out scientific studies of the immunochemical test “CITO TEST FECAL OCCULT BLOOD” “Pharmasco” (Ukraine, Spain) for rapid diagnosis of occult blood, which is used in clinical laboratory diagnostics, the results of the work are presented at international conferences and published (Krivda R.G., Stoyva M.I., Yushchuk K.M., “Prevailing the ability to test the immunochromatographic test“ Cito Test Fecal Occult Blood ”to establish evidence and species belonging to blood tests on speech evidence in an integrated trial Wildlife Expertise "Molodiy Vvecheniye No. 4 (44), 2017 p.). It was proved that the immunochemical test “CITO TEST FECAL OCCULT BLOOD” “Farmasco” (Ukraine, Spain) can be used for screening studies of blood traces at the scene, in the laboratory, in order to reduce the time for a comprehensive forensic biological examination for subsequent DNA -analysis.

After establishing the nature and species of the biological material, micro trace of blood, sperm and saliva are examined using molecular genetic methods in accordance with the developed procedure. DNA is extracted from biological micro-traces of blood, sperm and saliva using the PrepFiler® Forensic DNA Extraction Kit (Applied Biosystems, USA), a DNA isolation kit, in accordance with the protocol recommended by the manufacturer. Next, the concentration of extracted DNA from objects is determined using a Qubit 2.0 Instrument Q 32866 fluorimeter (Invitrogen, USA). For the study of loci, the polymerase chain reaction (PCR) method is used using the AmpFlSTR Identifiler Plus reagent kit (loci D8S1179, D21S11, D7S820, CSF1PO, D3S1358, TH01, D13S317, D16S518, D2S135, D19S418, D19S418, D19S435, D19S433, V19 , FGA, Amelogenin) manufactured by the company ("Applied Biosystems" USA), in accordance with the instructions attached to the kit. The amplification reaction is carried out using a GeneAmp® PCR 2720 device (Applied Biosystems, USA). The specificity of the amplification reaction was assessed using the positive control (control DNA sample 9947A and negative control (DNA-free sample). Separation and detection of fluorescently labeled amplified fragments was performed by capillary electrophoresis using a 3130 Genetic Analyzer (Applied Biosystems, USA), in the environment of the polymer POP-4, the length of the capillaries - 36.0 cm, the acceleration time - 45 minutes Determination of the lengths of the amplified fragments and the establishment of allele numbers were carried out on the basis of the internal length standard GeneScan-600 LIZ Size Standard (" Applied Biosystems ", USA) and an allelic leader included in the reagent kit using the GeneMapper ID Software v.3.2 program. The analyzed electrophoregram data were arranged in the form of a table with an established DNA profile, then a comparative analysis of the DNA profiles of subjects and experimental subjects was carried out.

Our comprehensive approach to conducting a forensic medical examination of evidence with trace amounts and micro-traces of blood, sperm and saliva using molecular genetic methods differs from the traditional one in that at the stage of searching for micro-traces, the situational analysis method is used to determine the formation mechanism of specific or suspected traces and their likely location (location) on a specific physical evidence based on the evidence of the case file for the detection algorithm works by finding traces; to search for traces, it is proposed to use modern complexes of expert light; it is recommended that biological material be removed using special forensic kits to collect evidence; to establish the nature and species of biological material, we recommend using special tests based on immunochemical analysis; To establish DNA profiles of micro-traces, we recommend using sets adapted for criminalistic purposes for DNA isolation and PCR amplification.

Thanks to the proposed integrated approach, it is possible to efficiently plan the material and technical costs of conducting the BMS, reduce the cost of reagents and consumables at the stage of establishing the nature and

species of biological material, reduce the time of the BMS due to the efficient and targeted search and removal of traces and establish the nature and species accessories of biological material, DNA analysis.

The genetic experts should be entrusted with carrying out all stages of the BMS of material evidence, and most importantly, increase the effectiveness of the forensic molecular genetic examination.

