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## The opinion of forensic expert in the field of DNA analysis in the light of a survey. Preferences and expectations of bodies of the criminal trial and the parties of criminal procedure.

### Summary

The article presents the results of surveys conducted among district court judges, prosecutors and lawyers. The presented considerations relate to the following aspects of evidence material based on genetic polymorphism: preferences of judges, prosecutors and lawyers in relation to the statistical discussion of DNA analysis results, the tendency towards undertaking trial decisions or the selection of defence tactics based on the conclusions of a forensic DNA expert, defining the nuisance factors of DNA analysis opinion for the parties of criminal trial, the relevance of the characteristics of scientific evidence means for the judiciary. The analysis of the results of the survey revealed that both jury panels and trial parties expect the presentation of the final results of statistical analysis. The most useful way of inference is testing the likelihood of alternative hypotheses based on a likelihood ratio. According to respondents, the information derived from forensic DNA expert opinion is of the great importance for undertaking trial decisions, regardless of the meaning of the remaining evidence. The analysis of the survey also results in the notion of a rational assessment of the survey results and correlating them with the data obtained from the other types of evidence. The most troublesome feature of scientific evidence is the long time that elapses from the moment of issuing an order for admission of expert evidence to the time of receiving the opinion. In contrast, the use of different analysis methods by forensic laboratories and the need of statistical discussion are not perceived as nuisance factors. According to the respondents, the most important feature of the opinion, based on the DNA polymorphism, is the ability to identify a person, even in case of family relation.

**Keywords** forensic DNA expert opinion, criminal procedure, DNA analysis, surveys, statistical analysis, trial decisions, nuisance features of forensic DNA expert opinion.

### Introduction

The opinion of an expert in the field of DNA analysis is widely used type of evidence in criminal procedure. Almost thirty years of the use of molecular biology for the purpose of law enforcement has been a period long enough to examine what are the preferences and expectations of judicial bodies and trial parties in relation to scientific types of evidence. In the literature, the survey results were reported (conducted among 76 judges, who rule in criminal and fire-fighter cases) on the problem of the level of subjectivity in forensic opinions, and also, which of the forensic science methods, in the judges' and prosecutors' assessments, can be defined as scientific evidence [1, p. 12, 84] and relevant to forensic identification [2, pp. 95–108; 198–219]. In addition, analysis of the survey results were submitted (conducted among regional and district court judges, prosecutors from district

prosecutor's offices and lawyers from all appellate districts, completed in 2012), relating to the issue of probative value, reliability and usefulness of this type of evidence to prove the categories of offences typified in the Criminal Code [3, pp. 9–17].

The content of this publication provides an answer as to which of the methods of inference and description of the results of DNA analysis is most useful for achieving the objectives of the judiciary and the trial parties. The influence of results of DNA analysis on making judicial decisions was verified and also the expectations of judges, prosecutors and lawyers in the matter of the degree of individualization were described. The last part of the survey is the analyses the level of significance of nuisance factors associated with the scientific evidence in the form of DNA analysis. The methodology of the survey, the group of respondents and their number are presented in the first part of the publication [3, pp. 9–17].

### **Preferences of the parties in the criminal procedure and the judicial bodies in relation to a statistical discussion of the results of DNA analysis**

The methodology of forensic DNA analysis requires the use of statistical tests [4]. Without a thorough mathematical analysis of the obtained test results, the research findings are worthless and the expert opinion does not meet the requirements of the scientific means of evidence [5]. The lack of discussion on the results of DNA analysis may allow to claim that expert conclusions are based on a subjective impression rather than on an objective mathematical foundation [6, p. 120]. The results of the survey, conducted by Moszczyński in 2008, involving 21 forensic experts, show that the conclusions of forensic DNA expert opinion do not contain elements of subjective decisions, provided, among others, that they are confirmed by statistical calculations [2, pp.107–108]. The case law of the Supreme Court of Poland shows that there exists the need to justify the views expressed in the opinions by means of statistical methods [7]. This is possible due to the significant number of tests that can be applied to the interpretation of analytical results based on the variability of polymorphic traits [8]. The alternative hypotheses are tested, the parameter of likelihood of traits appearing in the another, unrelated, random person from the population is calculated and the chance of excluding or not excluding a random person as the DNA donor of sample material is also analysed [9, pp. 206–216]. In one of the questions of the survey the usefulness of the following tests was verified: likelihood ratio, probability of a random compliance, and incidence of particular traits in the population [10, pp. 87–94]. In the survey, out of total respondents, 44% of the regional court judges, 51% of district court judges, 54% of prosecutors and 35% of lawyers stated that inference based on testing two alternative hypotheses is the most convincing way, compared to the values of the remaining algorithms for statistical discussion. The survey results are shown in Figure 1 (Assessment of usefulness of the types of statistical inference for undertaking trial decisions; see Polish version).

