Artículo de investigación

Assessment of the conclusions of molecular genetic examination in the investigation of crimes

ОЦЕНКА ВЫВОДОВ МОЛЕКУЛЯРНО-ГЕНЕТИЧЕСКОЙ ЭКСПЕРТИЗЫ ПРИ РАССЛЕДОВАНИИ ПРЕСТУПЛЕНИЙ

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Abstract

The importance of molecular genetic examinations which analyze traces of biological origin increases in the practice of the investigation of crimes in Ukraine. One of the important stages of the expert study and its use in the evidence is the evaluation of the expert's conclusion. As a result of studying scientific and methodical literature, as well as materials of criminal cases of premeditated murders, it was established that expert, investigative and judicial evaluation of conclusions of molecular genetic examinations do not fully meet the needs of criminal proceedings in Ukraine.

The work is based on the analysis of the procedural legislation of Ukraine and forensic literature on DNA analysis, the results of the study of the conclusions of molecular genetic examinations in 180 criminal proceedings on deliberate murders, the study of the practice of inviting experts to court to clarify the conclusions of the examination. In the study, a system of

Аннотация

В практике расследования преступлений в Украине возрастает значение молекулярно-генетических экспертиз, в которых проводится анализ следов биологического происхождения. Одним из важных этапов экспертного исследования и его использования в доказывании является оценка заключения эксперта. В результате изучения научной и методической литературы, а также материалов уголовных дел об умышленных убийствах было установлено, что в Украине экспертная, следственная и судебная оценка заключений молекулярно-генетических экспертиз не в полной мере отвечают потребностям уголовного производства.

В основе работы лежит анализ процессуального законодательства Украины и судебно-экспертной литературы по ДНК-анализу, результаты изучения выводов молекулярно-генетических экспертиз в 250

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methods of scientific knowledge was used: system-structural, comparative-legal, analysis, synthesis, analogy and others.
In order to improve the effectiveness of the evaluation of molecular genetic expertise based on the results of DNA analysis, the expert should formulate accessible conclusions about the origin of biological traces, for which it is necessary to develop criteria for the coincidence of comparable objects. In order to admit the conclusions of the genetic expert as evidence, criminal procedural legislation of Ukraine should be improved by developing special rules for the selection of biological samples for DNA analysis by the investigator, the court and their voluntary giving by citizens. It should also be possible to carry out verification studies at the pre-trial stage of investigation and develop expert methods to solve questions about the mechanism of DNA penetration into objects.

Key words: Molecular genetic examination, DNA analysis, assessment of forensic findings, DNA as evidence in criminal investigation, conclusion of an expert in criminal proceedings.

уголовных производствах об умышленных убийствах, изучение практики приглашения экспертов в суд для разъяснения выводов экспертизы. В ходе исследования использовалась система методов научного познания: системно-структурный, сравнительно-правовой, анализ, синтез, аналогия и другие.
С целью повышения эффективности оценки молекулярно-генетической экспертизы по результатам ДНК-анализа эксперт должен формулировать доступные выводы о происхождении биологических следов, для чего необходимо разработать критерии совпадения сравниваемых объектов. Для допущения выводов эксперта-генетика в качестве доказательства следует усовершенствовать уголовное процессуальное законодательство Украины путем разработки специальных норм по отбору биологических образцов для ДНК-анализа следователем, судом и их добровольной даче гражданами, а также решать вопросы о механизме попадания ДНК на объекты, изъятые при расследовании преступлений.

Ключевые слова: молекулярно-генетическая экспертиза, ДНК-анализ, оценка выводов судебной экспертизы, ДНК как доказательство в уголовном расследовании, вывод эксперта в уголовном производстве.

Introduction

Molecular genetic examination is increasingly used in investigative practice due to the high efficiency and accuracy of solving problems for the identification of criminals. DNA analysis methods are particularly important for investigating serious crimes such as rape and murder (Prahlow J.A, Cameron T., Arendt A., Cornelis K., Bontrager A., Suth M.S., Black L., Tobey R., Pollock S., Stur S., Cotter K, Gabrielse J., 2017). The effectiveness of the use of molecular genetic expertise in criminal investigations in Ukraine is not at the proper level and requires further improvement. According to our data, the significance of this examination in the investigation of murders for the identification or justification of suspects does not exceed 62% of the criminal cases in which it was conducted (Stepaniuk R., Shcherbakovskyi M., Kikinchuk V., Lapta S., Guseva V., 2019). The issues of molecular genetic examination in legal proceedings are widely covered in the scientific literature. A significant number of works are devoted to methodological features of the study of biological traces of crime, to a lesser extent - procedural aspects related to the preparation, conducting of an examination and formulating of the expert's conclusions in solving identification problems. One of the significant problems that affects the evidentiary value of the expert's conclusions is the assessment by investigators and the court of the results of the study of objects of biological origin. Therefore, it is important to consider the features of the evaluation of molecular genetic expertise and to offer recommendations for improving the evidentiary value of the expert's conclusions. In this regard, we have identified a number of problems, the solution of which will allow to increase the evidentiary value of molecular genetic examinations in criminal proceedings.