An example of the effective use of the proposed integrated approach when conducting a forensic molecular genetic examination in order to identify micro trace blood, saliva, sperm and secretions from the anus, on the fact of sexual violence against a minor.

From the circumstances of the criminal case, it follows that in the I.th district of Odessa region in August, an unknown man, being in the park during the daytime, fraudulently took a 9-year-old boy to his apartment, after which he committed depraved acts with him in the form of an introduction to the anus 50.0 ml plastic baby bottle. A few hours after the deed, the suspect released the child. The investigator delivered the boy's clothes to which he was at the time of his discovery, namely a T-shirt, shorts, underpants, and socks, to the Department of Forensic Molecular Genetic Examinations. One day after the suspect was detained and his apartment was inspected, his clothes were seized: a short-sleeved T-shirt, sports pants, underpants, as well as a plastic bottle with a volume of 50.0 ml.

At the first stage, the following materials were requested by genetic experts to study, namely: the protocol of the inspection of the scene of the incident - the apartment of the suspect, the photo table of the inspection of the scene of the incident, the report of the interrogation of the victim, the expert report of the forensic medical examination of the department of victims, accused and other persons on the examination of the child , examination of depraved acts against a minor.

After studying all the case materials received, on the basis of the obtained factual data, various situations were modeled on a possible mechanism for the formation of traces (damage) within the framework of the versions indicated by the investigation for developing an algorithm for searching for traces.

The algorithm for finding traces on material evidence consisted of the following steps:

1. Inspection of the victim's clothes: T-shirts, shorts, underpants, a pair of socks for traces of blood, saliva, sperm and discharge from the anus. The interrogation of the injured child showed the following: at the time the crime was committed, the injured boy was without clothes directly on the couch. From the data of the expert's report of the forensic medical examination of the department of victims, accused and other persons on the examination of the child, it follows: no visible injuries were found on the body, no injuries (tears, ruptures, hemorrhages) were found in the anus. Thus, it can be assumed that the child did not have external injuries, accompanied by bleeding, therefore, the search for traces of blood on the clothes of the victim may not be effective. Attention should be paid to finding traces of saliva, semen and secretions from the anus directly on the MP. From the protocol of the inspection of the scene - the apartment of the suspect, the data from the photo inspection of the scene of the incident shows that there is a sheet and a pillow on the sofa. Thus, an expert version of the incident was formed, according to which the center of the scene should be considered a sofa with a sheet. The investigator was informed of this fact, as a result of the repeated WMD, the sheet was seized.

2. Inspection of the clothes of the suspect: T-shirts with short sleeves, sweatpants, panties for the search for traces of blood, saliva, sperm and secretions from the anus. From the findings of the expert report of the forensic medical examination of the department of victims, accused and other persons on the examination of the suspect, it follows that when examining the body of the suspect, no visible external injuries were revealed, hygiene procedures and the toilet of the genitals were carried out 6 hours before the examination. Thus, it can be assumed that the suspect did not have external injuries accompanied by bleeding, therefore, the search for traces of blood on his clothes may not be effective. The questioning of the injured child showed the following: at the time the crime was committed, the suspected man was in his underpants directly on the couch. Attention should be paid to finding traces of saliva, sperm, secretions from the anus directly on the suspect's panties.

3. Inspection of a plastic bottle with a volume of 50.0 ml: based on the size of the object, version of the investigation, testimony of the injured boy: "the man carried out actions (manipulations) in the area of the anus with the help of a plastic bottle, while he himself" licked "it and forced him to lick the victim ". A plastic bottle with a volume of 50.0 ml, which was discovered and seized during a WMD, was delivered for examination. The likelihood of finding traces of saliva, discharge from the anus, contact traces is high, you should visually differentiate these traces, in order to avoid mixing biological material from the victim and suspect.

4. The sheet that was discovered and seized during the WMD was delivered for examination. From the data of the inspection report of the scene of the incident - the apartment of the suspect, the sofa and the bed sheet, the photo inspection table of the scene, the protocol of the interrogation of the victim, the visual inspection of the sheet: the dimensions of the subject are 145.0 x 214.0 cm, various situations were simulated regarding the possible position of the victim and suspect with the purpose of identifying the most likely places of contact tel.