After statistical analysis of the survey results, the occurrence of significant differences in the choice of answers to this question was observed. The view that the statistical method, based on the use of a likelihood ratio, is the best way of interpreting the test results, achieved a clear dominance (in all groups of respondents). Furthermore, no significant differences were observed in the distribution of responses within a particular group of respondents. Therefore, regarding the size of the survey and the results of mathematical analysis, it can be stated that according to the judges, prosecutors and lawyers, the most useful way of analysing the results of DNA analysis and mathematical

proving of opinion is a likelihood ratio based on testing alternative hypotheses.

The statistical discussion of the DNA analysis results is the basis for the process of individualizing the source of biological material origination [5]. Shown in the opinion, the whole algorithm of mathematical analysis would be the fulfilment of the demand for readability of the evidence [6, p. 77]. However, extensive mathematical calculations would hold back the control of forensic DNA expert opinion [11, p. 160]. For this reason, it was examined what the expectations of the respondents were in the matter of inserting the whole mathematical discussion into the opinion. The percentage distribution of responses is shown in Figures 2 (Respondent answers to the question concerning the ways of presenting the statistical analysis in the opinion of an expert [the DNA profiles of one person]; see Polish version) and 3 (Respondent answers to the question concerning the ways of presenting the statistical analysis in the opinion of an expert [mixed DNA]; see Polish version).

After the statistical analysis of survey results, significant differences in the choice of answers to this question were found. The view that it is sufficient to put down only the final probability values obtained clear dominance (in all groups of respondents). No differences were observed in the responses within the different groups of respondents. Therefore, taking into account the survey size and the results of mathematical analysis, it can be concluded that it is sufficient to put down in the opinion only the final results of the statistical discussion.

### **A tendency to undertake trial decisions or defence tactics on the basis of the conclusions of forensic DNA expert opinion**

The survey examined which decisions the respondent would make when the expert genetically identified an individual, while the other evidence presented did not point to that individual. A similarly sounding question, however, relating to the defence tactics was put down in the questionnaire forms addressed to the lawyers.

Among the regional court judges, 53% of them stated that in such a procedural situation they would decide to compare the probative value of the expert opinion from the DNA analysis with other types of evidence collected during the criminal procedure. 40% of respondents believe that they would make a decision to appoint another expert to verify the findings which were previously made. Only 4.7% of respondents expressed the view that the right decision would be to return materials of criminal procedure to the prosecutors in order to supplement the evidence.

Among the district court judges, 65% of them would choose the first response (comparing the probative

value of the opinion), 32% of respondents would make the decision to appoint another expert in order to verify the obtained DNA analysis results, and 3% of respondents were in favour of complementary evidence.

Most of the prosecutors involved in the survey (64%) stated that in the event of confirming an accusation on the basis of forensic DNA expert opinion while other evidence refuted the accusation they would decide to extend the preparatory proceedings to support the forensic DNA expert findings with other evidence. 22% of respondents would make the decision to refer the indictment, along with the materials of the case to the court, while 13.5% showed a tendency towards appointing another expert to verify the conclusions of DNA analysis.

Among the respondents of the questionnaires from law firms, 46% of the lawyers stated that they would try to prove the hypothesis that the matching DNA profiles result from other reasons than the biological material left by the accused at the scene of a crime. 29% of the respondents are of the opinion that in such a situation it would be necessary to check whether the institution conducting the DNA analysis has certificates confirming its competence. Approximately 3% of the respondents chose to answer that they would take the decision to consult an expert to control the DNA analysis ordered under expert opinion.