The first problem is related to the formulation of the task to the expert and the conclusion, which is presented by the results of the expert study. In

the majority of examinations carried out (76.7%), the positive conclusion about the coincidence of comparable biological objects by genetic characteristics (DNA profiles) is given in the form of probability with the representation of the calculated mathematical value. This is due to the fact that the methodological recommendations for the Expert Service of the Ministry of Internal Affairs of Ukraine for the conduct of molecular genetic examinations establish precisely this version of the formulation of conclusions. However, this form causes significant difficulties in assessing the established facts by investigators, prosecutors, advocates and other participants in the process who do not have the appropriate expert knowledge.

The second problem is that the pre-trial investigation authorities and prosecutors do not properly comply with the requirements of the law to select biological samples from the inspected people and collect traces of biological origin during the investigation. Procedural violations established as a result of the assessment of the expert's conclusion lead to the recognition by the courts of the conclusions of molecular genetic examination by unacceptable evidence. The problem of imperfect legal regulation of the application of DNA analysis in criminal proceedings in Ukraine is directly related to this circumstance. Currently, DNA testing in legal proceedings is only possible in the form of forensic examination, and the results outside the procedural analysis, which often should be carried out quickly for a large number of witnesses, are estimated to be illegal.

Another problem is the need to further improve the methods of conducting molecular genetic examinations with a view to improving their capabilities not only in determining the origin of the trace from a particular person, but also in clarifying the possible mechanism for their formation. The evaluation of the mechanism of DNA penetration on objects significantly affects the understanding of the circumstances of the crime.

The purpose of the article is to reveal problems of estimation of molecular genetic experts in practice of evidence in criminal cases, which are caused by unclear formulation of experts' conclusions, legal and methodological disadvantages of selection of biological samples from inspected people, collection of traces of crimes of biological origin and their subsequent study.

Methodology

In carrying out this study, the approaches described in the scientific literature to the content of the conclusions of molecular genetic examinations and their use in proving criminal cases were analyzed. We studied 180 criminal proceedings in the cases of premeditated murder examined by Ukrainian courts in 2017-2019, with the aim of obtaining data on the frequency of the experts' presentation of probabilistic results of DNA analysis and their evidentiary significance; establishing the distribution of the practice of inviting experts who conducted molecular genetic expertise at the pre-trial investigation stage to the court to clarify the conclusions of the examination; definitions of the formulations of the experts' conclusions in the event of the coincidence of DNA profiles; clarification of the subjects of the evaluation of the mechanism of the formation of detected DNA traces. The study of the legal aspects of the evaluation of the evidentiary value of the results of molecular genetic examination was carried out using generally accepted methods of scientific research – systemic-structural, comparative-legal, analysis, synthesis, analogy and others.

Results and discussion

One of the most complex and responsible types of research of molecular genetic examination is the comparative analysis of biological traces (blood, sperm, saliva, skin particles, etc.) found at the scene of the accident or on the victim, and the corresponding samples that are selected from the suspect. A positive solution to the question of the origin of traces from a particular subject is of significant evidentiary importance in the investigation of the crime. In its content, the study of objects of biological nature in order to establish a specific person from whom they separated refers to the identification of an entire object by parts separated from it (Mitrichev V.S., 1976). The entire object in this case is the body of the inspected person, and parts are biological traces at the scene of the incident.