After examining the victim's things (T-shirts, shorts, underpants, a pair of socks) and conducting an immunochemical analysis using the rapid tests SERATEC® HemDirect (Germany), Amylase Test (Germany),

PSA Semiquant (Germany), visible traces similar to blood, saliva, sperm concluded: no biological material (blood, saliva, semen and secretions from the anus) was found.

After examining the things of the suspect (short-sleeved T-shirts, sweatpants, panties) according to a similar scheme, no biological material was found (blood, saliva, secretions from the anus), traces of sperm that were removed for DNA analysis were revealed on the panties.

After examining a plastic bottle with a volume of 50.0 ml, traces of saliva were revealed in the upper part of the bottle, mixed traces of saliva and secretions from the anus with a low blood content were found in the lower part of the bottle.

After examining the sheets from the most likely places of contact between the bodies of the victim and the suspect, as well as traces of suspicious blood, saliva, sperm and secretions from the anus, clippings were made that were adequately examined. Conclusion: traces of saliva, sperm, blood, traces similar to sweat-fat secretions were found.

All biological material found was removed in the form of clippings or swabs using the SafeDry Evidence Collection Kit.

After the procedure of DNA extraction from biological traces, polymerase chain reaction (PCR) with extracted DNA, and obtaining the sizes of amplified fragments, DNA profiles of traces (objects) were established, then a comparative analysis of DNA profiles of objects and samples of subjects was performed.

Results. As a result of the work, DNA profiles of traces of sperm found on the suspect's panties, mixed traces of saliva and secretions from the anus, traces of saliva, sperm, blood, traces of sweat and fat secretions on the sheet, the genetic signs of which completely coincided with the DNA profiles of the suspect and were identified, were identified. the victim.

Practice shows that primary forensic medical examinations, in the production of which forensic immunological and forensic cytological (traditional) methods are used, do not meet modern knowledge and the requirements of forensic medicine and jurisprudence, and may be ineffective when working with subtle or invisible (latent) traces . An example of the effective use of the proposed integrated approach when conducting a repeated forensic molecular-genetic examination in order to identify micro-saliva and contact sweat-fat traces.

In one of the districts of the city of O. in the apartment, a corpse of a minor with signs of violent death was discovered, the cause of mechanical asphyxiation by strangulation with a soft loop. A soft textile belt was removed from the scene of the incident from a woman's dressing gown with a length of 150.0 cm. Initial forensic examinations, including molecular genetic examinations, were carried out. According to the results of studies, "traces of sweat and saliva were found on the belt, to determine the group, gender of which was not possible." For the initial molecular genetic examination for the study, clippings with biological traces after the studies were carried out, as a result of DNA analysis of biological material on the clippings from the dressing gown "it was not possible to determine the DNA profile of the traces".

A repeat forensic molecular genetic examination was appointed to our department in order to identify micro trace of saliva and contact sweat and fatty traces. A soft textile belt from a woman's dressing gown with a length of 150.0 cm was presented for the study, with traces of the studies. After studying the materials provided in the criminal case (the protocol for examining the scene of the incident - the apartment in which the victim was found, the photo table for examining the scene of the accident and the place of detection of the corpse - the kitchen center on the floor, the protocols for interrogating witnesses, the expert report of the forensic medical examination of the corpses of medical emergencies), the most probable places of detection of traces of the person who committed the crime. After using the proposed integrated approach, traces of saliva and sweat were found, in most objects these were mixed traces of the victim and biological traces of people who had contact with this thing. Thus, an expert version of the incident was formed with a limited circle of suspects.

The effectiveness of the study of contact traces is due to the progress of biology and the integration of its knowledge into many other sciences. Biological traces carry enormous information both about the properties and attributes of the subject who committed the crime, and about the mechanism of its commission. The role of traces of biological origin at the initial stage of the investigation of crimes is especially significant when other sources of information about the circumstances of the crime are extremely limited or even completely absent.