The analysis of the results of the survey allows to justify the view that the respondents, appreciating the high level of credibility and probative value of the forensic DNA expert opinion, show caution in relation to DNA polymorphism. They see the possibility of making analytical errors before and during the analysis and are critical of the conclusions of forensic DNA expert. Not only do they compare evidence obtained with other materials gathered during the investigation, but they also allow the possibility of verification of conclusions by another team of experts.

The next question of the survey presents an alternative situation to the one described above: an expert in the field of DNA analysis excluded the defendant as the person leaving biological material at the crime scene, while other evidence indicates the person accused. Out of the total of regional court judges, 50% of respondents would take the decision to analyse the probative value of other evidence and compare them with one another. 38% of the respondents stated the opinion that in such a situation they would make the decision to appoint another expert in the field of DNA analysis to verify the previously obtained opinion. 12% of the respondents stated that the opinion of an expert in the field of DNA analysis would be the basis to make procedural decisions because of the categorical character of the conclusions. A similar distribution of responses appeared in case of judges of the district courts. 53% of the respondents would make an analysis of the

probative value of other forensic opinions and would compare the obtained result with the evidence from the DNA analysis. 31% of the respondents would appoint another expert to verify the results obtained, and 16% of respondents would consider the opinion of an expert in DNA analysis as the basis for undertaking trial decisions.

Most of the prosecutors involved in the survey (60%) stated that in such a situation they would take the decision to extend the preparatory proceedings to verify the results of forensic DNA expert opinion using other sources of evidence. 23% of the respondents stated that they would appoint another certified forensic expert in DNA analysis in order to verify the obtained findings, 10% of the respondents would bring an indictment to the court, 8% of the prosecutors would end the trial without presenting charges.

Out of all the respondents of questionnaires sent to law firms, 40% of the lawyers would focus on indicating the level of uncertainty of other means of evidence, confirming the hypothesis of the prosecution in relation to the categorical conclusions of the opinion of the forensic DNA expert; 27% of the respondents, as the basis for the defence tactics, would assume that it was impossible to prove the presence of the accused at the crime scene because the biological material was left by another person, while 11% of respondents, on the basis of the results of DNA analysis, would focus on proving that the defendant had a credible alibi.

On the basis of the survey results, it can be stated that the representatives of judicial bodies of criminal procedure show far-reaching caution with regard to the opinion of an expert in the field of DNA analysis. The judges, in the majority, would carry out a comparison of the probative value and reliability of evidence collected in the procedure with the conclusions of DNA analysis. Also, they do not rule out the possibility of verifying the findings of an expert by putting out another opinion. Prosecutors are determined to extend the preparatory proceedings to verify the forensic DNA expert findings with other means of evidence and to control the correctness of analysis and conclusions based on it in the complex opinion. A different approach is represented by the lawyers. Their answers to the questions of the survey show that lawyers indicate a considerably limited level of criticism in relation to this type of evidence. According to the lawyers, mismatched DNA profiles are not a result of a possible laboratory error but presumably the accused was not present at the crime scene.

#### **Perception of the features of DNA analysis opinion by the parties of criminal trial**

The aim of the question that the prosecutors and lawyers were asked was to determine the level of nuisance of factors associated with forensic DNA

expert opinion. The following elements were analysed: duration of analysis procedure, cost of DNA analysis, inference based on the laws of probability and the use of non-uniform analysis methods by various institutions.

#### Duration of analysis procedures

According to 63% of prosecutors and 71% of lawyers, the most nuisance factor of criminal procedure is the long duration of analysis procedure, which carries the risk of non-compliance with the deadlines of criminal trial.

#### Cost of expert's opinion

According to 40% of prosecutors, the cost of the expert's opinion in DNA analysis was the highest nuisance factor (value 4), and 37% of the respondents indicated this factor as a significant nuisance (value 3).

According to 39% of respondents from law firms, the cost of DNA analysis opinion was an important factor (value 3), while 15% of lawyers considered this feature of DNA analysis the most nuisance (value 4).

#### Possible conclusions from expert's opinion in DNA analysis

According to 35% of the prosecutors, the necessity of applying the statistical discussion for interpreting the results of DNA analysis was the least nuisance (value 1) feature of expert's opinion. Also, 35% of respondents indicated this factor as little nuisance (value 2).