Identification is carried out on the basis of unique features characterizing the own structure and composition of the identified object. The uniqueness of a person as a biological organism is manifested in his individual genetic code. When carrying out molecular genetic examination, uniqueness is established according to the genetic characteristics, which is the DNA-profile. The procedure of identification in the molecular genetic examination is carried out in accordance with the general method of

identification research, developed in the theory of forensic examination (Shcherbakovskyi M., 2011). The structure of this technique includes the stages of a separate study of objects, the comparison of the revealed properties and the expert evaluation of the results of comparison. Molecular genetic studies establish not only qualitative, but also quantitative parameters of coinciding features (loci), the probability of their coincidence is calculated taking into account the frequency of occurrence of alleles in the population (Lewontin R.C., Hartl D.L., 1991). Based on the special knowledge of genetics, the expert analyzes the results of research, identifies different and coinciding characteristics, determines their significance for solving the research problem.

The expert's formulation of the answers (conclusions) to the questions posed to him is the last stage of the examination. At this stage, a professional expert evaluation of the results of the study should be continued in the expert's answers to the questions posed by the investigator, prosecutor, court. The interpretation of DNA analysis data is a key point of the identification study. It should be noted that according to Article 102 of the Criminal Procedure Code of Ukraine the conclusion of the expert should necessarily reflect "... the results obtained and their expert evaluation". The expert evaluation serves as a scientific basis for the inference (conclusion) of the expert on criminally relevant circumstances of interest to the investigation or the court. The purpose of identification studies is to establish identity, that is, the origin of biological traces from a specific subject. The assessment of the established individual genetic features (DNA profiles) of the compared objects is carried out not only on a qualitative, but also quantitative level, which, of course, significantly increases the scientific substantiation of the results of comparison. The probabilistic and statistical approach allows to significantly supplement and clarify the given estimation of rare signs from the position of reliability of the conclusion on identity (Koldin V.YA., 2002).

However, it should be noted that the scientific apparatus and tools of genetics do not correspond to the principles, concepts and terminology used in forensic examinations. This leads to significant complications and reduces the effectiveness of the application of DNA analysis as a method of obtaining evidence in legal proceedings. Thus, expert, investigative and judicial practice of Ukraine indicates that in all cases genetic experts transfer the intermediate, expert evaluation of the obtained matching results of studies, which is calculated in probabilistic form, completely, without any changes, to the wording of the final conclusion of the examination. For example, in the case of the murder, the expert concluded: "The Genetic signs of traces of blood on fragments of gauze coincide with the genetic signs of the blood of the suspect. The probability of accidental coincidence of genetic features is 8,37x10-34. The set of genetic features established in these objects is found no more than in 1 of 1.19x1033 people " (Criminal sentence № 292/1135/17, 2019). Thus, in the practice of conducting molecular genetic examinations, it is concluded only that the objects being compared are likely to overlap accidentally, leaving the solution of the issue of a specific source of biological traces (DNA) to the discretion of the investigator or the court. Scientists have expressed different views on how to evaluate the results of DNA analysis carried out for identification, and how to present them in expert opinion. Some researchers recommend formulating a definitive conclusion on identity (Holden C., 1997; Taroni F., Biedermann A., Vuille, J. & Morling N., 2013), others recommend refusing the expert's decision on identity and forwarding it to the court (Balding D.J., 1999; Weir B.S., 1999). The problem is that neither forensic experts nor judges have criteria for assessing probability values for identification purposes. The formulation of conclusions in probabilistic form leads to the ignoring of molecular genetic examination or its incorrect interpretation by the participants of the process. The analysis of criminal sentences shows that since the courts are unable to evaluate the conclusions of the experts, their actions are implemented in two versions. In some cases (43.3%), the conclusion about the probability of accidental coincidence is transferred without changing the procedural documents. Somewhat more often (53.3%) the conclusion of the expert on the extremely small probability of accidental coincidence of objects is replaced by the judgment about the established identity. The word "coincidence" is accepted by non-professionals as a synonym of "identification" (Thompson W.C., Newman E.J., 2015). In single cases (3.3%), the expert who conducted molecular genetic examination at the pre-trial investigation is summoned to the court and interrogated in a court session to explain the conclusion he gave.

In our opinion, the conclusions of the expert formulated in the form of probability do not meet the requirements that are imposed on expert conclusions, developed by long-term practice

and the theory of forensic examinations. The expert's conclusion is an inference based on the results of the conducted studies on the basis of the established data about the investigated object. It is the conclusion that determines the evidentiary value of the expert's conclusion. The final conclusions are answers to the questions posed to the expert. Each of these questions should be answered in substance or indicated as impossible to resolve. One of the basic principles that are presented to the conclusions of any examination is the certainty and availability of information (Orlov Yu. K., 2005). According to the principle of certainty, unclear and ambiguous conclusions that allow different interpretations, for example, conclusions about "coincidence" or "uniformity" of objects, which are compared, are unacceptable. In accordance with the principle of accessibility, only such expert conclusions that do not require special knowledge are available to investigators, judges and other participants in the process can be used in the process of evidence.