Today, we use these technologies when conducting forensic medical examinations in order to identify a person by contact traces. Most often, crime instruments, such as knives, axes, etc., are examined in order to identify traces of blood on the working surface and to identify contact traces on the handles. Also, in situations of confirming the version of the investigation and reconstructing the events of the MP during an accident, the internal surfaces of the vehicle, the steering column, control levers and airbags are examined.

The study consists of a study of the materials provided (protocol for examining the scene of the incident - a vehicle, photo tables for examining the scene of the incident, protocols for interrogating witnesses, expert opinion of the forensic medical examination department of the SME corpses, if necessary, expert opinion of the forensic medical examination department of the victims, accused and other persons about examination of victims). Further research is the compilation of an algorithm for searching for traces, the search for traces is carried out using a

complex of expert light with a wavelength of at least 350 nm, the next step is the removal and proper investigation of the traces.

The following determining factors influence the effectiveness of the process of conducting molecular genetic studies of contact invisible (latent) traces: the content of cells and DNA in the trail, the method of removal, and the need for additional studies.

Firstly, a priori, in contact sweat-fat traces contains a very small number of nuclear cells - DNA sources, as well as an unknown amount of "free-lying" DNA (extracellular DNA). The content in the trace of a certain number of nuclear cells and "free-lying" DNA is determined by the individual characteristics of the individual who left the trace, environmental factors, as well as the characteristics of the subject itself.

To increase the amount of sweat-fat secretions, i.e. the increase in the amount of biological material in the trace is affected by gender, the state of the body and health. For example, men sweat twice as much as women, in a state of hyperthermia - an increase in temperature with infectious diseases, with intoxications of various origins, with age-related changes (menopause, hormonal disorders), with non-infectious diseases - psoriasis, with increased psycho-emotional status with severe somato - autonomic reactions in adolescents, in states of psycho-emotional and physical arousal and tension (physical activity, violation of ethical standards, rights), all these processes increase perspiration the rate of regenerative processes, desquamation and exfoliation of the epithelium many times.

Also, individual habits influence the amount of biological material in the trail, for example, wipe sweat on the face with your hands, nose with your fingers, touch your lips. As a result of this, there is a simple contact mechanism for transferring skin cells, mucous membranes to hands, fingers, and then, when touched, these cells are transferred to objects in the form of contact traces.

Environmental factors often negatively affect the state of contact traces, for example, ultraviolet rays, humidity, and time cause processes of degradation of cells and extracellular DNA [4, P. 14-18].

Characteristics of the subject should be considered both individual and trace perceiving. For example, on used banknotes, door handles, tool handles, ATM keyboards, etc. with a large number of users, it is almost impossible to obtain a suitable DNA profile.

The following characteristics are associated with the structure of the material and its surface. For example, on a printer paper, a contact trace is suitable for DNA identification within 5-7 days; on a smooth surface, contact traces are suitable for obtaining a DNA profile within seven days.

Secondly, the method of removing the contact trace depends on the material and its surface, which in turn affects the final amount of DNA under investigation. Among the proposed working methods: make clippings with traces of the material with the carrier, flush and the technique of teiplifting.

The problem of removing contact traces is to collect as much biological material as possible from the person who left the trace, and the trace should be free of “foreign DNA”.

Cutting out contact marks with carrier material can only be done provided that there is investigative and operational information about the use of the item by one person, i.e. in forensic research of individual items of clothing, to solve problems of belonging items to a specific person, for example, gloves, hats, masks, etc.

In other cases, it is necessary to carry out, washing off the traces or applying the method of teiplifting.

Rinses should be carried out from smooth hard surfaces using sterile gauze swabs moistened with double-distilled water, or sterile saline. We carried out scientific research on this topic, the results of which are presented in the methodological recommendations of the Ministry of Health of Ukraine, Kiev, 2013 (“Forensic medical research algorithm for micro trace of biological origin on material evidence using molecular genetic methods”, Krivda G.F., Krivda R .G., Umansky D.A.). It was shown that it is possible to wash contact traces with a lysis buffer, which is part of the PrepFiler® Forensic DNA Extraction Kit (Applied Biosystems, USA). The positive effect of using lysis buffer immediately at the time of removal of the biological material is achieved due to (based on the fact that ...).