According to 35% of respondents from law firms, the conclusions based on likelihood of DNA analysis opinion were an insignificant factor (value 2) and 25% of lawyers found this feature of DNA analysis as the lowest nuisance factor (value 1).

#### The use of non-uniform analysis methods by various institutions

41% of respondents from regional prosecutor's offices stated that non-uniform analysis methods were the lowest nuisance factor (value 1), 27% of respondents thought that the non-uniform analysis methods were the factor of least nuisance (value 2).

According to 33% of the lawyers who responded to the survey, the use of different analysis methods by experts was the lowest nuisance factor (value 1), and 31% of them thought that it was the factor of least nuisance (value 2).

The percentage distribution of survey respondents' answers (prosecutors and lawyers) is shown in Figure 4 (Assessment of the significance of the factors of forensic DNA expert opinion while making trial or defence tactics decisions [4 – the most important 1 – the least important]; see Polish version).

The analysis of the distribution of given responses shows that according to the respondents the most nuisance factor of the DNA analysis is the long time

from issuing the admission decision for the evidence to the moment of submission of scientific evidence material. The practice shows that time-consuming analysis methods, as well as the procedure of giving opinions and interpreting the results, makes it necessary to prolong the criminal procedure.

#### Significance of the features of DNA analysis opinion for the court

The aim of one of the last questions in the survey, addressed to the regional and district court judges, was to determine the significance of the following features of forensic DNA expert opinion for undertaking trial decisions.

##### Obtaining the information that allows for the individual genetic identification of high probability

Among the respondents from regional courts, 86% believed that it was the most important feature of forensic DNA expert opinion (value 4); 5% of the respondents stated that it was an essential feature of expert opinion (value 3).

In the survey addressed to the district courts, 95% of respondents agreed that the individualization of a person with a high probability value was the most important feature of forensic DNA expert opinion (value 4); 3% of respondents said that it was a significant feature (value 3).

##### Determination of family relation degree and the exclusion of relatives of the accused person

43% of the regional court judges stated that this was an important feature (value 3), and 20% of the respondents said that it was the hallmark of the greatest importance (value 4).

57% of judges in district courts stated that the discussed feature was important (value 3), and 17% of respondents said that this feature was of the greatest importance (value 4).

##### The application of various analysis methods hindering the comparison of results

28% of the regional court judges stated that this was an important feature (value 3), and 1% of the respondents said that this feature was of the greatest importance (value 4). At the same time, 29% of the respondents found this feature of expert opinion to be the least important (value 1) and 42% of the responding judges found this feature to be of little significant (value 2).

12% of district court judges stated that the discussed feature was important (value 3), and 4% of the respondents stated that it was a feature of the greatest importance (value 4). 36% of the respondents considered this feature of opinion the least important (value 1) and 48% of the responding judges considered it as of little importance (value 2).

Applying an approximate statistical discussion in forensic DNA expert opinion for mathematical analysis of the results included in other sources of evidence

14% of regional court judges stated that this was an important feature (value 3), and 5% of respondents gave this feature of expert opinion the greatest importance (value 4). At the same time, 38% of respondents considered this feature of opinion the least important (value 1) and 42% of the responding judges considered it as of little importance (value 2).

7% of district court judges stated that the discussed feature was important (value 3), and 9% of respondents stated that it was a feature of the greatest importance (value 4). 48% of respondents considered this feature of the opinion the least important (value 1), and 36% of the responding judges considered it as of little importance (value 2).

The percentage distribution of answers of regional and district court judges is shown in Figure 5 (Assessment of the significance of DNA analysis opinion features when undertaking trial decisions [4 – the most important one, 1 – the least important]; see Polish version).

The analysis of the distribution of obtained responses presents that according to the respondents of the survey the most important feature of forensic DNA expert opinion is the possibility of identifying an individual person. The survey results show that the use of different analysis methods in laboratories performing DNA analysis and the need for statistical discussion are not perceived as being nuisance factors.

In the last question of the survey (an open one), the respondents were asked to define the problems they faced during requesting DNA analysis and after obtaining expert opinion.