This principle does not correspond to the conclusions about accidental coincidence of genetic features of comparable objects with a certain probability, since the investigator and the court, without having the relevant knowledge of genetics and not understanding the extent of the characteristics listed by the expert (DNA profiles), are unable to assess the evidentiary value of such conclusions. In itself, the indication of the probability of an accidental coincidence of genetic features does not carry any useful information for the investigator and the court. The evidentiary value of such conclusions is therefore doubtful, and their use as evidence is almost impossible. It is obvious that such a conclusion about the probability of accidental coincidence cannot be understood or appreciated by any non-specialist. The wording of the answers in the form of a "coincidence" redirects from the expert to the court the solution of the question of the importance of the set of identification signs for the establishment of identity. However, the court could not resolve the issue of identity on its own, since, first, it did not understand the conclusion, secondly, it contradicted its procedural function, according to which it could not form evidence. The court is intended to determine the evidentiary value of the results of the molecular genetic examination in a specific criminal proceeding. The question of identity is to be decided by the expert, and the matter of the court is to evaluate the expert conclusions in the context of all evidence in the criminal case.

The expert should interpret the results of complex analytical studies and bring the chain of his conclusions to such a form when his conclusion becomes public and understandable to any participant in the process who does not have special knowledge in the field of genetics. Consequently, forensic geneticists need to develop reliable criteria that would provide an optimal solution to the problem of individualization, and adopting a specific probabilistic value as a criterion for the uniqueness of the DNA profile would serve as a basis for formulating a categorical expert conclusion about identity. One way to solve the problem is to develop a criterion for assessing genetic identity or a standard for DNA identification (Perepechina I., 2017). The development of such a criterion (standard) will avoid subjectivity when making a decision on identification based on the results of DNA analysis. The achievement in the examination of this value will be the basis for the expert to formulate a categorical conclusion about the source of origin of biological objects. The standard should ensure that the issue of identity can be resolved regardless of the circumstances of the incident. The choice of the criterion of individualization based on a scientifically sound approach and its subsequent regulation, in our opinion, will allow to provide an objective and affordable solution of the issue of identity.

Another problematic issue that concerns the assessment of the findings of molecular genetic examination is that investigators and prosecutors comply with the requirements for collecting biological traces (for example, at the scene of the incident) and for the display of biological samples from verifiable individuals for further expert examination. Violations of the law during these actions lead to the exclusion of the expert's conclusion from the list of evidence. In general, the state of legal regulation of obtaining biological samples in Ukraine requires improvement (see at: Drozd V., Rusnak V., Olishevsky A., Hapotii V., Minkova O., 2019). Practical activities on the selection of biological samples using medical procedures are not a violation of human rights, provided there is no action that degrades the honor and dignity of a person or is dangerous to his health (Article 241 of the Criminal Procedure Code of Ukraine), as well as compliance with the requirements set forth in the practice of the European Court of Human Rights (Kaplina O.V., Shylo O.H., Titko I.A., 2019). However, in the investigative practice of Ukraine, legislative requirements for obtaining such samples are not always observed. For example, in a criminal case involving the

murder of an investigator, during the investigation of the scene of the incident, cuts from the nail plates were selected from the detainee, who at that time was not informed of the suspicion of the crime and, therefore, his procedural status was not determined. Subsequent examination stated that DNA of the victim was revealed in these cuts (Criminal sentence № 752/13790/15-к, 2018). At the same time, according to Article 245 of the Criminal Procedure Code of Ukraine, the selection of biological samples from a person is possible only in relation to the victim, the witness or the suspect and only by carrying out a separate investigative act - a certificate. Due to the procedural violations, this evidence was not accepted by the court, the accused was acquitted. Thus, the evaluation of the conclusions of molecular genetic examination led to the establishment of the absence of the criterion of admissibility of the conclusion as a source of evidence. It is also a common practice to have poorly trained law enforcement personnel leave their biological traces during the scene examination, which are then subjected to expert examination. The objects identified in this way are not related to the crime committed, and the established facts are inapplicable evidence. The existence of a significant number of such examinations only creates the appearance of a solid evidence base, although the established data do not affect the truth of the case in any way.