Flushing contact traces from tissue surfaces can be performed using special forensic probes, for example, Genetics 4N6FLOQSwabs ™ (Copan, Italy) or others.

For example, when the contact trace of the suspect is on the victim’s clothing from textile, wool material, the process of extracting biological material should be superficial in order to minimize the impact on the underlying substrate of material adjacent to the body, to prevent capture of the biological material of the host.

Today, in the department of SMMGE OOБ CMЭ to remove contact traces we use the method of teiplifting. We have the results of our scientific research on this topic, the results are presented in the journal Molody Vcheniye, No. 9, (24), 2015 in the article “Optimization of DNA extraction methods from hidden traces of biological material”, Krivda R.G., Stoeva M.I.

The method of taping - the selection of biological material on adhesive tape [...], due to its simplicity, allows you to process a large area of objects and maximize the collection of biological material of the face, which left a mark free from "foreign DNA" under certain conditions. In our expert work, we use the medical adhesive “Transpore ZM”, a hypoallergenic transparent breathable size of 2.5 cm x 9.1 m, the patch is perforated, with a

good degree of adhesion. Before using the new packaging, we cut off the edges of the coil, 0.7 cm above and below, unwind 10-15 cm. To remove biological material, a patch of 1.0 x 1.0 cm is needed, the patch does not stick to the gloves of the expert, we apply the fragment with a little effort the adhesive surface several times to the places of the intended trace until the patch loses its adhesive properties (sticks), after which it must be turned outward with the working surface and transferred to a tube for DNA isolation. One patch of patch can be used to treat a textile surface with a trace measuring 5.0 x 5.0 cm, then it loses its properties, becomes clogged with fibers and the probability of a trace being removed is extremely small. From smooth surfaces with one fragment, you can process the surface with a trace of 15.0x15.0 cm.

Thirdly, when working with contact traces, there is a need for additional research. Additional research should be understood as the question of establishing the presence of nucleated cells and the nature of biological material, i.e. the need for forensic immunological and cytological studies to establish the presence of blood, saliva, sperm, cells of the mucous membranes or skin.

The presence of nucleated cells is determined in the Department of Forensic Cytology using microscopic techniques and special methods for staining cells in preparations. As a result, from the contact trace with a low content of genetic material (a priori) we obtain the result-response in the form of “establishing the presence of several nucleated cells in the preparation”, based on this result, it cannot be concluded that it is possible to obtain a DNA profile of cells, as well as that it’s impossible to get a DNA profile.

The determination of the presence of sweat is carried out in the department of forensic immunology using a qualitative reaction to serine - an amino acid that is part of the sweat. The conclusion is "sweat, in the contact track revealed", the material has been used up, the result is similar.

In our opinion, conduct cytological and immunological studies of contact traces on objects with a limited surface such as cartridges, ampoules, cartridges, pens, letters, keys, etc. today there is no direct need, in cases where operational-investigative measures have established facts of simple contact between a person and an object.

For example, the decision states “to determine the DNA profile of the contact trace on the material evidence ...”, which means that the contact traces left by someone (the suspect, the victim) on the subject, the forensic examiner examines DNA and provides DNA during the examination the conclusion on the determination of the DNA profile of a particular person without indicating the nature of this trace, i.e. a conclusion is drawn on determining the DNA profile of biological material in a contact wake. The mechanism of formation of such traces on the subject is a complex debatable and exclusively legal issue.

Additional studies to establish the nature of biological material are carried out only in cases where the nature of the trace is of fundamental importance for the investigation.