In 10 questionnaires received from the district courts, the respondents included the following postulates: formulating opinions in a manner understandable to judges and parties of the criminal trial in accordance with the rules of logic; assigning the labels of tested samples to the specific evidence material submitted for analysis; shortening the waiting time for expert's report and reducing the cost of opinion, aiming to achieve the categorical conclusions of scientific evidence.

In 25 questionnaires, returned after completing by the district court judges, the respondents included the following postulates: reducing the time of analysis and preparation of opinions; reducing the cost of DNA analysis and increasing its availability; concise, clear and logical formulation of final conclusions; addition of the information regarding the potential distortion of analysis result in case of incorrect collection and preservation of evidence material; addition of the information on the effect of environmental conditions

and the occurrence of contamination on analytical obtained results; explanation of technical terms used in opinions; aiming for the categorical character of opinion or showing the probability value; specifying the relationship of analysed sample with the forensic trace evidence collected during the crime scene investigation; meeting the deadlines of obligations imposed by experts; the appearance of an expert in the court on the time and date set by judicial summons.

In 77 questionnaires returned by the respondents from regional prosecutor's offices the following postulates were included: reduce the time of carrying out the opinion and decreasing the cost of analysis; prepare concise opinions using the language understood by lawyers; clear position of an expert regarding the possibility of separating individual DNA profiles in case of the analysis of mixtures; the court consulting an expert before issuing a decision on the admission of expert evidence in order to verify the evidence material to be tested and to assist during the formulation of the purpose and scope of laboratory analysis; the suggestion of an expert about the necessity of requesting other analysis; presented in the reporting section of the opinion, the entire procedure of analysis the biological trace evidence (from expert inspection and sampling for analysis, through DNA analysis, to the final conclusions).

The lawyers who participated in the survey and returned the completed forms via e-mail did not include additional comments, suggestions or proposals relating to forensic DNA expert opinion.

## Conclusions

Forensic DNA expert opinion is a well-established means of evidence in the practice of criminal procedure. Due to the widespread use of DNA analysis for almost thirty years, the procedure of proving an offence has been largely enriched with information of a low level of subjectivity. As highlighted in the literature, DNA analysis is considered by the survey respondents as a scientific means of evidence [1, p. 12], which also has a high level of objectivity [2, pp. 95–108]. These were the main reasons for exploring the views of judicial bodies and the parties of criminal procedure concerning evidence based on DNA polymorphism. The analysis of the results of the survey, carried out by the author in 2012, shows that the judicial bodies and the parties of the criminal procedure consider this type of evidence as credible and being characterized by the highest level of probative value of opinions based on biological features. The survey also shows that forensic DNA expert opinion indicates various suitability for proving or developing the tactics of defending a person accused of committing a crime typified in sections of the Criminal Code. According to the regional and district court judges, as well as

the prosecutors, this type of evidence demonstrates the highest level of the suitability for proving crimes against life, health and sexual freedom. Forensic DNA expert opinion shows also the highest suitability for the defence tactics of a person being accused of committing crimes, indicated in Sections XIX and XXV of the Criminal Code. For this type of evidence to meet the conditions of methodological correctness and consistency with recommendations of the Supreme Court, it is necessary to include a statistical discussion of the results obtained in the analysis [12]. According to respondents, the most useful way of mathematical analysis of results is presenting the final value of likelihood ratio which consists in specifying the probability of two alternative hypotheses. The information obtained from forensic DNA expert opinion is important when undertaking trial decisions in different situations of criminal procedure. The survey justifies the view of objective considering of survey results and correlating them with other types of evidence material obtained in the procedure. The way

the respondents of surveys acted during the analysis of forensic DNA expert opinion is in line with the case law of the Supreme Court of Poland which points to the need of analysing the whole evidence material [13]. The greatest nuisance feature of forensic DNA expert opinion is the duration of analysis procedure and its cost, and the most important is the possibility of identification, even in case of family relation. The survey results show that both the trial decision-makers as well as the parties of the criminal trial are far from uncritical adoption of results based on biological methods of analysis. The undertaken trial decisions or the developed defence tactics are based on an objective scientific tool.

### **Source**

Figures 1–5: author

Translation *Ronald Scott Henderson*