Another problem is due to the fact that in Ukraine the study of biological traces and samples in criminal cases is possible only in the form of forensic examination. Therefore, DNA research, which has a search character (DNA testing of a significant number of individuals and objects being inspected), takes a long time, is carried out in a procedural form, materials are necessarily placed in a criminal case and only clutter it. At the same time, it is not uncommon for a large number of individuals in a limited place or territory to be found whose DNA needs to be analyzed promptly to identify the offender. Delay with such an express analysis will not only make it difficult to find all the persons present later, but will also allow the criminal to hide. Given this fact, we consider it necessary to develop and introduce into the legislation and practice of the law enforcement agencies of Ukraine voluntary DNA tests, which are of search importance for investigation. This kind of testing is used in foreign countries, whose experience would be useful to Ukraine (Kreag Jason, 2015). Their organization requires the adoption of legislation that establishes the legal basis for the filling, maintenance and use of DNA profiles databases, procedures for the voluntary surrender of biological samples, and the possibility of conducting pre-trial investigations not only of forensic expertise, but also of verification studies.

Currently, in addition to the task of identification, in view of the special sensitivity of modern methods of DNA analysis, the problem of establishing and subsequent evaluation of the mechanism of the formation of identified biological traces is of particular importance. In the process of investigation, it is not so much the question of whose DNA was discovered as the way it was in the scene of the crime that comes to mind. In this regard, it is correctly noted that the conclusion about the source of the origin of traces (probability of accidental coincidence) depends not only on the results of comparison, but is based on expert knowledge, experience and consideration of the circumstances of the crime which together form the expert's conclusion (Biedermann A., Champod C., Jackson G., Gill P., Tailor D., Butler J., Morling N., Hicks T., Vuille J., Taroni F. , 2016). The analysis of criminal cases conducted by us gives grounds to assert, that in Ukraine judicial experts-geneticists do not carry out studies on establishing mechanism of DNA hit on objects. We were also unable to find cases where experts were summoned to court to seek their views on such issues. The reason for this situation is the absence of any development and recommendations on this problem in the domestic investigative, judicial and expert theory and practice. Nevertheless, in criminal investigations, the expert's opinion that DNA could be transferred directly or indirectly to an object would be an important help in determining the circumstances of the event, for example. Solving this problem requires improving the technical and methodological support of forensic expertise in the field of molecular genetics.

Conclusions

1. In the practice of investigating crimes in Ukraine, the conclusions of molecular genetic examinations on the study of DNA profiles obtained from traces of crime and samples from individuals, in most cases do not correspond to the principle of accessibility, since they are formulated in the form of probability of coincidence. This approach leads to difficulties in assessing the expert's findings by the investigator, the prosecutor and the court. We suggest improving the theoretical basis of this

examination on the development of scientifically-based criteria for the coincidence of comparable objects, so that experts, carrying out an expert evaluation of the conducted research, formulate clearer conclusions about the belonging of the identified DNA to a particular person.

2. Often, as a result of the evaluation of the study, the conclusions of molecular genetic examination are rejected, because they do not meet the criterion of admissibility of evidence in the criminal process. This problem is caused by the failure of investigators to comply with the legal norms for conducting investigative actions, during which traces of biological origin are revealed, biological samples are obtained from individuals. In addition, the criminal procedural legislation of Ukraine on this aspect requires improvement in terms of the development of special rules governing the selection of biological samples, rather than referring to the rules for the examination of a person, as is done now.
3. Another reason for the deviation of the expert's conclusions during the assessment of molecular genetic expertise is the conduct of DNA analysis in a different form than the forensic examination, which is a violation of procedural legislation. The result of such a ban is a significant narrowing of the capabilities of pre-trial investigation bodies to solve search issues, a delay in the disclosure and investigation of crimes, a lightning of criminal cases with a large number of excessive examinations. The solution to this problem seems appropriate by legislative development and introduction into the law enforcement practice of the voluntary participation of individuals in DNA testing and conducting verification studies at the stage of pre-trial investigation.
4. In the expert, investigative and judicial practice of Ukraine, it is not customary to involve genetic experts in the decision of the problems about the mechanism of DNA getting to objects seized during the investigation of the crime. At the same time, increasing the capacity of molecular genetic examination in this direction would facilitate the objective assessment of the expert's conclusions and reduce the likelihood of judicial errors associated with the use of DNA as evidence.

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