An example of the effective use of the proposed integrated approach when conducting a forensic molecular-genetic examination with the aim of identifying contact sweat-fat traces in the framework of the examination of the corruption of minors in fact depraved actions in relation to minors. From the materials of the pre-trial investigation it is known that c. I., who is the stepfather, of an 8-year-old girl has repeatedly carried out depraved actions against her. The girl told her mother about the events only a few days later. During the forensic medical examination in order to establish the fact of corruption of the juvenile, no mechanical damage was revealed, the fact of depraved actions was not proved by an investigative way. A few months later, the mother and child again turned to the police with a statement about the commission of depraved acts, no more than 6 hours have passed since the crime was committed.

During the inspection of the girl, no mechanical damage was detected, based on data previously obtained from the girl about what happened when she was left alone with her stepfather gr. I. (the protocol of interrogation of the witness with the participation of a child psychologist), the specialist carried out swabs from the skin areas of the girl in the chest, abdomen, groin, i.e. from all alleged places of contact of the skin and hands of the suspect with the victim, according to the situational picture of the incident.

When conducting additional studies in order to establish the nature of the biological material, saliva, buccal epithelium, and sperm cells were not found in the swabs. Based on the results of the molecular genetic study, mixed DNA profiles (genetic traits) of the victim, the suspect, and her mother were identified. Thus, an expert version of what happened was formed.

An example of the effective use of the proposed integrated approach when conducting a forensic molecular-genetic examination in order to identify contact sweat-fat traces in the framework of the examination of causing serious bodily harm.

From the materials of the pre-trial investigation it is known that on 11/21/17 about 20.00 gr. D., 72 years old, was in his apartment and drank alcohol with an unfamiliar man of uncertain age, who caused gr. D. bodily injury. After the deed, the criminal left the apartment, gr. D., 72 years old, was discovered by a neighbor; in an unconscious state he was taken by an ambulance to the hospital, where he died without regaining consciousness.

The investigator appointed a forensic molecular genetic examination of the victim's things. The following materials of the case were requested by genetic experts for study, namely: the protocol of the inspection of the

scene of the incident - the apartment of the victim, the photo-table of the inspection of the scene of the incident, the protocol of the interrogation of the witness, the report of the expert of the forensic examination of the department of forensic examination of corpses. After studying all the case materials received, based on the obtained evidence, it was found that there were injuries on the body of the corpse in the chest and left shoulder areas. Probable traces of biological origin were removed from the projection of these injuries onto the victim's clothing. It was in these places that contact traces were found, and mixed DNA profiles (genetic traits) of the injured, suspected, unknown person of the male genetic sex were determined. Thus, an expert version of what happened was formed.

Conclusions

The widespread introduction and application of methods to identify and examine visible and invisible (latent) DNA-containing traces will lead to an increase in the disclosure of serious and especially serious crimes, including the disclosure of crimes of past years. The development and improvement of this area of research is one of the highest priority tasks of the forensic genetic examination.

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Особенности обнаружения и изъятия следов биологического происхождения во время расследования уголовных правонарушений

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Аннотация: разработка комплексного методического подхода по проведению судебно-медицинской экспертизы с целью идентификации микроколичеств, микроследов, контактных следов биологического происхождения при использовании современных молекулярно-генетических методов.

В процессе совершения преступления происходит непосредственный контакт преступника с телом потерпевших, их одеждой, и другими предметами окружающей обстановки, в результате образуются видимые и невидимые (латентные) следы. Сложность полного уничтожения либо фальсификации следов биологического происхождения повышает удельный вес данных следов в системе вещественных доказательств. Используемые в идентификационных целях эти доказательства отличаются наибольшей достоверностью и значимостью как в изобличении обоснованно подозреваемых, так и в установлении непричастности к преступлениям лиц невиновных.

Широкое внедрение и применение методов, позволяющих выявлять и исследовать видимые и невидимые (латентные) ДНК-содержащие следы, приведёт к увеличению раскрытия тяжких и особо тяжких преступлений, в том числе к раскрытию преступлений прошлых лет. Освоение и совершенствование данного направления исследований – одна из самых приоритетных задач судебно-генетической экспертизы.

Ключевые слова: идентификация, следы преступления, доказательства, судебно-медицинская экспертиза.